

INVESTMENT STRATEGIES

August 2001

ACTIVE VERSUS PASSIVE INVESTMENT MANAGEMENT: WHICH STRATEGY IS BEST?

By Geeta Kapadia

- ⇒ Active management proves to be successful most of the time in the small-cap growth and international equity markets.
- ⇒ Passive management is more likely to provide better returns in the U.S. large-cap, mid-cap, and fixed income markets.
- ⇒ The final decision on whether to invest actively or passively (and how much) is dependent on an investor's willingness to cope with each strategy's tradeoffs.

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ACTIVE VERSUS PASSIVE INVESTMENT MANAGEMENT: WHICH STRATEGY IS BEST?

INTRODUCTION

The decision to invest actively or passively continues to be difficult for institutional investors. Quantitative evidence does not always indicate which strategy is superior. And even if historical data compellingly favors one strategy, past performance patterns do not always repeat. Also a factor is investors' desire to not just match market returns, but to outperform the market.

In recognition of the dilemma investors face when selecting between active and passive strategies, and the potential value added from making a correct selection, we studied:

- historical returns of actively-managed funds versus indices (passive management),
- market factors that contribute to the outperformance of one strategy over another, and
- qualitative factors that influence an investor's decision to use one strategy over another.

Our objective was to determine which asset classes have the highest probability of success using active

management and when a passive strategy might be the better alternative.

METHODOLOGY

We used the Morningstar Principia Pro database as the source of return data for this study. While the Morningstar data has some limitations, it has many attractive features. On the positive side, returns are net of all expenses, which eliminates potential errors from reducing gross returns by fees. Second, the returns are representative of what institutional investors could achieve; virtually all institutional investment management firms offer mutual funds. Third, the database is compiled by an independent source and avoids some of the complexities of collecting composite data.

We began our analysis by screening the database to eliminate funds that did not fit into the five broad categories included in our study: large-cap equities, mid-cap equities, small-cap equities, international equities, and market duration fixed income. The characteristics we used to determine the constituent funds are found in Table 1.

Table 1
Screening Methodology

Large-cap Equity	Mid-cap Equity	Small-cap Equity	International Equity	Market Duration Fixed Income ¹
<ul style="list-style-type: none"> • Market capitalization \geq \$5 billion • Investment objective is not: <ul style="list-style-type: none"> – fixed income – international – sector fund • Bonds not more than 20% of the fund • International securities not more than 20% of the fund • No index funds 	<ul style="list-style-type: none"> • Market capitalization between \$1 billion and \$5 billion • Investment objective is not: <ul style="list-style-type: none"> – fixed income – international – sector fund • Bonds not more than 20% of the fund • International securities not more than 20% of the fund • No index funds 	<ul style="list-style-type: none"> • Market capitalization \leq \$1 billion • Investment objective is not: <ul style="list-style-type: none"> – fixed income – international – sector fund • Bonds not more than 20% of the fund • International securities not more than 20% of the fund • No index funds 	<ul style="list-style-type: none"> • Investment objective is foreign stock • Bonds not more than 20% of the fund 	<ul style="list-style-type: none"> • Corporate bonds of general or high quality • Government bonds – general, Mortgage, or Treasury • Duration between 3.8 and 7.2 years • Maturity between 7 and 11 years (when duration is not available)

¹ Includes core and core plus strategies.

To further analyze the three domestic equity segments, we ranked funds by price/book ratios. We first determined the average price/book ratio for each category. A manager with a price/book ratio of more than 1.1 times the average was classified as a “growth manager.” A manager with a price/book ratio of less than 0.9 times the average was considered a “value manager.” Funds with price/book ratios higher than 0.9 times the average but less than 1.1 times were excluded from the analysis.

The analysis focused on multiple five-year time periods that spanned a ten-year period from 1991 through 2000. Five years is a reasonable period over which to evaluate managers' ability to outperform an index through different market environments. Additionally, five years is a typical investment horizon for institutional investors.

We evaluated six rolling five-year periods from the period ended December 31, 1995 through the period ended December 31, 2000. We recognize that this covers only limited market history, however, prior to 1995, data was unavailable in electronic format from Morningstar. Survivorship bias is a limitation of the data. Poor-performing managers tend to drop out of the sample over time, either merging into other funds or ceasing to exist altogether. Funds with higher returns tend to

survive and could bias the study in favor of active management. On the other hand, the Morningstar data includes high cost retail funds, which could skew the results in favor of indexing.

RESULTS

The results for each market segment are displayed on risk-return charts beginning with page 3. The objective of using a risk-return assessment is to determine whether active managers outperform the market index not just on a return basis, but when adjusted for the amount of risk incurred. A manager's position on the chart relative to the security market line indicates if the manager outperformed or underperformed the index on a risk-adjusted basis. Managers above the line outperformed the risk-adjusted return of the index, while managers below the line underperformed.

We also calculated the mean active manager's return for each market segment. The horizontal line on each graph is the *average* active manager return.

A caveat for the reader: when interpreting the results on the following pages, please keep in mind that we are evaluating outperformance and underperformance on a risk-adjusted basis rather than on an absolute return basis.

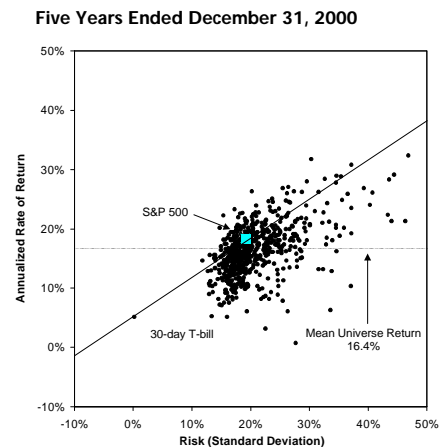
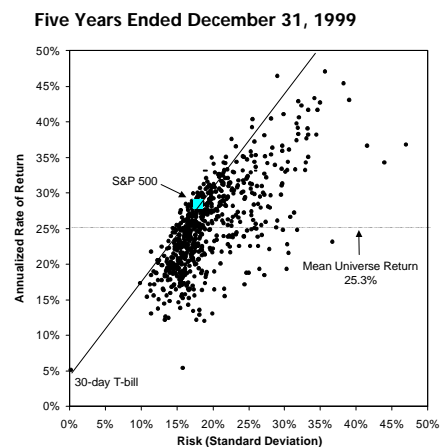
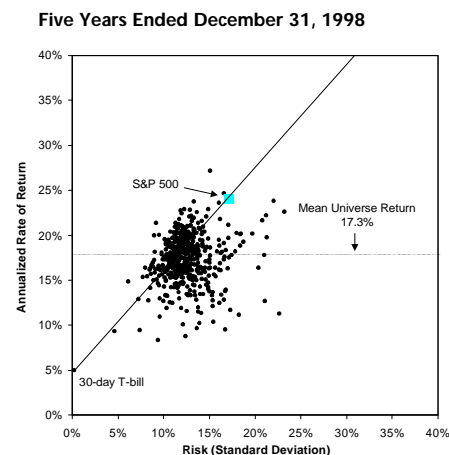
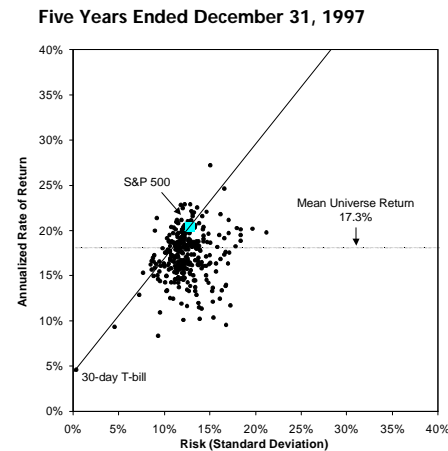
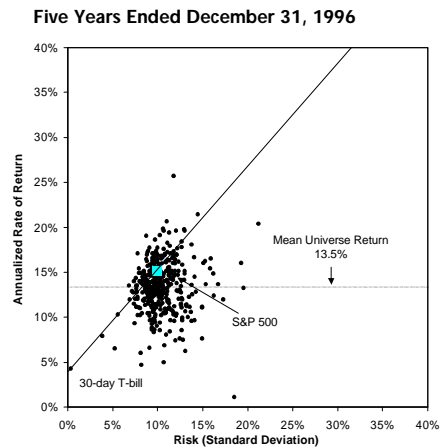
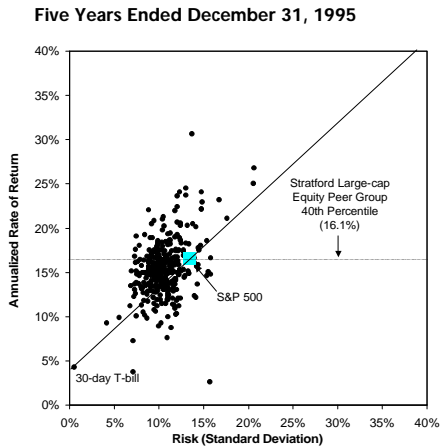
Large-cap Equity

For the five years ended December 1995, the majority of large-cap active managers outperformed the S&P 500 Index on a risk-adjusted basis. During this period, it would not have been advantageous to be invested passively in index funds. However, in each successive five-year period, the majority of active managers underperformed the S&P 500 Index on a risk-

adjusted basis. While managers outperformed the S&P 500 return during these periods, almost all did so while incurring more risk.

Interestingly, during the period when active managers performed better than the index (five years ended December 1995), the amount of value added was greater than the amount of value lost for the managers that underperformed. During the subsequent five-year periods, the reverse was true.

LARGE-CAP EQUITY RISK-RETURN



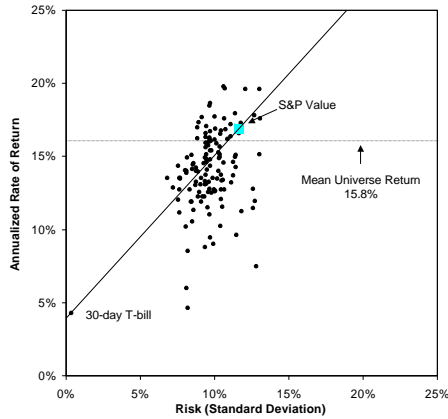
Large-cap Value

During three of the periods measured (ended December 1995, 1996 and 2000), the number of active managers that outperformed the index on a risk-adjusted basis was approximately the same as the number that underper-

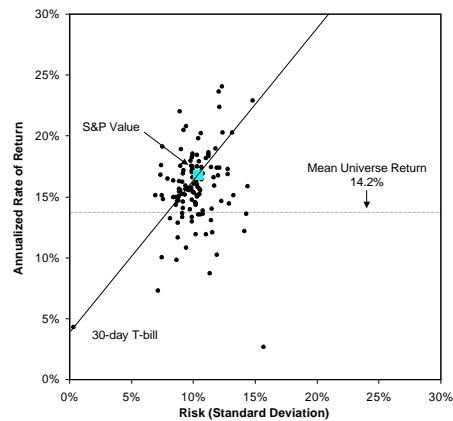
formed. In the three other periods, however, the majority of active managers underperformed the index on a risk-adjusted basis. Additionally, the active funds' performance shortfall was greater than the amount of outperformance.

LARGE-CAP VALUE RISK-RETURN

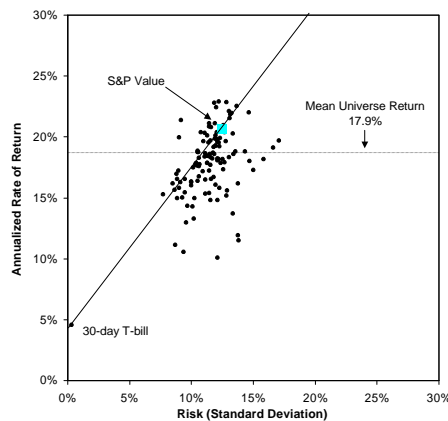
Five Years Ended December 31, 1995



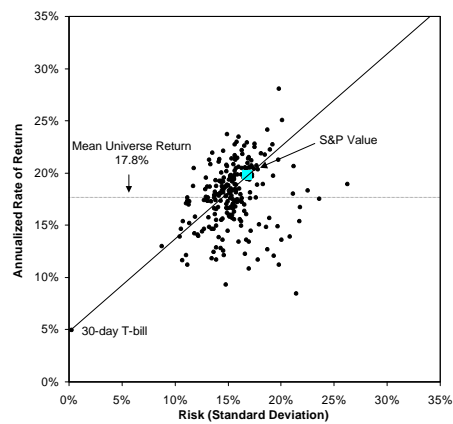
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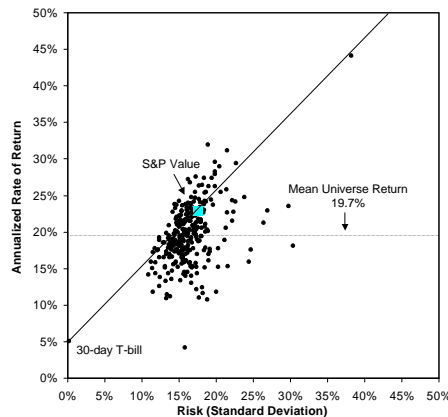
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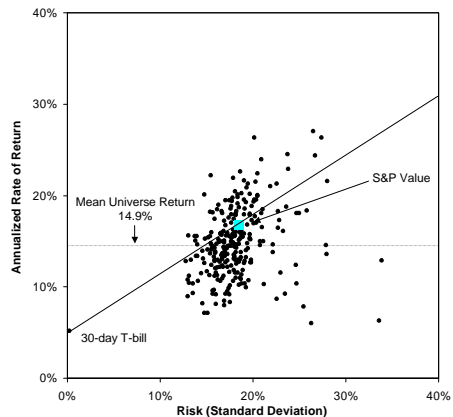
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Five Years Ended December 31, 2000



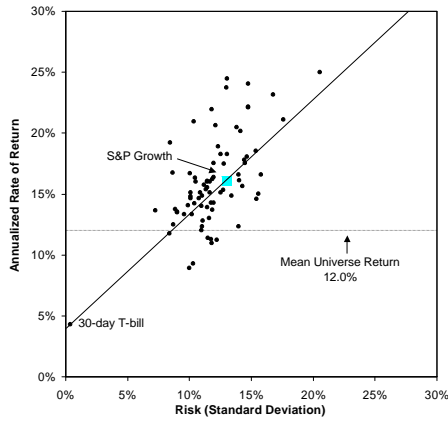
Large-cap Growth

For the five years ended December 1995, most of the active large-cap growth managers outperformed the S&P Growth Index on a risk-adjusted basis. In each successive five-year period, however, an increasing number of active managers underperformed the index. Over the period ended December

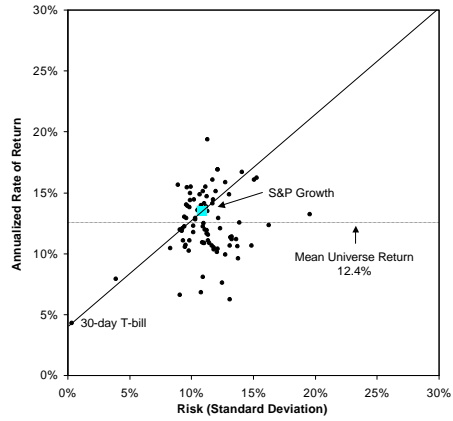
1999, only one of the active managers outperformed the index on a risk-adjusted basis. Although managers added value relative to the index during these periods, they did so while incurring more risk. These results reflect the challenging market environment faced by large-cap growth managers, particularly during the past few years.

LARGE-CAP GROWTH RISK-RETURN

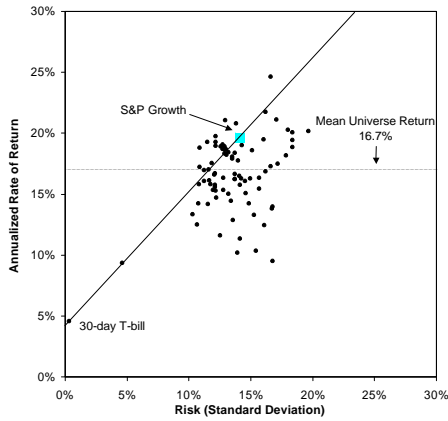
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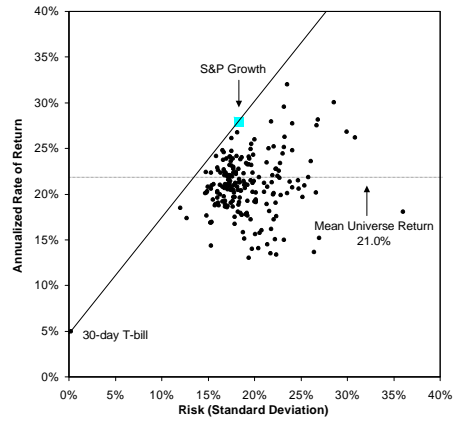
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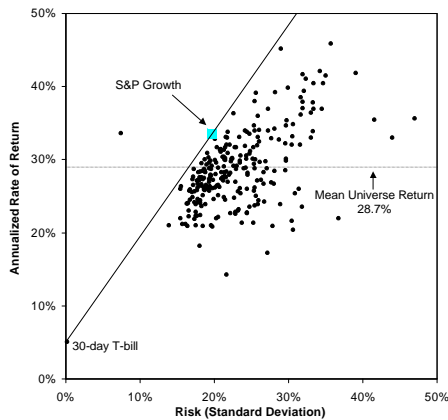
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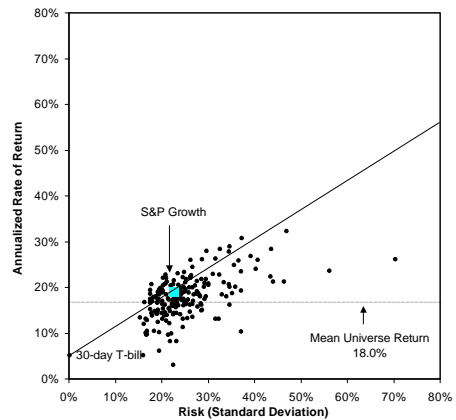
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Five Years Ended December 31, 1999



Five Years Ended December 31, 2000

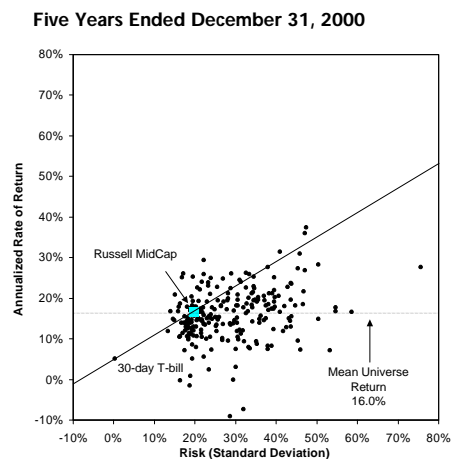
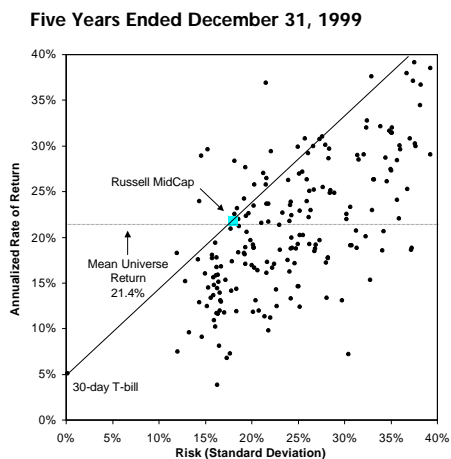
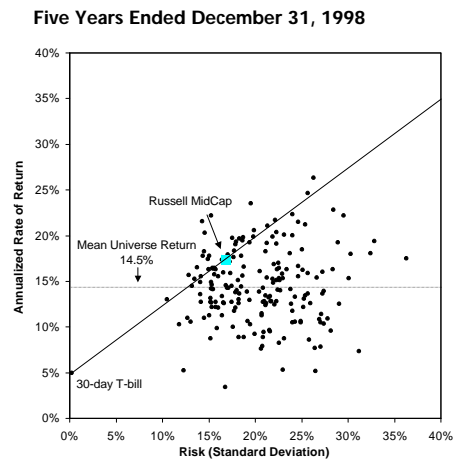
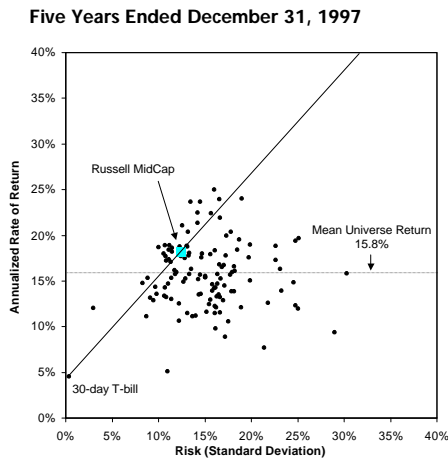
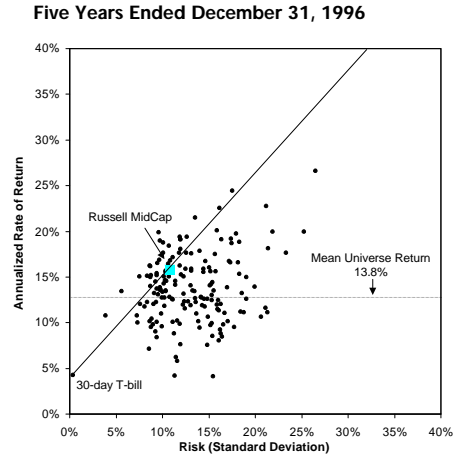
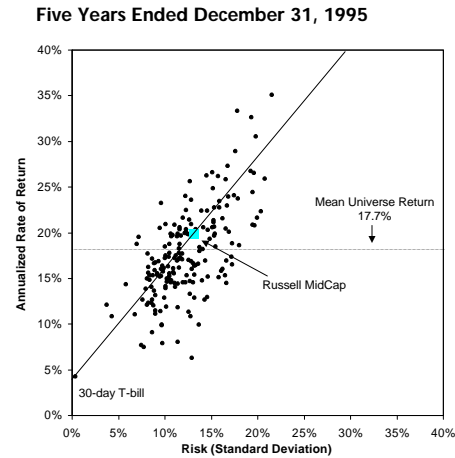


Mid-cap Equity

For the five years ended December 1995, some mid-cap equity managers outperformed the Russell MidCap Index on a risk-adjusted basis. In each consecutive five-year

period, however, most active managers underperformed the index. During these periods, very few managers were able to add value relative to the index's risk-adjusted return.

MID-CAP EQUITY RISK-RETURN



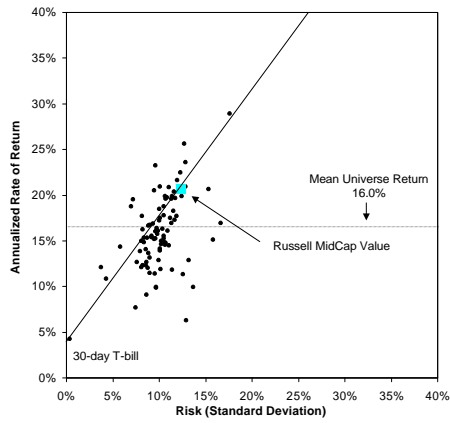
Mid-cap Value

On average, mid-cap value managers underperformed the index during the five-year periods

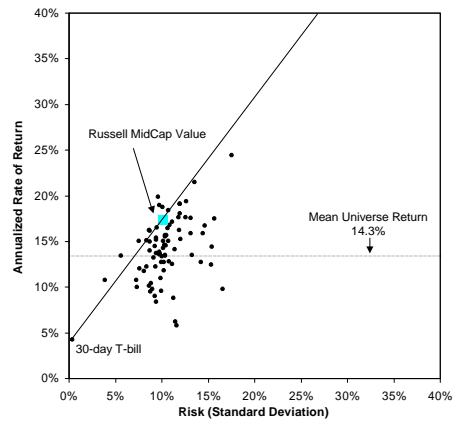
measured, on both an absolute and a risk-adjusted return basis. The exception was the period ended 2000, where the results were mixed.

MID-CAP VALUE RISK-RETURN

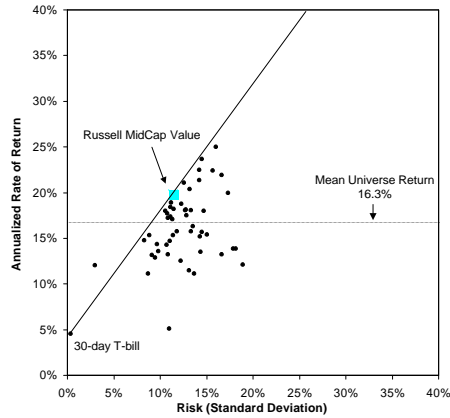
Five Years Ended December 31, 1995



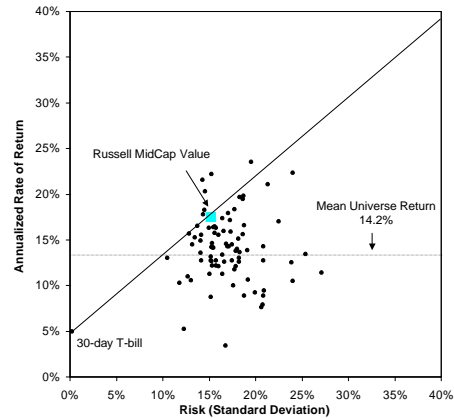
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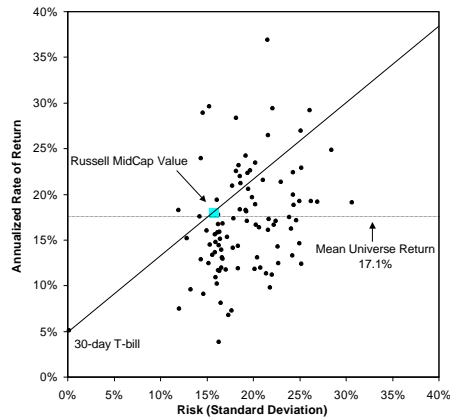
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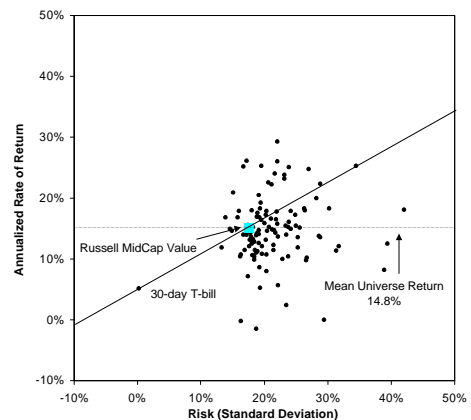
Five Years Ended December 31, 1998



Five Years Ended December 31, 1999



Five Years Ended December 31, 2000



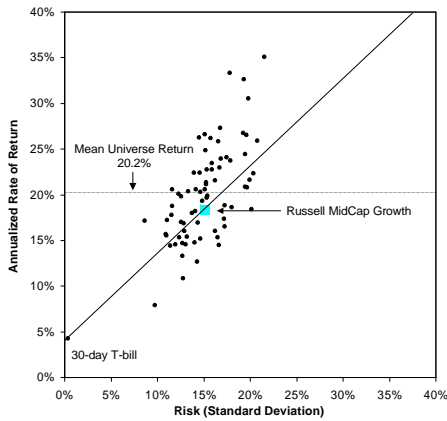
Mid-cap Growth

During the first period measured, most mid-cap growth managers outperformed the index while incurring less risk. In each successive period, fewer managers were able to outperform the index, particularly on a risk-adjusted basis, with the exception of the period ended 2000. Over

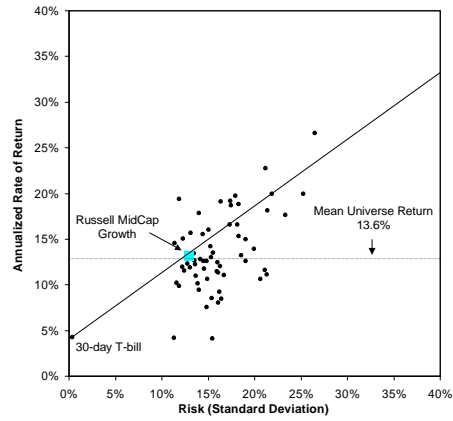
the last ten years, it has become increasingly difficult for mid-cap growth managers to outperform the index on a risk-adjusted basis. This may be partially attributable to the addition of Internet company stocks to the index. Many mid-cap managers do not typically purchase Internet companies, especially if they are initial public offerings.

MID-CAP GROWTH RISK-RETURN

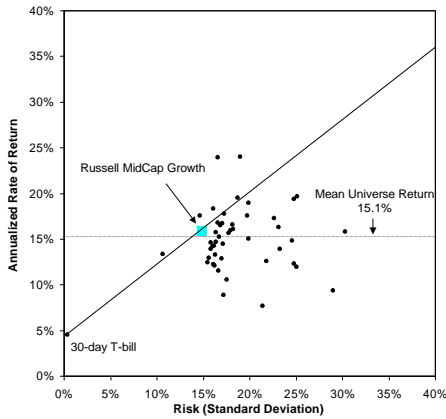
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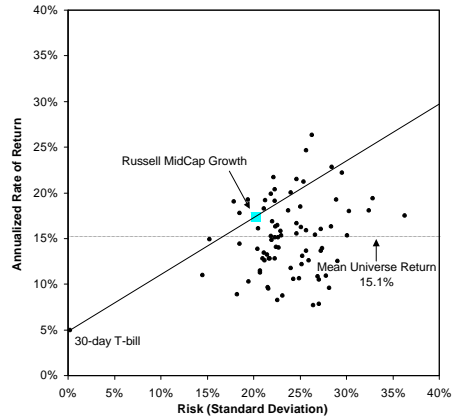
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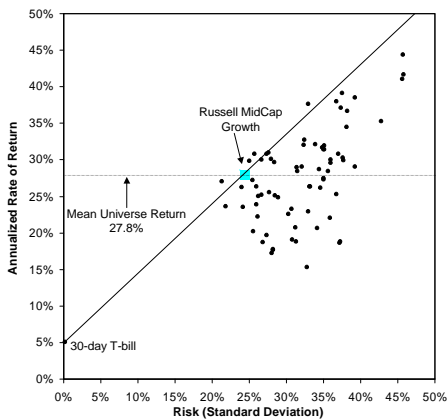
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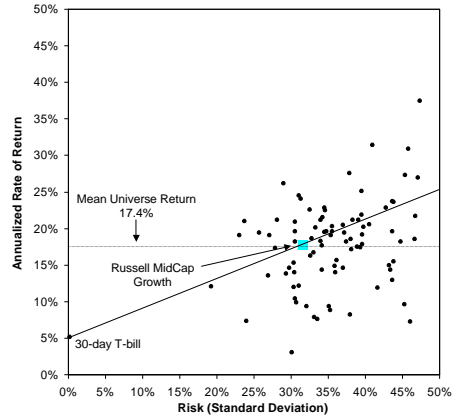
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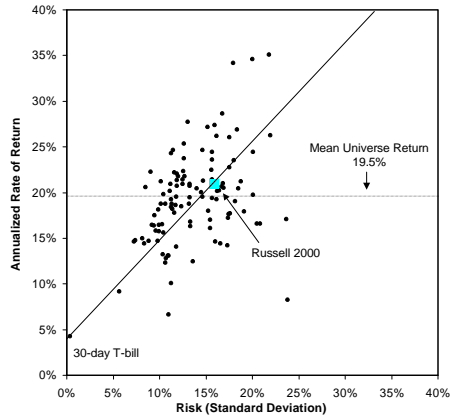
Small-cap Equity

Small-cap equity managers showed mixed results over time. The results for several periods measured (ended 1995, 1998 and 2000) indicate that the majority of managers outperformed the index on a risk-adjusted

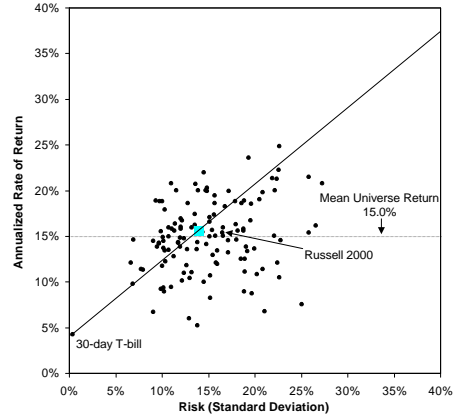
basis. However, for the five-year periods ended 1996, 1997, and 1999, the results are mixed. Of note, when the small-cap managers outperform, they tend to do so by a wide margin, although they also underperform by a wide margin.

SMALL-CAP EQUITY RISK-RETURN

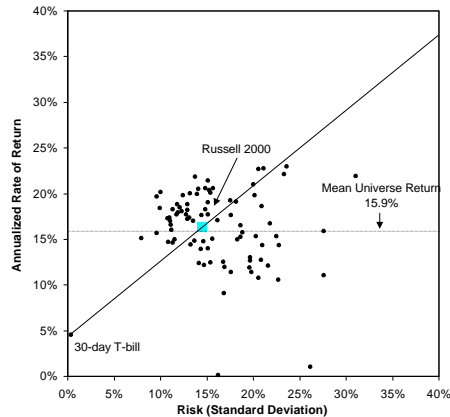
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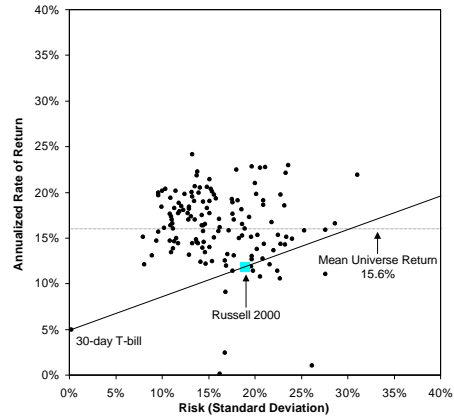
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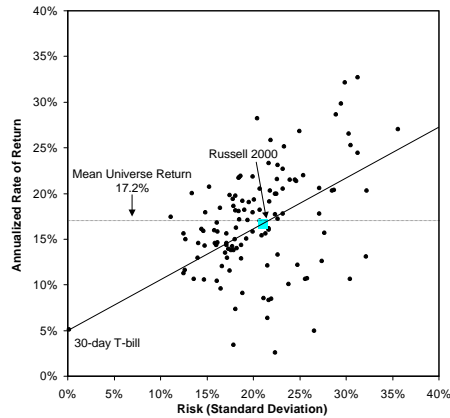
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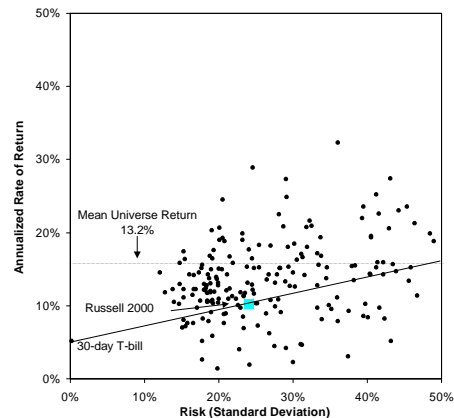
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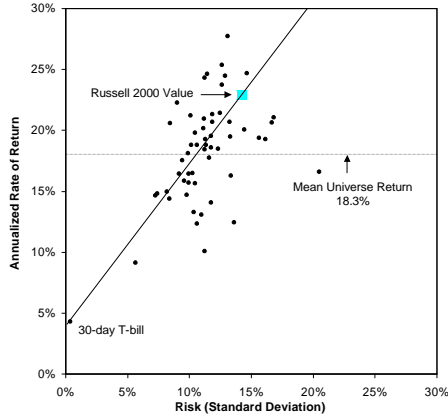
Small-cap Value

Small-cap value managers displayed mixed results over time. For the first period measured (five years ended December 1995), the managers are almost equally divided among underperformers and outperformers. However, for the five-year periods ended 1996, 1997, and

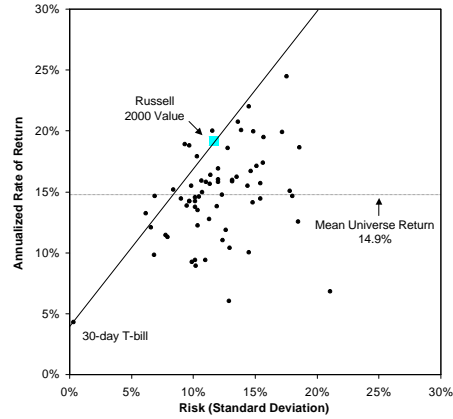
1998, the majority of active managers underperformed the index. Over the five years ended December 1999 and 2000, the results are again mixed. On average, the underperforming managers lost more value on a risk-adjusted basis than the outperforming managers added value.

SMALL-CAP VALUE RISK-RETURN

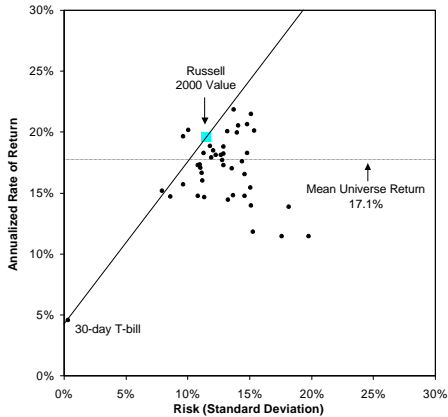
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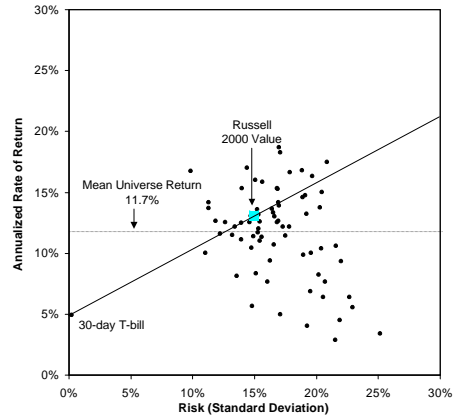
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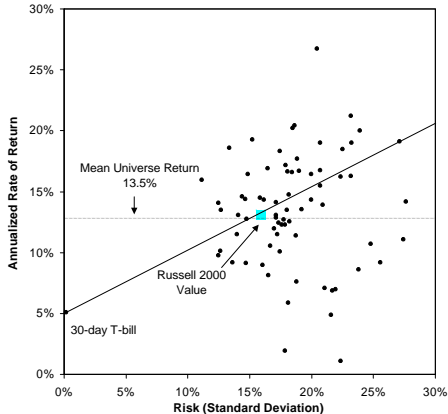
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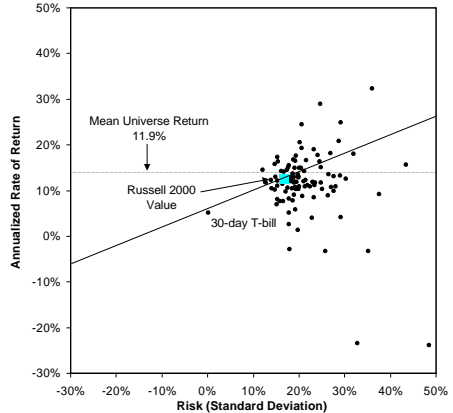
Five Years Ended December 31, 1998



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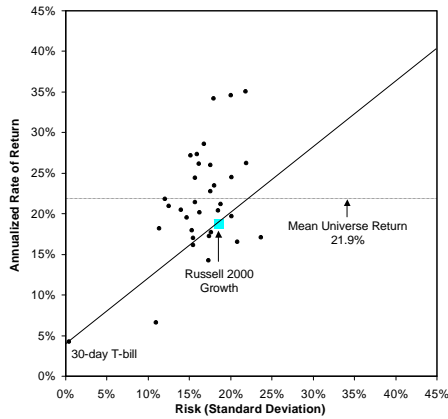
Small-cap Growth

The majority of active small-cap growth managers outperformed the index over the periods measured. Additionally, the amount of value added was generally much larger than the

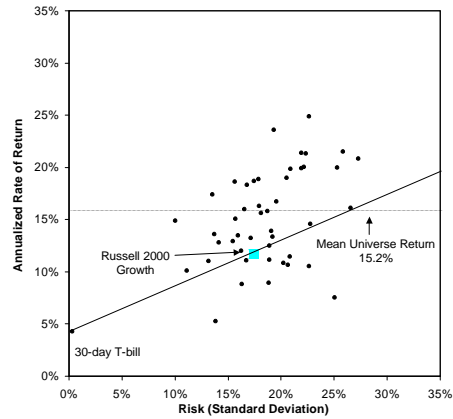
amount of value lost on a risk-adjusted basis. The results indicate that the use of active management over these periods would have likely led to substantial outperformance relative to the index.

SMALL-CAP GROWTH RISK-RETURN

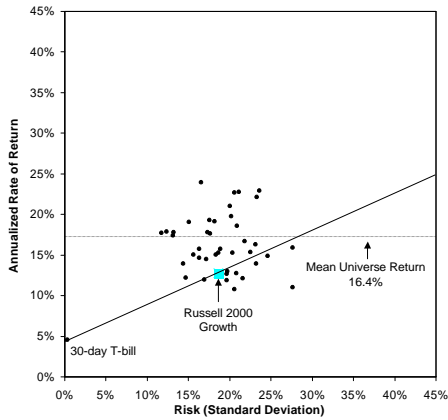
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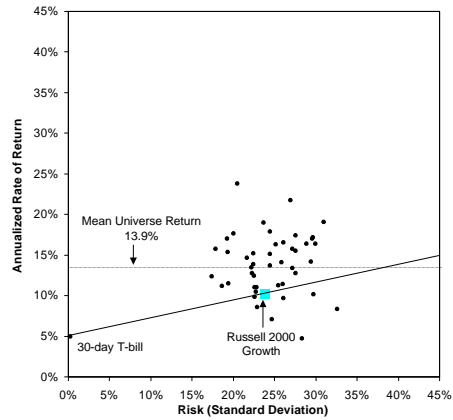
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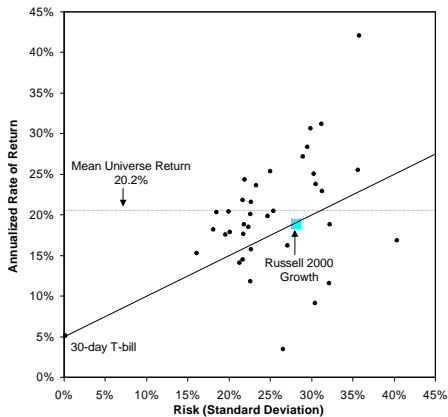
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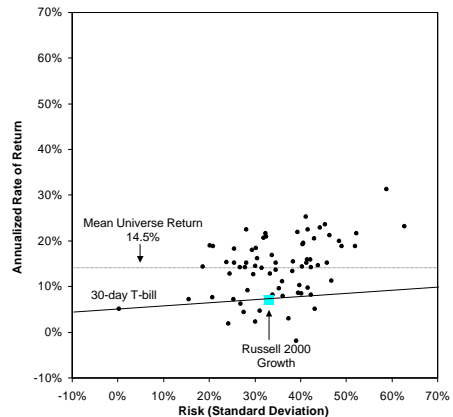
Five Years Ended December 31, 1998



Five Years Ended December 31, 1999



Five Years Ended December 31, 2000



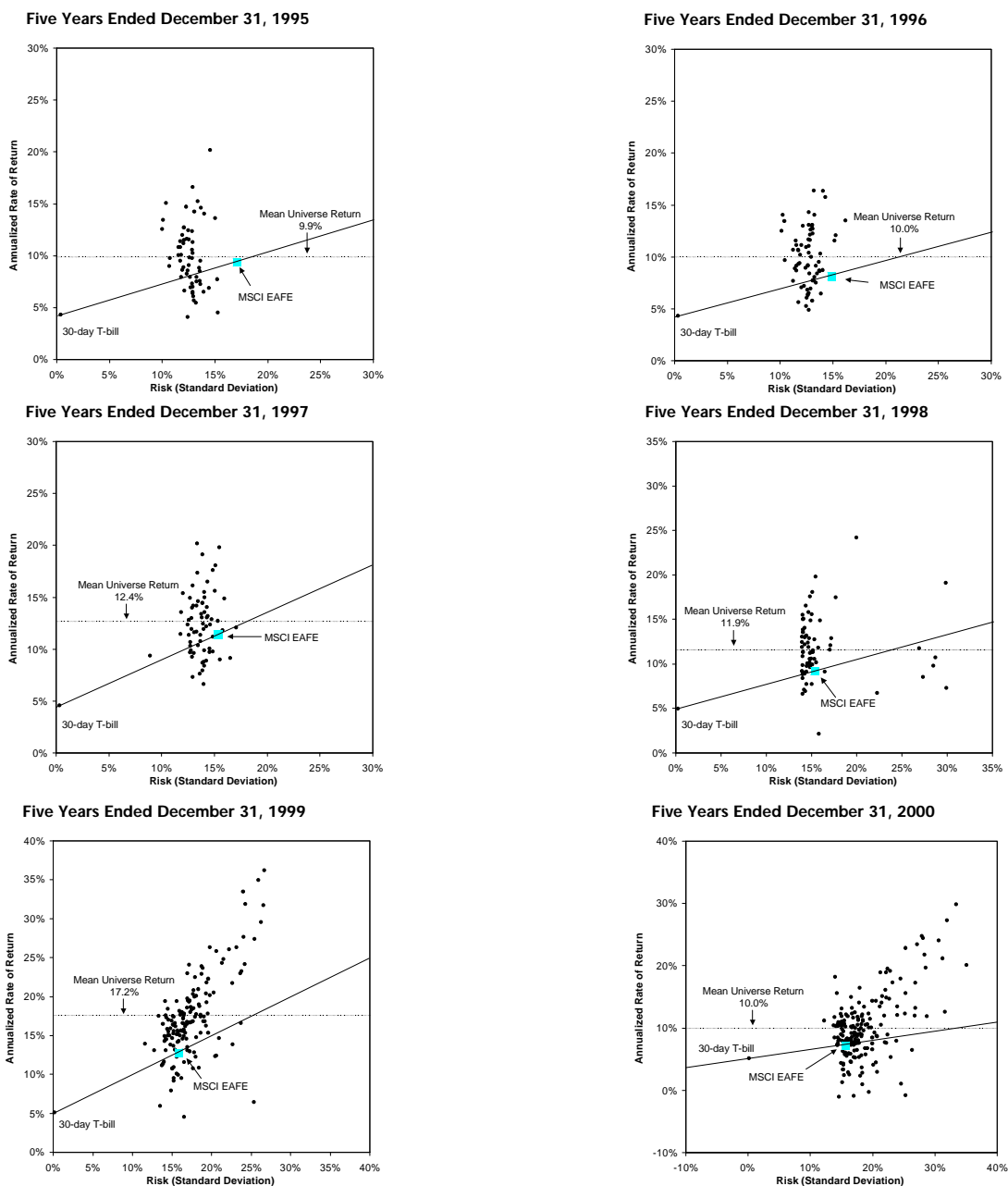
International Equity

International equity managers generally outperformed the index on a risk-adjusted basis over the periods measured.

The Morgan Stanley Capital International Europe Australasia and Far East (MSCI EAFE) Index, which we used as the benchmark for international equity managers, is one of the most widely-used international equity benchmarks. However, it has a large weighting in Japan, which has ranged from nearly 70% at its peak in 1989 to 26% currently.

Consequently, performance of the index is skewed heavily by Japan's performance, although this has been a diminishing factor as Japan's weighting has declined. Active managers' performance has been either good or bad depending on Japanese stock market trends and the index's allocation to Japan. As a result, this index has been criticized as a benchmark, but no better alternative has gained investor acceptance. Active management may be a better choice because of concerns over the international equity index's construction.

INTERNATIONAL EQUITY RISK-RETURN

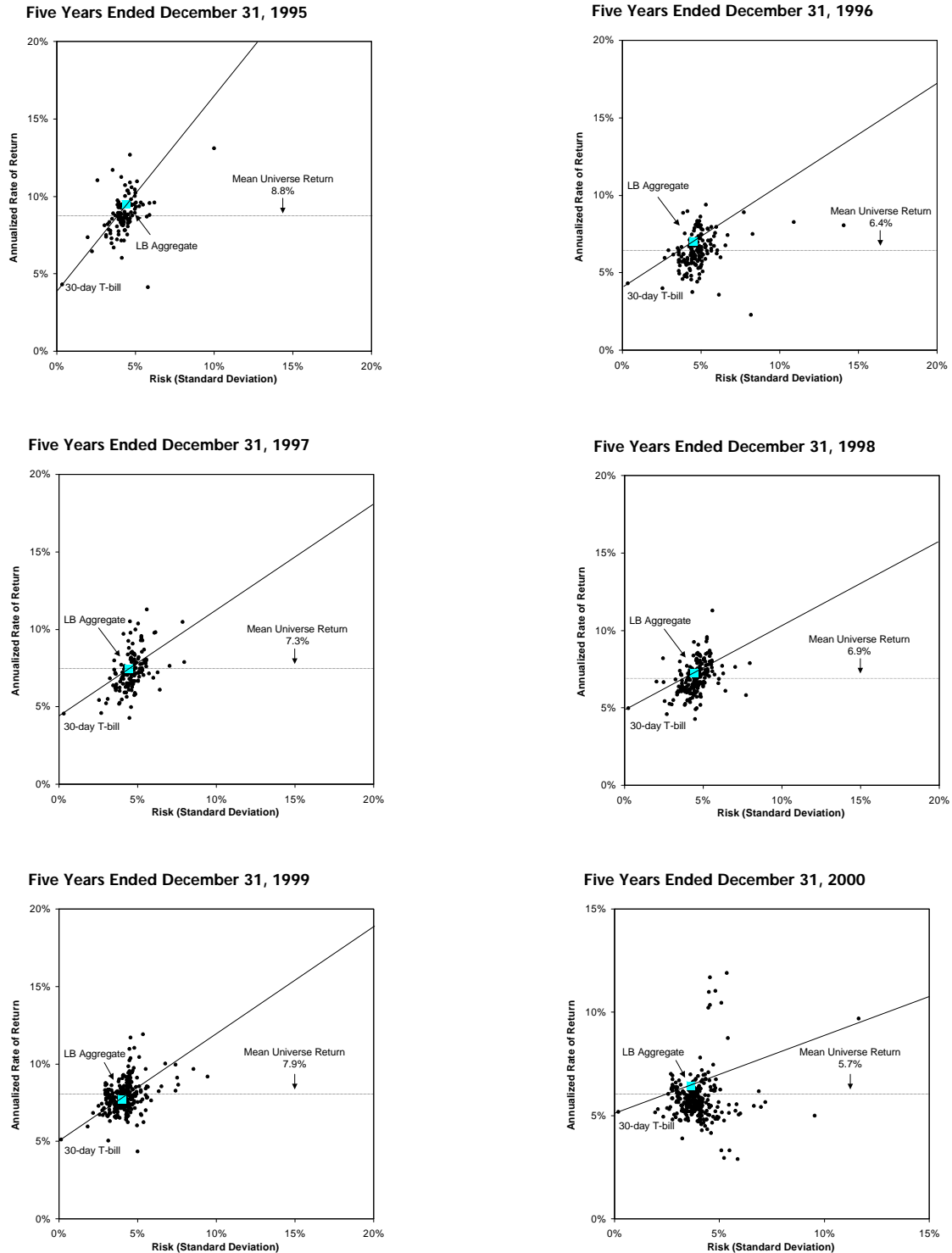


Market Duration Fixed Income

Most active funds underperformed the index over the periods measured. The period ended

December 1999 was the only exception, with the majority of active managers outperforming the index.

MARKET DURATION FIXED INCOME RISK-RETURN



ACTIVE MANAGERS' VALUE ADDED OR LOST

In addition to the risk-return analysis, we examined the mean of the outperformance or underperformance of the active managers

relative to their respective indices. It is important to note that the data demonstrates the magnitude of the outperformance or underperformance and does not take risk into account. The results are displayed in Table 2.

Table 2
Annual Alpha ¹ -- Value Added/(Lost)
Five-Year Periods Ended December 31

	1995	1996	1997	1998	1999	2000
Large-cap Equity						
Mean of Outperformers	2.4%	1.7%	1.4%	1.9%	4.3%	3.0%
Mean of Universe	(1.1%)	(1.7%)	(3.1%)	(6.7%)	3.3%	(1.9%)
Mean of Underperformance	(2.4%)	(2.7%)	(3.5%)	(6.8%)	(6.1%)	(4.1%)
Large-cap Value						
Mean of Outperformers	2.0%	1.1%	1.1%	1.7%	2.5%	2.8%
Mean of Universe	(1.1%)	(2.6%)	(2.8%)	(2.1%)	(3.2%)	(1.9%)
Mean of Underperformance	(2.5%)	(3.3%)	(3.4%)	(3.2%)	(4.7%)	(3.8%)
Large-cap Growth						
Mean of Outperformers	2.2%	1.6%	1.5%	2.9%	3.9%	3.1%
Mean of Universe	(4.0%)	(1.0%)	(2.9%)	1.4%	(4.9%)	(1.1%)
Mean of Underperformance	(4.3%)	(2.5%)	(3.4%)	(2.3%)	(6.5%)	(3.6%)
Mid-cap Equity						
Mean of Outperformers	1.2%	2.6%	1.3%	1.9%	2.9%	4.5%
Mean of Universe	(3.7%)	(2.9%)	(2.1%)	(3.5%)	(1.6%)	(0.7%)
Mean of Underperformance	(5.2%)	(4.1%)	(3.9%)	(5.6%)	(4.3%)	(5.0%)
Mid-cap Value						
Mean of Outperformers	2.4%	1.6%	2.2%	2.5%	4.6%	4.3%
Mean of Universe	(4.7%)	(3.1%)	(3.5%)	(3.4%)	(0.9%)	(0.3%)
Mean of Underperformance	(5.5%)	(4.2%)	(4.7%)	(4.5%)	(4.4%)	(3.8%)
Mid-cap Growth						
Mean of Outperformers	4.9%	4.1%	2.4%	2.8%	4.9%	4.4%
Mean of Universe	1.8%	0.4%	(0.7%)	(2.2%)	(0.2%)	(0.3%)
Mean of Underperformance	(3.1%)	(2.6%)	(2.7%)	(4.3%)	(5.3%)	(5.7%)
Small-cap Equity						
Mean of Outperformers	5.7%	3.0%	2.3%	5.1%	3.7%	7.6%
Mean of Universe	4.2%	(0.7%)	0.5%	4.6%	0.1%	6.0%
Mean of Underperformance	(1.5%)	(2.3%)	(2.5%)	(2.7%)	(3.1%)	(6.6%)
Small-cap Value						
Mean of Outperformers	2.1%	1.6%	0.9%	2.2%	3.6%	4.4%
Mean of Universe	(4.6%)	(4.3%)	(2.6%)	(1.4%)	0.4%	(0.7%)
Mean of Underperformance	(5.7%)	(5.2%)	(3.5%)	(3.4%)	(3.2%)	(4.7%)
Small-cap Growth						
Mean of Outperformers	6.1%	5.5%	4.7%	4.9%	6.0%	8.8%
Mean of Universe	3.2%	3.5%	3.7%	3.7%	1.2%	7.3%
Mean of Underperformance	(2.8%)	(1.9%)	(0.9%)	(1.8%)	(3.7%)	(3.9%)
International Equity						
Mean of Outperformers	2.2%	2.9%	2.2%	3.1%	4.5%	5.1%
Mean of Universe	0.2%	1.4%	0.7%	2.3%	3.8%	3.5%
Mean of Underperformance	(2.0%)	(1.5%)	(1.8%)	(1.3%)	(2.0%)	(2.6%)
Market Duration Fixed Income						
Mean of Outperformers	0.8%	0.8%	0.7%	0.7%	0.2%	1.0%
Mean of Universe	(0.8%)	(0.7%)	(0.3%)	(0.4%)	(0.2%)	(1.4%)
Mean of Underperformance	(0.9%)	(1.0%)	(0.9%)	(0.8%)	(0.4%)	(1.5%)

¹ Alpha is the amount of value added or lost by a manager relative to the index.

For five of the six periods measured, the mean of the large-cap equity managers' alpha was negative. This indicates that the average active manager underperformed the index. Large-cap equity managers that outperformed the index did so by a narrow margin.

Over each five-year period measured, with the exception of 1999, the average value added of the outperformers was three percentage points or less. The average value lost from the underperformers was significantly greater than the outperformers' value added.

The mean alpha of the underperformers ranged from -2.4 to -6.8 percentage points. The results for the large-cap value and large-cap growth managers were similar to those of the large-cap equity managers. It is likely that an investor would have earned less with an active large-cap manager than with the index.

Similar to large-cap, the mean of the mid-cap managers' alpha was negative for all periods measured. The mid-cap equity managers' mean alpha ranged from -0.7 to -3.7 percentage points.

The managers who were able to outperform the index did so by a small margin. However, the average performance shortfall of the underperformers was much greater, ranging from -3.9 to -5.6 percentage points.

The mid-cap value and growth managers performed similarly to the mid-cap equity managers.

In aggregate, the use of active management in the small-cap equity segment would likely have provided excess return over the index. The average

small-cap equity manager outperformed the Russell 2000 Index over most periods measured. The average alpha was negative only once, during the five years ended 1996. The average outperformance ranged from approximately two percentage points to six percentage points, while the largest mean underperformance was only 3.1 percentage points.

Within the small-cap equity universe, small-cap value managers added value less often than small-cap growth managers. The mean alpha of the small-cap value universe was negative for all but one period measured, while the mean alpha of the small growth managers was always positive. This result indicates that the average small-cap growth manager outperformed the index and the average small-cap value manager underperformed the index.

The average international equity manager also outperformed the index over the periods measured. Value added from the outperforming managers consistently exceeded value lost from the underperforming managers.

Within the fixed income universe, the average active manager underperformed the index over each period measured, but the size of the performance shortfall decreased significantly. The amount of value added decreased as well. The exception was the most recent period, when the mean alpha was -1.4 percentage points. This was the lowest alpha of all the periods measured. Interestingly, the average outperformance during this period was also the largest measured.

MARKET FACTORS

Each asset class has characteristics that can influence the ability of an active manager to outper-

form an index. Table 3 summarizes some of these factors for large-cap equities, small-cap equities, international equities, and market duration fixed income.

Table 3
Summary of Market Factors Impacting Active/Passive Decision

	Large-cap Equity	Small-cap Equity	International Equity	Market Duration Fixed Income
Market Characteristics	<ul style="list-style-type: none"> • \$12.5 trillion in market capitalization • About 500 securities 	<ul style="list-style-type: none"> • \$1.5 trillion in market capitalization • Over 6,600 stocks 	<ul style="list-style-type: none"> • \$9 trillion in market capitalization • 23 countries in the developed markets 	<ul style="list-style-type: none"> • \$5.5 trillion in market capitalization • 5,300 securities
Tracking Error				
Active	<ul style="list-style-type: none"> • High tracking error: spread of nearly 2000 basis points 	<ul style="list-style-type: none"> • High tracking error: spread of nearly 2000 basis points 	<ul style="list-style-type: none"> • High tracking error: spread of nearly 2000 basis points 	<ul style="list-style-type: none"> • Low tracking error: spread averages 800 basis points
Passive	<ul style="list-style-type: none"> • Low tracking error 	<ul style="list-style-type: none"> • High tracking error 	<ul style="list-style-type: none"> • High tracking error 	<ul style="list-style-type: none"> • Low tracking error
Active Trading Costs	<ul style="list-style-type: none"> • Low transaction costs • Averages 1.0% 	<ul style="list-style-type: none"> • High transaction costs • Can reach 4.5% 	<ul style="list-style-type: none"> • High transaction costs in many market segments • Can reach 5.0% 	<ul style="list-style-type: none"> • Low transaction costs • Averages 30 basis points
Fees	<ul style="list-style-type: none"> • Active fee range: 50 to 100 basis points • Index fee range: 3 to 20 basis points 	<ul style="list-style-type: none"> • Active fee range: 75 to 125 basis points • Index fee range: 10 to 30 basis points 	<ul style="list-style-type: none"> • Active fee range: 100 to 150 basis points • Index fee range: 20 to 60 basis points 	<ul style="list-style-type: none"> • Active fee range: 30 to 50 basis points • Index fee range: 3 to 10 basis points
Efficiency	<ul style="list-style-type: none"> • Significant research coverage: from 3 to 50 analysts per stock • Extremely liquid market 	<ul style="list-style-type: none"> • Coverage ranges from 0 to 20 analysts per stock • Liquidity diminishes as capitalization decreases 	<ul style="list-style-type: none"> • Research coverage depends on capitalization • Relatively liquid market 	<ul style="list-style-type: none"> • Research coverage dependent on size, quality, and perceived risk of issue • Treasury market is very efficient and liquid • Mortgage and corporate markets less efficient and liquid

Sources: Plexus Group, MSCI, Standard & Poor's, Elkins/McSherry.

The large-cap equity market consists of a limited and stable number of securities, most of which are established companies that are closely followed by research analysts. In addition, the market is very liquid. We believe these factors in combination improve the segment's efficiency.

Mid-cap equities, while not included in the table consist of a limited number of securities (approximately 800) with an aggregate capitalization of \$3.5 trillion.

Some mid-cap companies have significant liquidity and are closely followed by analysts

while others are not. This market segment is likely semi-efficient.

By number of securities, the small-cap equity market is huge (6,600 stocks) compared to the large-cap market. Research coverage is limited for this extremely broad universe of securities; some stocks are not followed at all by professional securities analysts. Table 4 illustrates the disparate coverage among the largest and smallest positions in two large- and small-cap indices, the S&P 500 and the S&P 600.

Table 4
Analyst Coverage of Companies

Largest Positions in the S&P 500 Index	Number of Analysts Covering Company	Smallest Positions in the S&P 500 Index	Number of Analysts Covering Company
General Electric	22	National Service	8
Cisco Systems	50	Worthington Industries	3
Microsoft	30	Briggs & Stratton	6
Intel	38	Cooper Tire & Rubber	5
Exxon	33	McDermott Intl.	7
Pfizer	38	Polaroid	9
Citigroup	30	Springs Industries	7
AIG	23	Bethlehem Steel	8
EMC Corp.	29	W.R. Grace and Co.	5
Wal-Mart	29	Armstrong Holdings	11

Largest Positions in the S&P 600 Index	Number of Analysts Covering Company	Smallest Positions in the S&P 600 Index	Number of Analysts Covering Company
Expeditors	11	Spartan Motors	0
Bisys Group	12	Nashua Corp.	0
COR Therapeutics	8	Frozen Food Express	1
Cephalon	7	Dixie Group	4
Radian Group	10	Action Performance	6
Universal Health Services	19	Green Mountain Power	0
Plexus Corp.	18	Books-A-Million	2
KEMET Corp.	5	Curative Health Services	3
Dallas Semiconductor	6	J. Baker	1
Techne Corp.	5	Cyrk	1

Source: Bloomberg, 2000.

The lack of small-company coverage increases the chances of market inefficiencies occurring. Also, transactions costs are much higher for small-cap stocks. Higher transaction costs may cause a manager to trade less frequently, further contributing to market inefficiency.

The international equity market has many similarities to the domestic small-cap market. The large number of countries and companies result in varying depths of research coverage. Larger, developed markets are typically followed more closely than smaller markets. Liquidity is also directly proportional to market size and stage of economic and financial market development. These factors generate potential inefficiencies that

increase the chances of outperformance by active managers.

The fixed income market is sizeable as well, with several thousand issues in the Lehman Brothers Aggregate Index and an estimated size of over \$5 trillion. Research coverage and levels of liquidity differ by market sector. In comparison with stocks that are valued through expectations of future growth, fixed income securities are primarily priced mathematically. In today's environment, this may reduce the opportunity for a fixed income manager to take advantage of pricing inefficiencies. Transactions costs and fees can reduce an active manager's ability to add significant value relative to the index.

QUALITATIVE FACTORS

Several qualitative factors play a role in determining whether or not to use passive strategies and to what extent.

One is time available for oversight of the investment program. Active managers require more monitoring than passive managers. Ongoing monitoring typically includes updates on the organization, personnel, the investment strategy, performance, etc. This effort can prove costly, especially in today's environment of industry consolidation and frequent personnel changes. Many of these organizational changes require several years of monitoring before it is clear whether the changes will potentially benefit performance. Organizational and personnel changes also affect firms that offer passive investment products; however, the impact on product performance tends to be minimal.

A second factor investors should evaluate is their tendency to dismiss managers that have been performing poorly and invest with managers that have been performing well. Often in this situation, the "sold" manager's performance improves and the "purchased" manager begins to suffer below-average performance. This can result in a cycle of moving in and out of managers at inopportune times. The costs extend beyond the performance shortfall. They also include transactions costs of moving from one manager to another, consultant search fees, and investor time needed to study the issue, make a decision, and oversee implementation.

An investor's ability or willingness to deal with these types of frustrations and costs should factor into the decision to invest actively or passively and to what extent.

CONCLUSION

Stratford's analysis indicates that for the large-cap, mid-cap, and fixed income markets, passive management is most likely to result in

better returns. The large-cap market consists of a small number of well-researched securities, providing few opportunities for active managers to outperform the index. Similarly, the mid-cap market largely consists of established, well-covered companies. Within fixed income, the securities' pricing structure appears to limit an active fixed income manager's potential to add significant value.

Active strategies are likely to be more successful in the small-cap growth and international equity markets. The small-cap market's large number of securities, limited research coverage and low trading volume can result in substantial inefficiencies. These inefficiencies increase active managers' ability to add value over the index. Similarly, within the international market, differing levels of research coverage and liquidity can promote inefficiencies that benefit active managers.

The quantitative data is not decidedly in favor of active or passive management for small-cap value. But, small-cap value managers should be able to benefit from the same market inefficiencies as small-cap growth managers.

The final decision on whether to invest actively or passively (and how much) is dependent on an investor's readiness to cope with each strategy's tradeoffs. Investors who gain satisfaction from the process of identifying outperforming managers, who are willing to undertake the effort to oversee active managers, and who accept the possibility of underperformance during certain periods, should have larger allocations to active managers. Other investors who are less willing to commit the time and effort required to supervise active managers and who are prepared to give up potential excess return should have a greater allocation to passive management.

APPENDIX

Statistical Calculations

To test our hypothesis that active management has outperformed passive management in particular market segments, we performed the test of the mean of a normal distribution with a 95% degree of confidence. We tested the null hypothesis:

H_0 : mean alpha is less than or equal to 0

(i.e., the mean manager's return was less than or equal to the index's return);

against the alternative hypothesis

H_1 : mean alpha is greater than 0

(i.e., the mean manager's return was greater than the index's return).

We defined the decision rule as:

- reject H_0 and accept H_1 if the test statistic of the data is greater than the critical value as defined by the Student's t random variable, and
- accept H_0 and reject H_1 if the test statistic is less than or equal to the critical value.

In other words, if the calculated test statistic was greater than the critical value, the mean manager outperformed the index. If the test statistic was less than or equal to the critical value, the mean manager underperformed the index. The calculated test statistics and critical values can be found in Table 5.

In general, our calculations indicate that the mean manager's return was less than the index's return, or that active managers were unable to outperform the index on a risk-adjusted basis. The calculated test statistics were, on average, less than the critical value of 1.65. Two notable exceptions were small-cap growth and international equity. During most of the periods, the test statistic for these asset classes was greater than the critical value. The results indicate that the mean small-cap growth and international equity manager outperformed the index over these periods. However, the hypothesis testing for all other asset classes demonstrates that the mean active manager did not outperform the respective index over the periods studied.

Table 5
Hypothesis Test Calculations

Five-Year Periods Ended December 31

	1995	1996	1997	1998	1999	2000
Large-cap Equity						
Test Statistic	(0.11)	(12.74)	(20.63)	(50.97)	(13.91)	(11.04)
Critical Value	1.65	1.65	1.65	1.65	1.65	1.65
Number of Managers	368	433	316	582	668	649
Large-cap Value						
Test Statistic	(3.87)	(11.66)	(11.51)	(10.52)	(12.82)	(8.48)
Critical Value	1.65	1.65	1.65	1.65	1.65	1.65
Number of Managers	123	135	119	237	288	267
Large-cap Growth						
Test Statistic	(15.95)	(3.61)	(9.06)	6.10	(15.36)	(3.70)
Critical Value	1.65	1.65	1.65	1.65	1.65	1.65
Number of Managers	76	84	83	204	259	208
Mid-cap Equity						
Test Statistic	(6.26)	(6.87)	(7.50)	(9.64)	(0.76)	(1.61)
Critical Value	1.65	1.65	1.65	1.65	1.65	1.65
Number of Managers	187	168	123	188	197	235
Mid-cap Value						
Test Statistic	(11.47)	(8.22)	(6.54)	(8.30)	(1.58)	(0.60)
Critical Value	1.65	1.65	1.65	1.65	1.65	1.65
Number of Managers	90	79	50	85	98	109
Mid-cap Growth						
Test Statistic	2.96	0.75	(1.53)	(4.80)	(0.34)	(0.47)
Critical Value	1.65	1.65	1.68	1.65	1.68	1.65
Number of Managers	72	60	47	78	42	96
Small-cap Equity						
Test Statistic	(3.13)	(1.96)	(0.83)	(1.40)	0.85	12.12
Critical Value	1.65	1.65	1.65	1.65	1.65	1.65
Number of Managers	109	125	87	138	122	202
Small-cap Value						
Test Statistic	(8.03)	(9.63)	(6.44)	(3.26)	0.71	(0.90)
Critical Value	1.65	1.65	1.65	1.65	1.65	1.65
Number of Managers	56	66	43	74	76	101
Small-cap Growth						
Test Statistic	3.10	5.32	6.78	6.71	1.13	9.57
Critical Value	1.70	1.68	1.68	1.68	1.68	1.65
Number of Managers	33	47	42	46	38	70
International Equity						
Test Statistic	1.41	5.51	(0.05)	9.23	10.40	9.33
Critical Value	1.65	1.65	1.65	1.65	1.65	1.65
Number of Managers	61	67	69	128	156	190
Market Duration Fixed Income						
Test Statistic	(5.45)	(6.82)	(1.91)	(4.68)	2.47	(32.44)
Critical Value	1.65	1.65	1.65	1.65	1.65	1.65
Number of Managers	110	152	142	197	292	285

APPENDIX

Index Descriptions

S&P 500. The S&P 500 is constructed to represent movement in common stocks. Stocks are chosen so that, in aggregate, they represent a broad distribution by industry group comparable to the stocks traded on the NYSE. Decisions about stocks to be included and deleted are made by the Standard & Poor's Index Committee.

S&P 500/BARRA Growth and Value Indices. S&P 500/BARRA Growth and Value indices are constructed by sorting the S&P 500 companies based on their price/book ratios. The low-P/B companies form the value index, and the high-P/B companies make up the growth index. Each S&P 500 company is included in either the growth index or the value index, and each style index has approximately the same market value. The weightings are provided by Standard & Poor's. The indices are rebalanced December 31 and June 30; companies are replaced regularly.

Russell Midcap. The Russell Midcap comprises the 800 smallest stocks, as calculated using float, contained in the Russell 1000. The Russell 1000 represents the top one third of the largest 3,000 U.S.-domiciled companies.

Russell Midcap Growth and Value Indices. Russell Midcap Growth and Value indices are created by sorting the Russell Midcap universe book/price ratio and then again by the I/B/E/S long-term growth rate. The two series are standardized and then combined to create a composite value, which in turn determines the probability of a company's being either growth or value. About 30% of the stocks in the Russell Midcap appear in both the growth and value indices, in different proportions, based on the probability calculated; the sum of the shares in each index is the total number of shares floating. The remaining 70% of the companies are in one style index only.

Russell 2000. The Russell 2000 Index represents the bottom two-thirds of the largest 3,000 publicly traded companies domiciled in the United States. Frank Russell Co. uses market value when sorting its universe to determine its various indices. Total shares outstanding are then adjusted for cross-

ownership between firms and for shares held by insiders to determine the shares floating and thus the weight. The Russell Indices are rebalanced annually on June 30 using companies' market values as of May 31.

Russell 2000 Growth and Value Indices. Russell 2000 Growth and Value indices are created by sorting the Russell 2000 companies by book/price ratio and separately by the I/B/E/S growth rate. Each of the sorted series is normalized and combined to arrive at a composite rank for each company. The composite rank is used to generate the probability that a stock is either growth or value. About 30% of the stocks in the Russell 2000 appear in both the growth and value indices in different proportions based on the probability calculated; the sum of the shares in each index is the total number of shares floating. The remaining 70% of the companies are in either one index or the other.

Morgan Stanley Capital International (MSCI) Europe, Australasia and Far East (EAFE) Index. The Morgan Stanley Capital International (MSCI) Europe, Australasia and Far East (EAFE) Index is an international equity index, which consists of securities from 20 developed countries. MSCI's goal is to accurately represent the buyable opportunities in the markets covered. An independent group of country specialists employed by Capital International Perspectives S.A. is responsible for the index's stock selection. The index represents approximately 60% of the combined market capitalization of the 20 countries. The index attempts to replicate the industry composition of each local market and includes a representative sampling of large, medium, and small capitalization companies.

Lehman Brothers Aggregate Bond Index. The Lehman Brothers Aggregate Bond Index represents securities that are U.S. domestic, taxable, and dollar denominated. The index covers the U.S. investment grade fixed rate bond market, with index components for government and corporate securities, mortgage pass-through securities, and asset-backed securities. These major sectors are subdivided into more specific indices that are calculated and reported on a regular basis.

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