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RANDOLPH B. COHEN

Dimensional Fund Advisors, 2002

In June of 2002, David Booth faced a dilemma. His firm, Dimensional Fund Advisors (DFA), had in recent times shown stellar performance after going through some relatively rough patches in the late 1990s. Growth was steady and profits strong. Yet, *Pensions and Investments* ranked DFA a mere 96th in size among investment companies (see **Exhibit 1**). While DFA had never viewed maximizing assets under management as a goal, the ranking did suggest that it might be possible for DFA to achieve more as a firm than it currently was. Should Booth and DFA continue on the path that had brought them this far? Or was this the time for a major initiative that could catapult DFA to a status among the largest firms in the business?

The Company and its Clients

DFA was an investment firm based in Santa Monica, California. Founded in 1981 by Booth and Rex Sinquefield, two former students at the University of Chicago Graduate School of Business, DFA was dedicated to the principle that the stock market was "efficient"—that is, while over any given period some investors by luck would outperform the market and others would underperform, no one had the ability to consistently pick stocks that would beat the market. Such beliefs were associated with proponents of index funds, and, indeed, Sinquefield had run one of the very first S&P 500 index funds while at another firm. But DFA was not simply an index fund manager. In addition to efficient markets, DFA's founders believed passionately in two other principles: the value of sound academic research, and the ability of skilled traders to contribute to a fund's profits even when the investment was inherently passive. At its founding, DFA surmised that acting on these core beliefs would make it unique among investment companies.

By 2002, DFA had 130 employees, over 100 of whom worked in the main office by the sea in California. Most of the rest worked in a Chicago office and two other trading offices, in London and Sydney. In addition, the firm had close working relationships with a number of prominent academics, especially Eugene Fama and Kenneth French, who had been involved with the firm from its early days, when they both taught finance at the University of Chicago. DFA encouraged academics to work on subjects of interest to the firm by giving any professor a share of profits from investment strategies derived from his or her ideas.

Professor Randolph B. Cohen prepared this case. HBS cases are developed solely as the basis for class discussion. Cases are not intended to serve as endorsements, sources of primary data, or illustrations of effective or ineffective management. Professor Jay Light prepared "Dimensional Fund Advisors: 1993," HBS Case No. 294-025.

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DFA had started with a single investment fund that held small stocks, but it now offered a fairly broad product line (see **Exhibits 8** and **9** for information on DFA's equity products; DFA also had about $2 billion of fixed-income investments). Still, small stocks continued to be DFA's primary business. DFA's fees tended to be lower than those of most actively managed funds but higher than those of pure index funds (see **Exhibit 5**). This was fitting given DFA's position in the market as a passive fund that still claimed to add value.

DFA began by managing money for major institutions, and these original clients continued to make up the majority of its business. The total amount invested in DFA by institutions was about $25 billion. Such clients numbered over 125 and included corporate, government, and union pension funds, college endowments, and charities. Nearly all of DFA's institutional clients were tax exempt, either because of their not-for-profit status or because of the tax exemptions granted to retirement plans.

In 1989, DFA decided to pursue high-net-worth individuals, in addition to institutions, as clients. Because of the illiquid nature of many DFA holdings, it decided that direct accounts with individual investors would likely lead to intolerably high costs. Instead, DFA offered investment services to individuals through a limited number of investment and accounting firms that acted as intermediaries known as registered investment advisors (RIAs). The RIAs chosen shared DFA's core beliefs, especially the importance of diversification, low turnover, and low transaction costs. The advisors received no payment directly from DFA, but DFA's low fees enabled them to charge a moderate advising fee to the client while still keeping total charges reasonable.

These arrangements benefited both DFA and the advisors. DFA provided the RIAs with a low-fee product that the clients would not be able to obtain on their own. In addition, DFA educated its RIAs by providing them with access to top researchers who were developing innovative theories and empirical analyses. The RIAs then used what they had learned to advise their clients. In many cases, this advice generated questions that DFA delivered back to the academics for continued research. For their part, the RIAs brought DFA a pool of wealthy clients whose overall investments in DFA were quite substantial. Since DFA did not advertise, the RIAs were a crucial conduit enabling DFA to reach this market. DFA's RIA business had grown rapidly, from its start in 1989 to over $15 billion in assets under management in 2002 (see **Exhibit 2** for historical data on DFA's assets under management).

20 Years of Investing Based on Academic Research

DFA took pride in the belief that its investment strategies were based on sound academic research. When the firm began in 1981, its main product was a "small-stock" fund; that is, the fund invested in stocks whose market capitalization fell below a cutoff set by the 20th percentile of all NYSE stocks (this fund was known as the U.S. 9-10 Small Company Portfolio because it contained stocks in the ninth and tenth NYSE deciles based on size). The fund was later renamed the U.S. Micro Cap Portfolio. This category included a substantial number of stocks, since far more than 20% of AMEX and over-the-counter (now NASDAQ) stocks fell below the ninth decile NYSE cutoff. In 2002, there were more than 3,600 stocks eligible for the Micro Cap Portfolio. One crucial reason DFA saw small stocks as so attractive was the findings of academic papers, most notably the University of Chicago Ph.D. dissertation of Rolf Banz. Banz found that small stocks had consistently outperformed large stocks over the entire history of the stock market from 1926 through the late 1970s. Booth and Sinquefield reasoned that if this pattern were to continue, small-stock investing could deliver substantial returns to investors. Moreover, even investors who were skeptical about the findings of

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this research might desire to put a fraction of their money into a small-stock fund, since many mutual funds focus their investing primarily on the stocks of very large companies.

Soon after the successful launch of the 9-10 Portfolio, DFA added the U.S. 6-10 Small Company Portfolio (now U.S. Small Cap Portfolio), for which any stock smaller than the median NYSE stock was eligible. Then came the U.S. 6-7-8 Small Company Portfolio (now U.S. Small XM Portfolio, where "XM" stands for "except micro cap"), which contained stocks eligible for the 6-10 Portfolio but not for the 9-10 Portfolio. This gave investors several ways to get a piece of the stock market not covered by the S&P 500. (See **Exhibit 3** for more information on the coverage of these funds.) In 1986, DFA introduced small-cap funds for the United Kingdom and Japan based on research that indicated a size effect in these countries as well. Assuming the size effect was a global phenomenon, it added small-cap funds for the European continent (1988) and the Pacific Rim (1989) as well.

Beyond the Size Effect

In 1992, Fama and French published a breakthrough paper entitled, "The Cross-section of Expected Stock Returns." The paper contained a number of findings; most prominent among them were the following:

1. Stocks with high "beta," the fundamental measure of risk in the capital asset pricing model (CAPM), did not have consistently higher returns than low-beta stocks. This result shook the foundations of modern portfolio theory, which was based around the idea that investors receive greater reward (return) for taking on more risk (beta). As a consequence of this finding, the paper was nicknamed in the popular business press the "beta is dead" paper.

2. Stocks with a high ratio of book value of equity to market value of equity (BE/ME) exhibited consistently higher returns than stocks with low BE/ME. A series of previous academic papers had documented related effects in which stocks that had low price relative to some measure of firm fundamentals were found to exhibit high returns. Basu (1980) had shown that firms with high earnings-to-price ratios (or, alternatively, low P/E ratios) tended to perform well. Bhandari in 1986 had examined leverage, which can be measured as the ratio of a firm's total assets to market value of equity (A/ME). Rosenburg, Reid, and Lanstein (1985) had even looked at the book-to-market ratio itself. Fama and French's paper looked at all of these scaled price variables and more, concluding that book-to-market ratio was the most powerful scaled-price variable for predicting stock returns and that it subsumed the other variables in "horse race" tests.

3. Consistent with the earlier findings of Banz, small stocks outperformed large. Moreover, this effect could not be explained by beta or by book to market; and book to market could not be explained by size. It appeared that in considering the expected returns on stocks, investors would need to consider the "book-to-market effect" in addition to the "size effect."

Fama and French showed their preliminary results to Booth and Sinquefield, who were excited by the portfolio management implications of the book-to-market effect. Months before the publication of "The Cross-section of Expected Stock Returns" in the *Journal of Finance*, DFA had already begun a U.S. Small Value investment fund based around this new strategy. The high book-to-market stocks favored by the strategy became known in the academic literature as "value" stocks while the low BE/ME stocks DFA eschewed became known as "growth" stocks, or sometimes as "glamour" stocks. (**Exhibit 5** shows characteristics of the value and growth stocks.) DFA preferred the "growth" moniker, as the idea that low BE/ME stocks performed poorly because they were overhyped and glamorized did not fit with its efficient markets views. It argued that value stocks outperformed growth stocks for the only reason any asset consistently outperforms in a rational, efficient market:

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because they were riskier. Although the source of this risk was unclear, the idea was not implausible. Value stocks, which had low prices despite substantial assets on the books, tended to be companies with poor recent performance of both stock return and profitability; such stocks might well be "distressed" companies that could easily topple into ruin.

In the decade after the publication of the 1992 Fama-French paper, dozens of papers were written debating the question of whether value stocks were truly riskier than growth stocks. Best known among these was another effort by Fama and French, a 1993 paper entitled "Common Factors in the Expected Returns on Stocks and Bonds." In this paper the authors created two new portfolios. "SMB," for small minus big, was a portfolio that held small stocks and shorted big stocks, while holding comparable weights in value and growth stocks on the long and short side. "HML," for high-minus-low BE/ME, was long in value stocks and short in growth stocks, while being size balanced. Fama and French argued that sensitivity to the movements of these two factors, like sensitivity to the market (i.e., beta), constituted risk. They were able to show that beta risk along with these two newly identified risks explained a great deal of the variation of stock prices. In addition, SMB and HML provided a convenient way to summarize the relative performance of value-growth and small-big portfolios and to measure covariation with those portfolios. This approach became known as the "Fama-French Three-Factor Model." (**Exhibit 6** shows the annual average return and return standard deviation of these factors over various periods. **Exhibit 7** shows the portfolio growth for an investment that rebalances monthly to $1 each way in a long-short strategy based on each Fama-French factor.)

Fama and French argued that because their factors explained so much of the common variation in stocks, that suggested they were related to real economic risk. Others responded with new evidence that small stocks and value stocks did not appear to be nearly risky enough to justify their high average returns, and with new theories that used evidence from psychology research to argue that the effects were consistent with investors being susceptible to common irrational biases. The debate continued to rage.

Value and Growth Stock Performance in the Past and Around the World

Some research, instead of trying to explain the phenomena, called into question the very existence of a value-growth effect. Authors argued that the good performance of value stocks might simply have been a fluke or might have been due to problems with the data used by academic researchers. This argument was bolstered by the fact that research on the subject used only about 25 years of data, and all of that was from the United States. Fama and French set out to settle the question. Along with Professor James Davis (who was later hired by DFA), they pored through old, yellowed books by hand, compiling the data for firms traded in the 1926-1962 period. They then sorted stocks by book-to-market ratio. Again, they found a book-to-market effect: value stocks outperformed growth stocks during the early years as well as the more recent period. Another test was offered by the international data. Morgan Stanley Capital International had carefully collected data on thousands of firms in dozens of countries. These data included book value, dividends, and earnings, as well as stock price and stock return information. Fama and French analyzed these data and found once more that the book-to-market effect was robust. High book-to-market stocks outperformed low in virtually every country studied (see data in **Exhibit 6** on performance of value stocks globally). Based on these findings, DFA expanded its product offerings by introducing international value funds, much as it had introduced international small-stock funds in years past.

In addition to the impressive average performance of value stocks, Fama and French found another intriguing fact. When value stocks had a good year relative to growth stocks in one country, the same tended to be the case in many other countries as well. This high level of correlation among

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value-growth portfolios could be viewed as good news for efficient-market theorists and bad news for those hoping to beat the markets. If the value-growth portfolio of the United States was nearly independent of that of Japan, the United Kingdom, or Germany, then a value-growth portfolio that combined value stocks from all four countries in the long haul and shorted growth stocks would have the high average returns associated with value but, due to diversification, it would have very little risk. Such a situation would create a tremendous opportunity for the international value investor—levered holdings in such diversified minus-growth portfolios would have tremendous average returns, while levels of risk would remain reasonable. Fama and French found that no such opportunity existed. While value did well on average, in certain years value portfolios were outperformed by growth portfolios across a wide array of countries. This finding was consistent with the idea that investing in value stocks really was risky and that the high returns of value stocks were merely a reward for bearing this risk.

Subsequent Performance of the Small-Stock and Value-Stock Asset Classes

In the early 1980s, the United States went into a deep recession, and small companies were particularly hard hit. As the decade wore on, the economy and the stock market boomed, but small stocks continued to lag. One factor in the superior performance of large stocks may have been the growing primacy of the S&P 500 Index, an index of large companies, as many investors were attracted both to passive index funds and to actively managed funds that focused on stocks held in the index. However, the poor performance of small stocks in the 1980s and into the 1990s could not solely be attributed to small companies being "out of favor" in the markets. Fama and French wrote a paper in which they showed that the profitability and other economic measures of the performance of small *companies* had been poor relative to their larger competitors throughout the 1980s and early 1990s.

DFA was now in an unhappy situation. Although its small-stock fund continued to outperform most small-stock benchmarks and most of its competitors in the small-stock investing business, the fund lagged behind others that had invested primarily in large stocks. In particular, the fund lagged the S&P 500 Index, which more and more was becoming the benchmark by which all investors were judged. Critics argued that DFA had started investing in small stocks at exactly the wrong moment—it had bought in when small stocks, after decades of good performance, had reached their peak and begun to perform poorly. Others suggested that DFA itself might be responsible for its own poor performance. They claimed that as soon as the size effect became widely known and DFA and other funds began to trade on it, the effect went away, as predicted by some theories of efficient markets.

By the late 1990s, it appeared that history was repeating itself. Value stocks, which had so reliably beaten growth stocks in previous decades in a variety of countries, rose steadily throughout the decade. But these steady returns were dwarfed by the spectacular performance of growth stocks, most especially high-technology stocks with very high market capitalizations and relatively few assets in place—the exact type of stocks DFA most studiously avoided. As tech and other growth stocks soared through the 1990s, it appeared that DFA was entirely missing the boat. Of course, for dyed-in-the-wool value investors, the higher the prices of growth stocks climbed, the more undesirable they appeared. To this way of thinking, the relatively low prices of value stocks presented a more and more tempting opportunity with each passing day. But this was cold comfort to DFA investors who had to listen to the bragging of their tech-heavy friends. DFA hoped that the high returns of value stocks in 2000 and 2001 would finally stop investors from thinking that by investing in a particular style, DFA eliminated that style's edge.

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Trading

Going to the market to purchase the stock of a very small company could move the stock's price substantially. This liquidity problem was a primary reason why mutual funds had historically focused on large stocks. Early on, DFA hit upon a strategy that tried to not merely reduce transaction costs but actually use transactions to create value for DFA and its clients. Instead of bidding in the open market to buy stocks, DFA would simply absorb the selling demand of others. In return for accepting large blocks of stock from market participants who had a strong desire to sell, DFA was able to extract a discount on the stock purchase. As word spread that DFA was willing to buy large blocks of illiquid stocks from eager sellers, calls and electronic inquiries began to pour in at a rate of hundreds per day. Of course, not all purchases could be made via block trade. If funds came into the portfolio more quickly than block trade opportunities appeared, DFA would have to buy stocks in the open market. In the Small Cap Portfolio in 2001, 36% of purchases were block trades (see **Exhibit 10**). For the Micro Cap Portfolio in 2001, the figure (not shown in the exhibit) was 59%.

A typical DFA stock purchase might have gone as follows. A large mutual fund, heavily invested in the retail sector, might decide that economic and market conditions warranted a rotation out of retail and into another industry—say, energy. That fund was heavily invested in Saks Fifth Avenue (SKS)—a department store with a stock price of around $15 and a total market capitalization of around $2 billion. The fund held 1 million shares—a substantial stake comprising about 0.75% of the company. Since SKS only traded about 400,000 shares in a typical day, the fund manager knew that getting rid of 1 million shares in a day, or even in smaller increments spread over a week or two, could substantially and negatively affect the market price of SKS. Instead of sending the trade to the NYSE floor, the manager called an investment bank's block-trading desk or a broker-dealer, who then called DFA. DFA saw about 1,000 potential trades in a typical day and executed only about 20. The selection process involved answering a list of several crucial questions.

Is there important information about this company that we don't know?

Anyone who considers buying anything must be concerned with the *adverse selection problem* (sometimes known as the "lemons problem")—the possibility that the item is only available for sale, or only available at the given price, because there is something wrong with it. As with used cars, where buyers must always fear that the owner would not be selling the car if it were running well, so with securities. DFA's traders took several steps to minimize the likelihood that they were being sold a lemon. First, they generally would not buy if news announcements were known to be coming in the near future. For example, DFA generally would not close a transaction within a few days before a company's earnings announcement. Second, DFA would look to avoid stocks that were likely to negatively surprise in the near future by doing a thorough investigation of a stock, which could include an examination of company reports as well as other news sources. Third, DFA avoided stocks that had recently reported sales by insiders. Finally, DFA minimized adverse selection by paying careful attention to its seller and the nature of the stock blocks it traded. These points are considered below.

Note also what DFA would *not* do: it would not do any fundamental analysis of the firm in question. As a believer in efficient markets, DFA felt that on average the market price correctly incorporated all public information. Its concern was merely that there be no negative private information known to the seller but not to the market.

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Is this someone we are comfortable trading with?

DFA reduced adverse selection problems both by dealing with parties that had shown themselves to be trustworthy and by taking steps to encourage greater trustworthiness in its trading partners. DFA had a vast roster of regular sellers—brokerage firms that had a consistent need to trade large blocks of stock for their clients. Preferred sellers were firms (and individuals within those firms) that consistently made full disclosure to DFA of everything they knew about the stock. Such brokers would be more likely to get a deal done and to negotiate a less steep discount. DFA would be more cautious with brokers with whom it was less familiar. Such sellers might find that DFA wanted to do smaller deals until a trusting relationship had been established, or that DFA might negotiate a particularly steep discount because of the greater risk associated with the possibility of being "picked off."

As one of only a small number of firms with the ability and willingness to take down large blocks of stock in small firms, DFA became an important resource. If an institution could not deal with DFA, its ability to trade inexpensively could be severely inhibited. Since a refusal by DFA to do business with a brokerage firm was a consequence much to be avoided, DFA's "penalty box" was an effective tool for reducing adverse selection problems. If a broker sold DFA a block of stock and subsequent events made clear that the broker had not been entirely forthcoming about its knowledge of the company or about its plan to sell more of the stock, that brokerage firm's name would be placed on a large board visible from any spot on the DFA trading floor. The traders then knew not to do business with that institution for as long as its name was on the board. Depending on the severity of the infraction, a broker-dealer could stay in the penalty box for months or even longer. Since DFA's practice was well known in the investment community, brokerage firms were aware of the costs of providing false or misleading information, and the penalty box rarely had to be used.

Is this the entire block of stock?

Given the importance of price pressure to DFA's trading practices, it is no surprise to learn that future sales of the stock, as well as information about company profits, was of central interest to DFA traders and its brokers. The last thing DFA wanted was to buy a block of stock only to have the seller then sell an additional block of stock into the market, pushing the price down immediately after DFA bought it. Thus, DFA insisted that sellers reveal and offer for sale the entire holding of stock they owned. Unless DFA was convinced that the block purchase consisted of the seller's entire position, the trade would not be considered. DFA offered several benefits in return for this disclosure. First, DFA was frequently willing to take down the entire block of stock (as a consequence of buying very large blocks, DFA owned over 5% of the shares of many small companies). This simplified the broker's life and reduced the likelihood that each partial block sold would push down the price of the broker's next sale. Second, DFA had a sterling reputation for secrecy. Sellers felt safe revealing to DFA the size of their holdings and the size of their planned sale. Leaked information that a sale was pending could of course push the stock price down prior to the sale.

Does this trade increase or reduce the diversification of the fund?

DFA's strategy was to attempt to match a broad-based, value-weighted small-stock index. The firm had no interest in attempting to bet on particular firms by taking especially large positions in them—it left this sort of work to the active fund managers. On the other hand, precisely matching the holdings of the index portfolio would require DFA to go to the market as a determined buyer, which would lead to DFA paying premiums for stocks instead of getting discounts. Thus, DFA traders had to balance two objectives: they wanted to get the stocks that they could purchase at the

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best discounts but do so in such a way as to keep the fund maximally diversified and thus have minimal tracking error with the small-stock index. DFA was willing to buy more of a stock that was already overweighted in the portfolio relative to the index, but the more overweighted the stock was, the greater a discount DFA would have to obtain to make the purchase worthwhile.

How big a discount can we obtain on the trade?

The whole process could take just a few minutes if the seller was familiar and the stock had been looked at recently for another deal. In other cases, negotiation could take as much as two weeks. In the end all other factors mattered only to the extent that they were measured relative to price. For a large enough discount, DFA was willing take on increased risk of adverse selection or slightly decreased diversification. When a call came in, the size of the discount was not known. The traders had to use their knowledge of the broker and of the markets to estimate how low a price they could pay and still close the deal. The size of the available discount was the last and most crucial piece of the puzzle.

Trading History

Historically, all this care had yielded considerable benefits. DFA commissioned research to track the effect of its trading tactics. (Results from one such study, performed by Professor Donald Keim of the Wharton School, are shown in **Exhibit 10**.) For 2001, DFA obtained an average discount of 3.33% on its block trades. However, only 36% of fund purchases were made via the block-trade route. For the remaining 64% DFA had to "work the order" by patiently buying shares in a way that it hoped would have minimal price impact. Keim estimated that DFA lost 0.58% to costs on these orders. Taking a weighted average of these numbers gave a 0.83% average discount for all orders. In 2001, DFA's trading of the U.S. Micro Cap Portfolio was even more effective: the average purchase discount for all trades was 2.13%.

Since assets under management had thus far grown steadily, there had rarely been a need to sell for liquidity reasons. DFA insured that very large withdrawals would not force it to sell stock by reserving the right to redeem withdrawals "in kind"—that is, by handing over shares in hundreds of stocks. Moreover, DFA's passive strategy meant it did not sell based only upon a new, negative opinion about the company. In general DFA sold shares only if a stock no longer fit the portfolio it was in—if a small stock became large, or a value stock became a growth stock. Such changes had generally occurred simultaneously with substantial increases in liquidity. After all, a stock too large for the U.S. Micro Cap Portfolio could be sold to the U.S. Small XM Portfolio, and a stock too large for the Small XM was generally big enough to be quite liquid. By the time DFA was selling, the stock was often no longer difficult to trade. When DFA did sell, its strategy was usually the opposite of its approach to buying large blocks. Rather than trade large blocks, it would offer small amounts of stock (typically less than 25% of daily volume) to the market each day. Since any given stock constituted only a small fraction of the portfolio, traders could take their time selling out, in the knowledge that holding shares a little longer would not seriously affect performance.

Purchase discounts combined with the avoidance of adverse selection had enabled DFA's passively managed small-stock portfolio to outperform typical small-stock indexes by about 200 basis points per year over the past 20 years. This had led to great frustration for many other small-stock funds. Ibbotson Associates, a well-known financial research firm, had decided in the early 1980s that DFA's passive fund was the appropriate benchmark for small-stock funds generally. To compare such funds to an index without factoring in trading costs would, Ibbotson felt, be unfair—after all, since small stocks come and go, there is no way to run a small-stock fund without trading. Ibbotson, it seemed, had not reckoned with DFA's ability to turn the difficulty of trading small stocks into an

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opportunity. Consequently, most small-stock funds underperformed the Ibbotson benchmark over long periods.

New Products: Tax-Managed Funds

In recent years DFA had broadened its product line primarily through regular additions to existing lines of business. But DFA did implement one entirely new area of business that had top management excited: tax-managed strategies. (See **Exhibit 11** regarding DFA's tax-managed funds.)

Tax-Managed Funds: An Introduction

DFA's newest product was a family of funds managed to reduce tax payments. Such funds were not appropriate for all investors. A considerable portion of the money invested in U.S. securities was untaxed (most notably retirement-plan assets). Investors who faced taxation had begun in the 1990s to become more aware of the costs associated with investment taxes. This went hand in hand with the increasing popularity of index funds; unsurprisingly, investors concerned with management fees of 50 or 100 basis points and the other costs of active management saw tax reduction as a great opportunity to improve net investment performance.

Mutual funds were required by law to pass dividend and capital gains to the fund clients, so individual investors were the eventual taxpayers on any taxable flows received by a DFA fund they held. In April of 2001, the Securities and Exchange Commission (SEC) put into effect a rule requiring that all mutual funds disclose after-tax returns (in addition to the pretax returns whose disclosure had been required for many years). Since investors have different tax circumstances, the SEC introduced a standardized formula for computing after-tax returns. In essence, it assumed fund investors were in the highest federal tax bracket for the computation of both types of personal taxes on stocks in the United States.

Dividends were taxed as ordinary income; for top-bracket investors this meant federal taxes at a rate of 39.6%, plus state and local taxation that ranged from zero in states like Florida to 10% or more in New York City and California.

Capital gains were untaxed until they were realized—that is, until the investor sold the stock. At that point, taxes on the net gains of top-bracket investors were assessed by the federal government at a rate of 28% if the stock had been held less than one year, and 20% for stock held longer. State taxes varied. If an investor sold stock at a loss, the losses could be deducted from gains (and to a very limited extent from ordinary income) before taxes were computed.

DFA recognized that a few simple strategies could considerably reduce the taxes paid by clients:

Reduce dividends Dividends were taxed much more heavily than capital gains—not only at a higher rate but also sooner (capital gains were easier to defer). This was particularly true for DFA, whose passive approach enabled it often to hold a stock for many years before selling. In the year 2002, stocks that paid no dividends were easy to come by. A recent paper by Fama and French, "Disappearing dividends: Changing firm characteristics or lower propensity to pay?" showed that the percentage of listed stocks that paid a dividend had gone from 66.5% in 1978 to only 20.8% in 1999. But many of the largest firms still paid dividends every quarter. The challenge to DFA's tax-managed offerings was to replicate closely the performance of an index that, by dint of weighting holdings by size, put considerable weight on dividend-paying stocks, while keeping the overall dividend yield of the portfolio low. Since holding stocks consistent with the fund's mission was

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essential, value stocks in particular could pose a problem, as stocks of this type tended to have high dividend yields.

Reduce capital gains As noted above, capital gains taxes were charged only upon sale of the stock in question. Thus, capital gains were generally avoidable if net fund inflows were positive (except in special cases such as a cash buyout). However, if no stock was ever sold, the portfolio would tend to drift away from the benchmark, as the characteristics that landed a stock in a fund (such as being a value stock or a small stock) changed. The broader the fund holdings, the less severe the problem. But at times stocks might have to be sold for rebalancing reasons, or because they were paying dividends so high they interfered with other tax-management goals.

Avoid short-term gains Since gains on stocks held less than one year were taxed more heavily, investors could save by holding assets whose price had increased past the first anniversary of their purchase.

Harvest capital losses When a stock's price fell below the price at which it was purchased, selling created a tax-reducing capital loss. In order to take advantage of the loss, the investor had to wait 30 days before repurchasing the same stock (the "wash sale rule"). Of course, such harvesting of losses required additional transactions; any costs associated with these transactions had to be weighed against the tax benefit.

The Tax-Managed Fund Business

Tax management was a natural business for DFA to enter. A successful fund needed to make tax-beneficial trades in a way that kept trading costs low, and low (or negative) trading costs were a DFA specialty. And, as mentioned, the typical DFA client was exactly the sort who would be likely to care about such services. Finally, the tax-optimization problem was technical and complicated. It required sophisticated estimation of stock covariances in order to compute the loss of diversification and tracking error that would result from reducing the weight of dividend-paying stocks in the portfolio. Given the Fama-French findings mentioned above, a portfolio that received no dividends could invest in four-fifths of all listed stocks; however, many of the largest stocks did pay dividends, and in some industries nondividend payers were hard to find. By accepting some dividends the fund could achieve greater diversification. **Exhibit 12** illustrates this trade-off: the more the portfolio tilted toward nondividend-paying stocks (and away from the maximally diversified market portfolio), the more portfolio tracking error and volatility increased.

Another thing investors needed to consider was the possibility that tax management led to higher transaction costs. Otherwise-profitable block trades might have to be passed on to avoid dividend-paying stocks, and loss harvesting might incur nontrivial transaction costs. DFA had to keep in mind the mission of each fund; an opportunity might arrive to buy a stock at a good price, but if it was a growth stock, then purchasing it for the tax-managed value portfolio would be inappropriate. Consequently, the tax benefits and transaction costs of each potential deal had to be weighed together with the effects on the fund's risk-factor loadings and overall volatility to determine if the trade was a net benefit to the portfolio. DFA, with its technically skilled employees and stable of academic experts, felt itself well positioned to take on this challenging problem.

In January of 1999, DFA opened tax-managed funds for small-cap, value, small-cap value, and international value stocks. In 2001, a marketwide tax-managed fund was added. The fees of this fund and subsequent DFA tax-managed offerings were about 10 basis points higher than those of similar tax-insensitive DFA funds. Although still a small part of DFA's business in 2002, the tax-efficient funds looked to be a big part of DFA's future.

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The Future of DFA

In 2000 and 2001, the prices of technology stocks, and growth stocks generally, plummeted. Although the market as a whole fell, value stocks massively outperformed growth, with a net return on the HML portfolio of over 80% for the two-year period. DFA's value funds had tremendous returns, justifying the faith of its long-term investors and solidifying DFA's grip on the loyalty of its clients.

DFA had become a well-established and successful firm. It had built a profitable franchise around the things it did best and had earned sufficient confidence from its investors that it was able to weather even a lengthy period of poor returns. The question was, what next? Was the best plan to continue doing what had worked, growing steadily as new investors learned the gospel of DFA by word of mouth and occasionally adding new products? Or if the time was right for a bold step, in what direction? As well as things were going, a nagging feeling persisted among the firm's faithful that with principles so true and skills so impressive, DFA deserved to be a more dominant force in the 21st century.

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Exhibit 1 The Top 100 Firms Ranked by Worldwide Assets, in Millions of U.S. Dollars, June 2002

Firm	Assets	Firm	Assets
1. Fidelity Investments	1,007,898	51. Wells Capital	106,000
2. State Street Global	784,712	52. Principal Capital	100,844
3. Barclays Global	768,700	53. Pioneer Investments	98,776
4. Deutsche Asset Mgmt.	748,607	54. Fleet Investments	98,290
5. Vanguard Global	605,556	55. Nationwide Financial	96,544
6. J.P. Morgan Fleming	604,660	56. American Century	87,837
7. Merrill Lynch	528,701	57. TCW Group	87,597
8. Alliance Capital	455,404	58. Delaware Investments	80,788
9. Citigroup Asset Mgmt.	416,881	59. Mellon Capital	80,547
10. Morgan Stanley Inv. Mgmt.	415,984	60. SEI Investments	77,500
11. UBS Global Asset Mgmt.	400,312	61. U.S. Trust	76,322
12. Prudential Financial	387,959	62. John Hancock Financial	75,889
13. Capital Research	367,055	63. Hartford Investments	75,393
14. Northern Trust Global	330,058	64. Victory Capital	72,717
15. Zurich Scudder Inv.	327,942	65. Frank Russell	68,500
16. Putnam Investments	314,566	66. CIGNA Retirement	68,226
17. AIG Global Inv.	312,998	67. Lazard Asset Mgmt.	65,717
18. Wellington Mgmt.	307,212	68. HSBC Asset Mgmt.	64,760
19. Goldman Sachs	306,014	69. Loomis, Sayles	64,570
20. Credit Suisse Asset Mgmt.	303,689	70. BNY Asset Mgmt.	64,421
21. TIAA-CREF	273,561	71. David L. Babson	64,401
22. Franklin Templeton	266,287	72. Dresdner RCM	62,261
23. American Express	253,298	73. Brandes Inv.	61,996
24. PIMCO	241,289	74. Lombard Odler	61,000
25. BlackRock	238,584	75. Mellon Bond	60,532
26. MetLIfe	236,863	76. Neuberger Berman	59,048
27. INVESCO	218,112	77. Dodge & Cox	57,524
28. Evergreen Inv.	210,688	78. Aberdeen Asset Mgmt.	53,210
29. Banc of America	183,057	79. Gartmore Group	52,603
30. Legg Mason	182,190	80. Eaton Vance Mgmt.	49,309
31. Janus	181,645	81. Bank of Ireland	47,758
32. Federated Investors	179,701	82. Standish Mellon	46,781
33. Dreyfus	176,548	83. State Street Research	46,237
34. GE Asset Mgmt.	168,339	84. Strong Capital	46,046
35. Schroder Inv.	160,115	85. Trusco Capital	45,500
36. AIM Advisors	158,000	86. Elliott & Page	44,069
37. ING US Financial	153,600	87. Diversified Inv.	44,000
38. MassMutual Financial	150,158	88. Lend Lease Real Estate	43,544
39. Charles Schwab Inv.	149,712	89. Lord, Abbett	41,949
40. Henderson Global Inv.	149,667	90. Davis Advisors	41,838
41. Banc Once Inv.	142,568	91. Brown Brothers Harriman	39,830
42. Nomura Asset Mgmt.	141,843	92. Oppenheimer Capital	37,392
43. MFS Investments	137,239	93. Payden & Rygel	36,569
44. T. Rowe Price	130,535	94. WestAM	36,569
45. New York Life Ins. Mgmt.	124,275	95. Lincoln Capital	36,227
46. U.S. Bancorp Asset Mgmt.	121,194	**96. Dimensional Fund Advisors**	**35,719**
47. Capital Guardian	120,072	97. Munder Capital	35,260
48. Scottish Widows	113,073	98. Baring Asset Mgmt.	35,207
49. BNP Panibas Asset	112,981	99. F & C Management	35,034
50. General Motors Asset Mgmt.	111,200	100. Travelers Insurance	34,941

Source: *Pensions & Investments*, June 2002.

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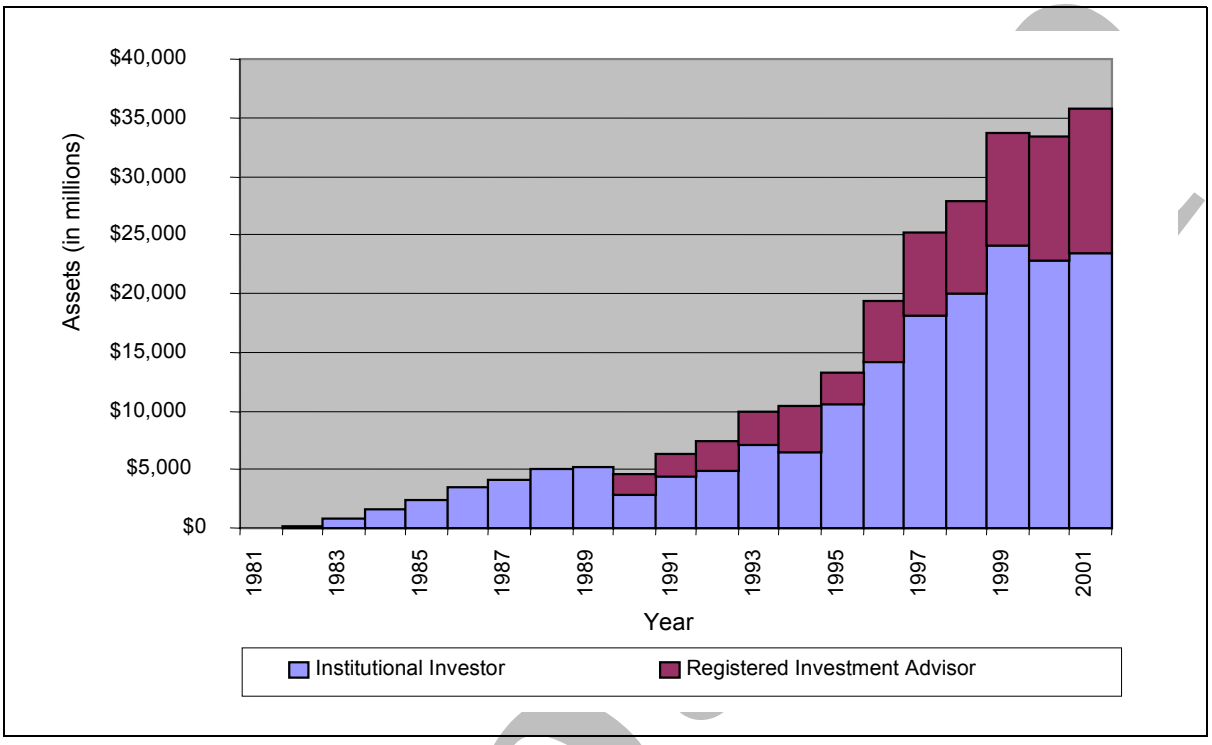
Exhibit 2 DFA Assets under Management over Time



Source: Dimensional Fund Advisors.

Exhibit 3 Defining Stocks Across the Size Spectrum—U.S. Data

Size	Percent of Overall Market	Largest Company Market Cap (millions)	Average Market Value (millions)	Number of Companies
Large Cap	70%	$398,105	$121,657	207
Mid Cap	20%	$10,363	$5,373	630
Small Cap (except Micro)	5%	$1,686	$1,217	563
Micro Cap	5%	$762	$385	3,620
Total	**100%**			**5,020**

Source: Dimensional Fund Advisors Firm Profile, 2002.

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Exhibit 4 Defining Stocks Across the Value Spectrum—U.S. Data

Style	Percent of Small-Cap Market	Book-to-Market Ratio Range	Number of Companies
Value	**Highest 25%**	**>0.72**	**1,774**
	Next 25%	0.47-0.72	739
	Next 25%	0.28-0.47	612
Growth	**Lowest 25%**	**<0.28**	**578**
Total			**3,703**

Style	Percent of Large-Cap Market	Book-to-Market Ratio Range	Number of Companies
Value	**Highest 10%**	**>0.69**	**115**
	Next 40%	0.25-0.69	384
	Next 30%	0.13-0.25	161
Growth	**Lowest 20%**	**<0.13**	**96**
Total			**756**

Source: Dimensional Fund Advisors Firm Profile, 2002.

Exhibit 5 Management Fees Charged by DFA and by Typical Funds, in Basis Points

	$25 Million		$50 Million		$100 Million	
Fund Type	DFA	Median Fund	DFA	Median Fund	DFA	Median Fund
Micro Cap Core	50	N/A	50	N/A	50	N/A
Small Cap Core	35	83	35	73	35	69
Small Cap Value	50	85	50	83	50	79
Small Cap Index	N/A	10	N/A	10	N/A	8
Large Cap Value	25	62	25	55	25	48
Large Cap Index	N/A	8	N/A	8	N/A	6
Non-U.S. Value	40	80	40	75	40	66
Non-U.S. Small Cap	50	90	50	85	50	80
Non-U.S. Equity Index	N/A	15	N/A	15	N/A	12
Emerging Markets Equity Core	50	100	50	100	50	96

Source: DFA data from Dimensional Fund Advisors Firm Profile, 2002; Median Fund data adapted from "Investment Management Fee Study, February 2002," William M. Mercer Investment Consulting Inc.

Note: DFA does not offer index funds. "Core" refers to small-cap or micro-cap funds that are not value funds, or to value funds that are not small-cap funds.

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Exhibit 6 The Fama-French Factors

Average returns for Fama-French factor portfolios, annualized, in percent

Period	U.S. Market–T-bill	U.S. SMB	U.S. HML	U.S. T-Bill	Global Market – T-Bill	Global HML	Notes
7/26–6/63	10.2	2.4	4.2	1.3	N/A	N/A	Pre-Compustat
7/63–12/81	2.5	5.4	5.3	6.2	N/A	N/A	Beginning of Compustat to beginning of DFA Micro Cap Fund
1/82–3/93	8.9	-0.9	6.0	6.9	9.5	5.3	Beginning of DFA Micro Cap Fund to beginning of DFA U.S. Value Fund
4/93–12/01	8.2	0.4	3.5	4.6	2.4	6.7	Beginning of DFA U.S. Value Fund to present
7/63–12/01	5.6	2.4	5.1	6.1	N/A	N/A	Compustat period

Full-period average returns and return standard deviations, annualized, in percent, July 1926–December 2001 for U.S. data; January 1975–December 2001 for global portfolios

Period	U.S. Market–T-bill	U.S. SMB	U.S. HML	U.S. T-Bill	Global Market–T-bill	Global HML
Average	7.9	2.4	4.7	3.8	9.2	5.7
Standard deviation	19.1	11.7	12.5	0.9	18.1	9.0

Source: Created by casewriter and adapted from Professor Kenneth R. French's public Web site, <http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html>.

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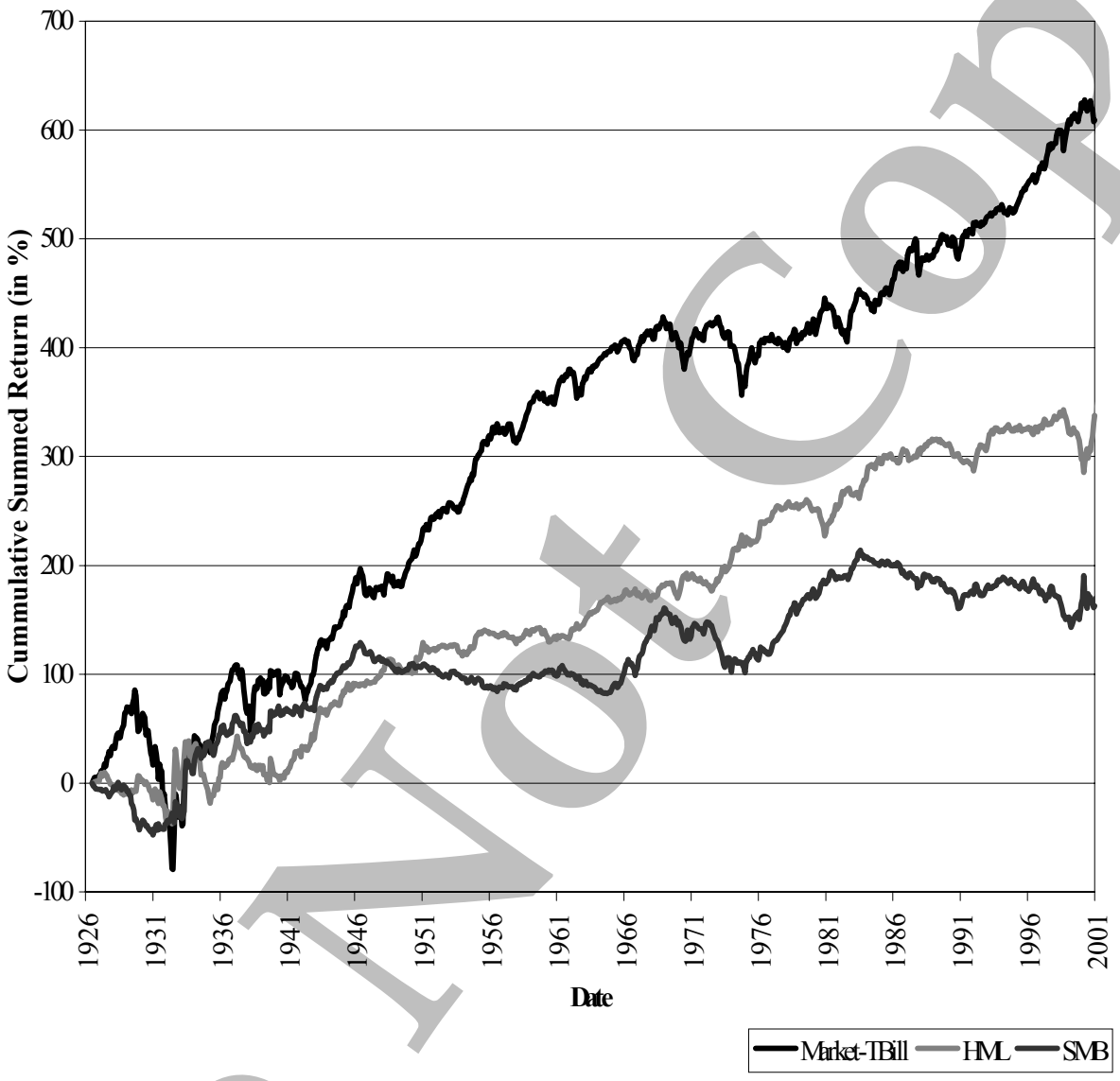
Exhibit 7 Fama-French Factors Plot



Source: Created by casewriter and adapted from Professor Kenneth R. French's public Web site, <http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html>.

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Exhibit 8 Partial List of DFA U.S. Funds, March 31, 2002

	U.S. Micro Cap Portfolio	U.S. Small Cap Portfolio	U.S. Small Cap Value Portfolio	U.S. Small XM Value Portfolio	U.S. Large Cap Value Portfolio	U.S. Large Company Portfolio	Real Estate Securities Portfolio
Inception	1/82	4/92	4/93	3/00	4/93	1/91	1/93
Assets (millions)	$1,845	$964	$3,364	$82	$1,209	$845	$362
Expense ratio (as of 11/30/01)	0.56%	0.42%	0.56%	0.47%	0.31%	0.15%	0.43%
Annualized Returns							
1 Year	30.4	22.0	29.4	29.8	9.0	0.1	22.6
3 Year	21.3	18.1	22.6		7.6	-2.6	16.7
5 Year	14.0	13.1	15.4		12.7	10.1	9.0
10 Year	14.9					13.2	
Since Inception	14.0	13.0	15.8	26.6	13.6	14.0	10.2
Monthly standard deviation since inception	5.6	5.4	4.7	5.6	4.6	4.1	3.5
Weighted average market cap (millions)	$292	$734	$560	$1,311	$10,429	$100,734	$3,404
Weighted average book to market	0.66	0.55	0.97	0.93	0.94	0.34	0.59
Total other assets managed under strategy (millions)	$2,121	$6,130	$6,171	$2,187	$1,118	$3,086	$30
Total assets managed under strategy (millions)	$3,966	$7,094	$9,535	$2,269	$2,327	$3,931	$392
Benchmark	**Russell 2000 Index**	**Russell 2000 Index**	**Russell 2000 Value Index**	**Russell 2000 Value Index**	**Russell 1000 Value Index**	**S&P 500 Index**	**Wilshire REIT-only Index**
Performance vs. Benchmark (positive numbers signify outperformance)							
1 Year	16.4	8.1	5.7	6.1	4.6	-0.3	-0.5
3 Year	11.5	8.3	3.9		4.0	-0.2	-0.8
5 Year	4.5	3.6	2.1		1.3	-0.2	0.1
10 Year	3.8					-0.3	
Since Inception	2.0	1.9	2.2	5.8	0.0	-0.3	-1.6
Weighted average market cap (millions) of benchmark	$920	$920	$947	$947	$65,419	$100,887	
Weighted average book to market of benchmark	0.52	0.52	0.66	0.66	0.46	0.33	

Source: Dimensional Fund Advisors.

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Exhibit 9 Partial List of DFA International Funds, March 31, 2002

	International Small Co. Portfolio	Continental Small Co. Portfolio	Japanese Small Co. Portfolio	Pacific Rim Small Co. Portfolio	U.K. Small Co. Portfolio	International Small Cap Value Portfolio	International Value Portfolio	International Large Co. Portfolio	Emerging Markets Small Cap Portfolio	Emerging Markets Value Fund	Emerging Markets Large Cap Portfolio
Inception	10/96	7/88	4/86	1/93	4/86	1/95	3/94	8/91	3/98	3/93	5/94
Assets (millions)	$413	$82	$67	$78	$42	$548	$426	$343	$23	$348	$352
Expense ratio (as of 11/30/01)	0.72%	0.76%	0.74%	0.75%	0.74%	0.83%	0.51%	0.45%	1.56%	0.52%	0.90%
Annualized Returns											
1 Year	1.2	2.0	-11.0	21.2	4.5	4.6	-2.4	-7.9	21.5	23.2	11.9
3 Year	3.2	1.6	-5.6	15.7	4.5	5.1	0.7	-4.6	10.0	7.5	4.6
5 Year	-1.2	3.9	-10.2	-6.9	2.6	-0.2	3.3	2.3		4.3	-3.6
10 Year								5.8			
Since Inception	-2.3	8.0	-6.6	3.3	9.4	-0.2	4.3	4.8	6.8	9.5	1.0
Monthly standard deviation since inception	4.5	3.7	8.4	7.7	4.3	4.1	4.0	4.2	7.7	7.4	7.0
Weighted average market cap (millions)	$368	$542	$228	$331	$336	$406	$13,136	$42,407	$83	$1,077	$4,959
Weighted average book to market	1.20	0.70	1.99	1.16	0.61	1.40	0.79	0.51	1.00	1.09	0.50
Total other assets managed under strategy (millions)	$13	$151	$145	$64	$61	$0	$1,332	$0	$24	$0	$11
Total assets managed under strategy (millions)	$426	$233	$212	$142	$103	$548	$1,758	$343	$47	$348	$363

Source: Dimensional Fund Advisors.

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Exhibit 10 Small-Cap Transaction Costs—Buys Only

	Total Cost (all trades)	Percent Discount Trades	Discount Block vs. Working Order	
			Total Cost (%) (discount block)	Total Cost (%) (working order)
2001	-0.83	36%	-3.33	0.58
2000	-0.73	29%	-4.60	0.85
1999	-0.88	38%	-3.69	0.82
1998	-1.64	50%	-3.56	0.28
1997	-0.86	43%	-2.56	0.44
1996	-0.77	49%	-2.16	0.55
1995	-0.81	59%	-1.82	0.63
1994	-0.90	57%	-2.10	0.68
1993	-1.02	70%	-1.78	0.73
1992	-0.97	80%	-1.44	0.93
1991	0.18	54%	-0.74	1.24
1990	-0.08	58%	-0.91	1.08
1989	-0.16	64%	-0.56	0.54
1988	-0.35	77%	-0.61	0.72
1987	0.38	39%	-0.41	0.89
1986	0.68	26%	-0.02	0.87

Source: 1986–1994: Adapted from SEI Trading Cost Data; 1995–present: Adapted by casewriter from Professor Donald B. Keim's research at The Wharton School, University of Pennsylvania.

Note: "Percent Discount" gives the percentage of stock that was purchased through discount block trades (dollar weighted). The last two columns give the average cost relative to the contemporaneous market price for stock purchased in block trades and stock not purchased in block trades ("Working Order"). When a stock purchase causes the market price to increase, the price impact is shown as a positive cost; purchases at a discount to market price are shown as negative costs.

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Exhibit 11 DFA U.S. Tax-Managed Funds, March 31, 2002

DFA Fund Name	Tax-Managed U.S. Small Cap Portfolio	Tax-Managed U.S. Small Cap Value Portfolio	Tax-Managed U.S. Equity Portfolio	Tax-Managed U.S. Marketwide Value Portfolio
Date of inception	January 1999	January 1999	October 2001	January 1999
Assets under management (millions)	$492	$1,200	$169	$678
Weighted average market cap (millions)	$904	$887	$71,576	$16,949
Weighted average book to market	0.53	0.87	0.42	0.95
Relevant index	Russell 2000	Russell 2000 Value	Wilshire 5000	Russell 3000 Value
1 year fund pretax	20.46%	25.33%	N/A	-1.80%
1 year fund after-tax	20.33%	25.14%	N/A	-1.97%
1 year index pretax	13.98%	23.74%	N/A	5.67%
Since inception fund pretax	14.21%	16.89%	16.67%	5.22%
Since inception fund after-tax	14.09%	16.66%	16.64%	4.76%
Since inception index pretax	7.19%	13.55%	13.45%	4.43%

Source: Dimensional Fund Advisors Firm Profile, 2002.

Note: After-tax returns are based on SEC disclosure rules for returns after taxation of all fund distributions.

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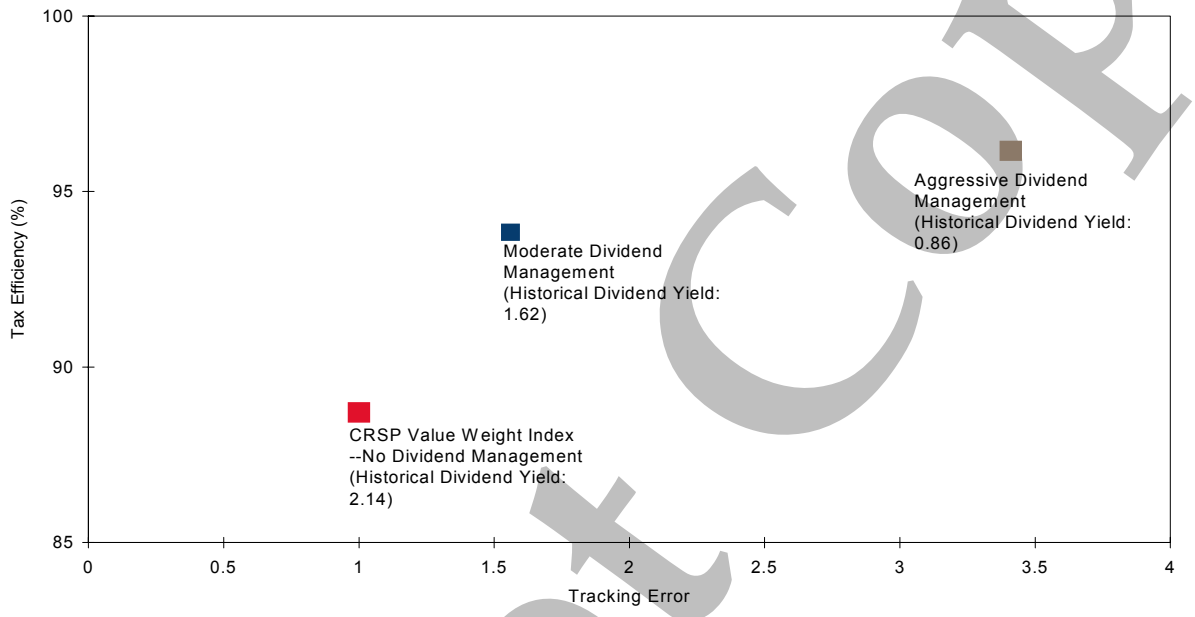
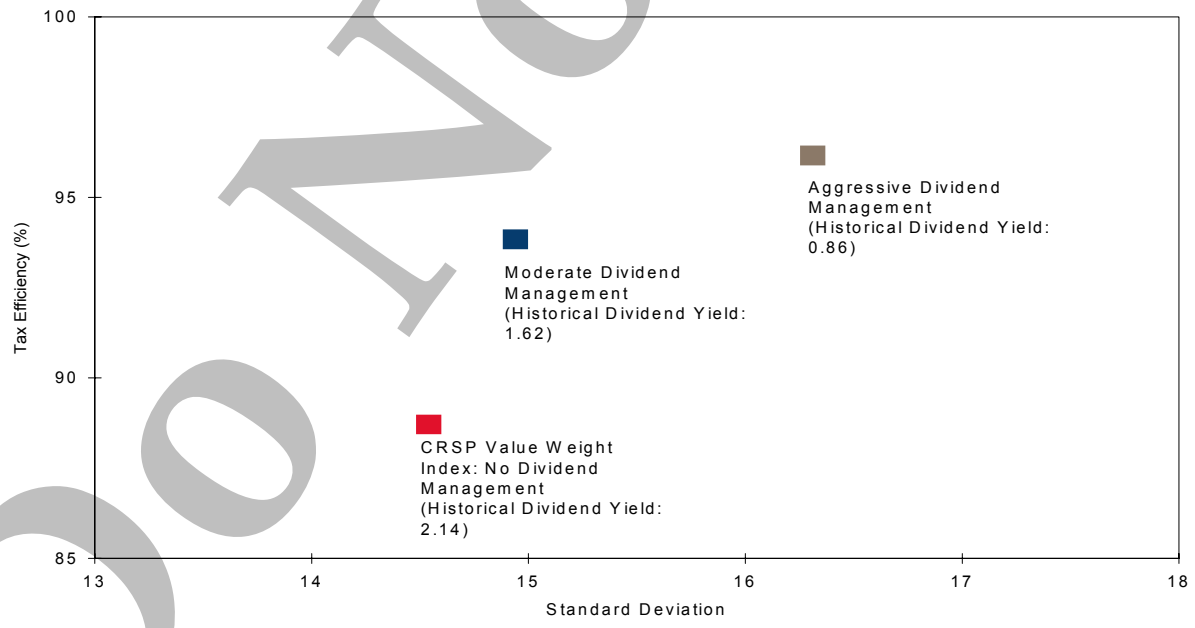
Exhibit 12 Costs and Benefits of Tax-Managed Strategies in the U.S. Equity (marketwide) Portfolio, July 1990–June 2001

Tracking Error Versus Tax Efficiency for Tax-Managed Marketwide U.S. Strategy



Volatility Versus Tax Efficiency for Tax-Managed Marketwide U.S. Strategy



Source: Dimensional Fund Advisors.

Note: Tax efficiency is defined by Morningstar as after-tax return divided by pretax return.

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