

C A M B R I D G E   A S S O C I A T E S   L L C

TELECOM INVESTING:  
FOCUS ON NON-MARKETABLE STRATEGIES

2002

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## Introduction

A massive amount of wealth has been created, and destroyed, in the telecommunications (telecom) sector over the past several years. At their peak in March 2000, worldwide telecom operators and manufacturers achieved a combined market-capitalization value of about \$6.3 trillion. By September 2001, their combined market value had plunged roughly \$3.8 trillion, according to a recent article in the *Financial Times*. Furthermore, billions more are likely to be lost if telecom companies continue to default on the record \$1.3 trillion in debt raised over the past five years. In the first half of 2001, over 60% of all high-yield defaults were due to telecom, and in the past year or so, over 400,000 job cuts were made by telecom companies and more than 15 telecom companies filed for bankruptcy, including Global Crossing—the fourth largest bankruptcy in history, all contributing to fears of a continued telecom meltdown.

Similarly, in the venture capital (VC) and private equity (PE) markets, net asset values (NAV) of telecom-portfolio companies have peaked and plummeted over the past several years. In 2000, VC firms in the United States invested more than \$17 billion and buyout firms contributed almost \$10 billion in the communications sector. However, many fund managers who invested aggressively and rapidly in telecom companies in 1999 and 2000 took major write-downs and write-offs in 2001, with more expected over the next several quarters. For example, JPMorgan Chase publicly announced over \$1 billion in write-offs and write-downs in July 2001, largely attributable to telecom investments.

In light of the major turmoil and uncertainty in the telecom industry, investors are questioning whether this is the right time to withdraw from existing telecom investments, or alternatively, to re-up and invest in new funds. This report provides an analytical framework and strategy for addressing these questions. It focuses on non-marketable strategies in VC and PE, excluding hedge funds and marketable securities. It primarily addresses the U.S. market, the largest and most acutely affected.

## Global Telecom Market Environment and Outlook

Optimists point to huge and largely untapped future demand (i.e., long-term growth opportunities), especially for broadband data services, while pessimists warn that it will take years to recover from the overbuilding and over-leveraging of the last several years, primarily led by telecom operators and equipment manufacturers.

The factors that create optimism about long-term growth opportunities include, first of all, the significant size and predicted growth of communications, driven by an underlying demand for bandwidth—faster, cheaper, more reliable, more secure, and mobile. The U.S. communications sector is currently about \$1.3 trillion (13% of GDP) and the global market for communications services alone was about \$765 billion in the year 2000 and is still growing.

Revenue forecasts for major categories of voice and data services in the U.S. telecom services industry are illustrated in Exhibit 1, based on a recent study by J.P. Morgan Securities Equity Research. Overall, data growth is expected to exceed voice, wireless voice is expected to far exceed demand for wire-line local (flat) and long distance voice (in decline), and Internet demand is expected to continue its dramatic growth.

In addition to the categories in Exhibit 1, certain segments are large and predicted to keep growing at high rates. According to a paper by Telegraph Hill Communications Partners, U.S. residential broadband revenue is expected to grow to \$16 billion by 2005; U.S. web-hosting services, \$25 billion by 2004; optical networking systems, \$18 billion by 2004; and wireless services to reach one billion global subscribers by 2003—implying five-year compound annual growth rates of 56%, 67%, 35%, and 29%, respectively. Even though there has been a huge amount of capacity built in the past several years, demand has been constrained by supply bottlenecks, especially in the local loop (i.e., connections between national pipelines and customers' premises), where new entrants are adopting "smart build" network strategies (e.g., cheaper overlay networks) and exploiting shared access to existing infrastructure (e.g., "unbundled" local loop facilities) to their competitive advantage.

However, over \$4 trillion has been spent on telecom services and equipment in the United States and Europe since 1997 and many of the world's largest telecom incumbents are struggling under mountains of debt. For example, total debt among Europe's top telecom operators (e.g., British Telecom, Deutsche Telecom, France Telecom) reached almost \$100 billion by the end of 2000. Much of this debt was raised just in order to acquire third generation mobile licenses; an estimated additional amount in excess of \$100 billion may be required to build out the mobile networks.

### **Key Subsectors**

The telecom industry consists of a vast and complex global system of residential and business consumers, service and network providers, and equipment manufacturers. Many players are simultaneously consumers, competitors, and suppliers of one another. However, the entire industry is fundamentally driven by end-user demand for voice, data, and video services, provided by local, long distance, and international service providers (*services subsector*). In turn, this end-user demand drives the demand for the infrastructure of fiber optic cables, satellites, copper wires, and wireless spectrum (*networks subsector*), provided through a complex system of switches, routers, hubs, and terminal devices, such as telephones, computers, and television sets (*products subsector*). Because the networks, and products to a lesser extent, tend to be very capital-intensive and time-consuming to build, there is a tendency to build "ahead of demand." When the end-user demand is overestimated, a vicious cycle can develop in which supply of networks and products vastly exceeds demand (see below), as is currently the case, resulting in a huge backlog of capacity.

### **Supply and Demand Imbalances**

In anticipation of exponentially rising predicted demand for telecom services, especially high-speed Internet access and next generation web-based wireless applications, major network operators and equipment manufacturers aggressively built long-haul fiber optic networks and optical networking equipment. These are time-consuming and very capital-intensive investments, which banks were willing and able to finance over the past several years, with loans in excess of \$250 billion; however, financing has virtually come to a halt in view of the record number of defaults and plummeting share prices. Furthermore, as stated above, many of the major carriers in the United States and Europe paid huge amounts of money just to obtain licenses to build the next generation of mobile networks, without any certainty of the magnitude or timing of demand.

In contrast to overcapacity in the long-haul network, there are actually bottlenecks in the local networks, particularly in the "last mile" connections to customers' premises. As the demand for broadband services grows, these bottlenecks may create pricing inefficiencies that companies may be able to exploit, by using new, more efficient, and less capital-intensive technologies such as wireless fixed local loop and free-space optical lasers. Further bottlenecks may occur in certain optical components, until scalable manufacturing methods are developed.

### **Technological Innovation**

One of the most important factors leading to the widespread availability of inexpensive bandwidth is technological innovation in fiber optics networking, intelligent switching and signaling, packet-switched architecture, and distributed computing. The pace of technological innovation shows no sign of slowing. However, the economics of such advanced networks are far from certain. There are tremendous implications for incumbent network service providers and equipment manufacturers (e.g., Nortel, Lucent) who have invested approximately \$350 billion in current network infrastructure, roughly \$40 billion per year. The magnitude and pace at which the transition to advanced networks takes place will have a profound impact on the valuations of network providers, both existing and new entrants.

The next generation network will probably be packet switched but the optimal architecture is far from certain. In the interim, there will likely be demand for equipment that can bridge the circuit-switched and packet-switched networks through media gateways. According to several industry analysts as well as network engineers, the ultimate goal for media gateways is to provide "any-to-any connectivity" at optical speeds and the ultimate goal for the network is to provide an "always-on, all-you-can-eat capability" at optical speeds with all optical equipment.

### **Entry and Exit Valuations**

To the extent that entry valuations have been driven down to more reasonable levels, there may be some attractive, undervalued companies available for investment in certain subsectors, especially the services subsector. According to a recent study by Crossroads, current acquisition multiples for Competitive Local Exchange Carriers (CLEC) range from 0.6 to 1.0. Of course the exit valuations are also critical, and as long as they remain low, the prospects for reasonable returns remain uncertain. Furthermore, as long as the IPO markets remain effectively closed for telecom, and the M&A activity continues to languish, exits will be seriously constrained.

### **Cost and Availability of Capital**

Whereas the cost of capital was close to zero in 2000 for many telecom start-ups, the cost today is enormous, with many telecom entities unable to obtain loans, bonds, or equity at any price.

### **Types of VC and Non-VC PE Telecom Investment Strategies**

Investment strategies may vary by stage (e.g., seed, start-up, first-stage, expansion, late-stage, buyouts) and geography (e.g., northeast United States, California, pan-Europe, pan-Asia, global), and sector focus (one or several sectors and subsectors). To the extent a manager chooses to invest selectively in only one stage, geography, or sector, it is vitally important to understand the market cycles, entering when certain sectors and subsectors are out of favor and exiting when the market has peaked. In telecom investing, value was created, and then destroyed, by telecom start-ups without realistic, well-funded business plans, investing in unattractive parts of the industry. Furthermore, several buyout-focused managers were seduced to make early-stage investments (e.g., Blackstone, Hicks Muse Tate and Furst) and to take minority stakes in publicly traded high-tech telecom companies, much to their detriment as share prices plummeted. For early-stage telecom VCs, the worst vintage years will probably be 1999 and 2000, because pre-money valuations were extremely high and capital markets subsequently closed. For telecom buyout funds, the worst vintage years are probably 1998 to 2000, due to the rise and then collapse of the high-yield debt market, and subsequent reduced amount of leveraging in these investments. The managers who diversified across industry sectors (e.g., health care) and across telecom subsectors and segments (e.g., wireless and data services, networks, and products) are more likely to achieve reasonable returns in those vintage years.

### **Types of Business Models**

The business models with the highest probability of success are those with control over prices, control over costs, control over network management and quality of service, high barriers to entry, relatively cheap cost of capital, ability to set (or heavily influence) industry-wide standards, and access to

technological innovation. During the bull market, large amounts of capital were poured into companies with unrealistic business plans and weak balance sheets. For example, capital was raised for wholesale (versus retail) business models, especially CLECs, with few customers, limited control of prices, limited ability to sell additional services to customers, low barriers to entry, and limited control over costs due to pricing risk from leased lines and provisioning delays. Many of these have now filed for bankruptcy (e.g., Northpoint, Teligent, Covad). By contrast, retail telecom business models, which develop differentiated pricing based on customers' willingness and ability to pay, use wide distribution channels, control the network management and systems (e.g., customer service, billing), and can attractively package multiple services are more likely to achieve profitability than pure wholesale infrastructure providers. Some observers predict that at least in the short term, the business models of powerful incumbents, with large customer bases, owned and controlled facilities, access to capital, and weak competition will prosper possibly acquiring assets of failed start-ups. However, many once powerful incumbents are struggling under mountains of debt.

### **VC and PE Investing**

The percentage of VC investments allocated to communications was 16% of the total (\$1.9 billion) during the first quarter of 2001, just slightly below the 17% allocated during the first quarter of 2000 (\$17.7 billion) according to *Venture Economics*. Furthermore, the percentage rose to 18% in the second quarter of 2001 (\$1.87 billion): U.S. VC firms invested more than \$2.8 billion in 180 telecom start-ups in the first half of 2001 (down from \$7.55 billion in 365 companies in first half of 2000). In Europe, 80 telecom start-ups received funding of \$968.9 million in the first half of 2001 falling far short of the total \$4.2 billion raised in 2000. According to Capital IQ, PE funding has also continued to decline from peak 2000 levels. Combined U.S. investments by both VC and PE funds for the first four months of 2001 were only \$3.7 billion, compared to a total of \$20.7 billion in 2000. Much of the investment in PE was in the form of convertible and preferred stock, and many of these investments are trading far below their conversion price. Between 1997 and 2000, approximately \$192 billion in high-yield debt was issued by telecom and cable TV companies, and much of the debt is either in default or distressed. Further problems arose from private investments in publicly traded equities (PIPEs) because investments were made at high valuations in companies that were not fully financed. According to the *Daily Deal*, of the more than 80 PIPEs in the United States, fewer than 20 have produced positive returns to date. Moreover, some of the telecom companies receiving PIPE investments have filed for bankruptcy (e.g., ICG, Winstar, Viatel, Rhythms NetConnections, and Teligent), resulting in major write-downs for the fund managers, including Hicks Muse Tate and Furst, Blackstone, JPMorgan Chase, and Welsh, Carson, Anderson and Stowe.

On a more optimistic note, whereas the total amount of U.S. VC disbursements fell again in the third quarter of 2001, marking the sixth consecutive quarter of decline for the venture industry, by contrast, investments in communications seemed to stabilize. Despite significant decreases in the first and second quarters (-42% and -38%, respectively), by the third quarter of 2001, communications companies raised \$1.9 billion in 91 deals—a 7% decline in the amount invested but the same number of rounds as in the previous quarter, and median pre-money valuations reached \$32 million, the highest level since third quarter 2000, according to *VentureEdge*. Furthermore, investments in communications/networking during the third quarter of 2001 still accounted for 43% of the total investment in information technology (IT).

### **Exit Strategies**

Reflecting the severe drop in valuations in the telecom industry, the initial public offering (IPO) market is still virtually closed for communications companies. A few years ago, communications and networking IPOs were rapidly accelerating, with 15 in 1998 raising \$1.3 billion, and 52 IPOs in 1999 raising \$5.9 billion. There were 34 IPOs in 2000, which raised \$5.1 billion. Only one venture-backed IT company went public in the first quarter of 2001, compared to 42 in the first quarter 2000, a 98% decline; there was not one venture-backed IT company that went public in the third quarter of 2001. The telecom M&A market has dramatically slowed as well. In the first quarter of 2001, only \$6.6 billion in deals were completed compared with a quarterly average of \$60 billion over the past three years. However, in the final quarter of 2001, the telecom sector accounted for the highest M&A volume, at \$519 million, according to the National Venture Capital Association. Nevertheless, the difficulties of communications exits are not to be underestimated.

Finally, valuations of selected communications companies with fundamentally sound assets and cash flows, have fallen to such levels as to be much more attractive to investors, positioning themselves to capture significant upside potential as the economy revives. However, it may take years to clear the backlog of overcapacity, especially in long-haul fiber networks and telecom equipment, thus delaying exits.

### **Risks and Other Factors for Consideration**

**Huge losses and decrease in market valuations.** In 2001, equipment giants Cisco Systems, Lucent Technologies, and Nortel Networks, among many others, announced huge losses (e.g., Nortel's \$19.4 billion, JDS Uniphase's \$50.6 billion), write-downs, profit warnings, revenue shortfalls, and major layoffs (over 100,000 for the industry in the last two years) as a result of poor sales to carriers and major



corporations. Numerous CLECs suffered a similar fate, due to overbuilding and erosion of prices, with plummeting share prices, credit ratings, falling revenues, and mountains of debt forcing many into bankruptcy.

**Regulatory environment.** Due to the elimination of major regulatory restrictions by the U.S. Telecommunications Reform Act of 1996, the telecom services industry has become much more competitive, with the emergence of over 2,700 CLECs, 7,000 Internet Service Providers, and hundreds of carriers; however many of these companies have or are expected to declare bankruptcy, be acquired, or consolidate with other players. Similarly, in Europe and to a lesser extent, Asia and South America, telecom deregulation has been opening up new markets for competitors, especially in wireless and long distance, which has also led to mergers and consolidation. However, as in the United States, the local exchange markets are still dominated by incumbents.

**Government.** Global governments including the U.S. will increasingly need to address issues of telecom (especially Internet) privacy and security, antitrust policies, taxation of e-commerce, legality of digital signatures, and validating and upholding online contracts. Changes in these policies could undermine the viability of some business models.

**Industry consolidation.** In the face of increasing competition, slowing revenues, and margin erosion, many investors expect industry consolidation and crushing restructuring among equipment providers in the short term. Compressed cash flows and reduced capital spending render suppliers less attractive to investors. An increasing number of CLEC bankruptcies may fuel industry consolidation among service providers, as winners will acquire capital-starved competitors and/or buy assets out of liquidation.

**Building ahead of demand.** Over the last five years, carriers have spent billions of dollars building networks that are in only partial use because they were built to satisfy a future explosion in demand for broadband services. Despite evidence of a telecom sector slowdown and signs of a fiber-optic glut, some carriers have continued with their plans to complete or even expand their networks, in anticipation of the eventual return of robust demand. The risk is that user demand will not catch up for years to come.

**Infrastructure.** While the backbones of telecom networking have largely been installed, many new entrants to the competitive local exchange market do not have the money to complete "the last mile," that is, the infrastructure upgrades at the endpoints, connecting directly to customers' premises. Incumbent telecom operators still dominate this market, and likely will for years to come. Companies are hesitant to build this infrastructure without certainty of achieving profitability, especially if they are dependent on leasing facilities from the incumbents—over whom they have no price control.

**Still waiting for "killer" applications.** There have not been enough bandwidth-intensive applications to consume the great amount of capacity created by the network buildup. Video-on-demand has not met expectations; virtual private networks are languishing; and Voice over Internet Protocol is still in its formative years.

**Wholesale versus retail business model.** Those companies that only provide wholesale network capacity, as a carriers' carrier, face a number of challenges in a market where bandwidth has been largely commoditized and prices driven down close to zero. They have limited, if any, price control over end-user services and no ability to sell additional services to end users. Furthermore, if they lease capacity from incumbents, they have no cost control either. Retail business models, on the other hand, allow for much greater ability to differentiate services and prices to end users, and if they also own some of their networks, to control costs as well.

**Future Technology Standards.** Demand for data services is expected to exceed that for voice in the next few years, which could have a profound effect on the future architecture of the network, evolving from a circuit-switched to a packet-switched based network architecture, potentially rendering lots of installed capacity obsolete and jeopardizing the business of companies that pursue non-industry standards. In addition, there are technical risks of transitioning to a future packet-switched network, without certainty about which standards and platforms will ultimately be adopted and there are economic risks without certainty about how much the new systems will cost. Finally, optical networking technology is still largely in the research and development stage, with uncertainty about the technical feasibility, as well as commercial profitability of different components and systems.

### **VC/PE Fund and Portfolio Company Returns**

In Exhibits 2 and 3, we illustrate the performance results of VC and PE telecom-focused funds, respectively, compared to diversified funds for the same vintage years, for both the mean and median benchmarks, as calculated by Cambridge Associates Non-Marketable Manager Database as of September 30, 2001. Using a very narrow definition of telecom-focused funds, namely only those that invest exclusively in the communications sector, means that unfortunately there are too few funds to calculate statistically significant results. For example, in PE there are fewer than ten funds per year, and in the early 1990s, fewer than three per year. In VC, there were fewer than ten funds per year until 1997, then the count jumped above 40 per year in 1999 and 2000. Furthermore, most of the funds raised since 1997 are too young to have produced meaningful results. Nevertheless, the data indicate that all the PE telecom-focused funds (albeit a small number) have outperformed the PE vintage-year mean and median benchmarks through 1997. However, the VC telecom-focused funds only outperformed about half the time through 1999. Further research is required to understand whether these differences are significant from a strategic point of view, even if not from a statistical perspective.

## Managers

In Exhibit 4 we highlight some telecom-focused VC and PE fund managers tracked by Cambridge Associates. These managers differ in diversification across telecom sectors and investment stages. Some funds invest broadly across all three subsectors of telecom (i.e., Providence IV, Blackstone Communications Partners I, Cresendo V, Blueprint II), while others choose to focus on one or two subsectors (i.e., ComVentures V, Telecoms Partners II, THCP, Centennial VII). Furthermore, some funds invest across the broad range of stages, from early- to late-stage, to buyouts, especially at the megafund level (i.e., Providence IV, Blackstone Communications Partners I). Generally, however, there are a greater number of telecom funds pursuing either venture or buyouts, not both. In addition, more funds of less than \$1 billion primarily focus on seed to early-stage investments.

There are also many managers who include telecom as only one of several sectors in a diversified fund portfolio (e.g., Warburg Pincus, JPMorgan Chase, Madison Dearborn, Welsh, Carson, Anderson and Stowe). For member institutions, we generally do not advocate investing in technology-focused venture or non-venture PE funds unless they are part of a large diversified non-marketable alternative program. High-quality funds that focus on four to five economic sectors including telecom have tended to have the right balance of diversification of strategies and depth of knowledge of the telecom business.

## Portfolio Company Returns

Using the Cambridge Associates proprietary database to investigate trends, we calculated and compared the returns from 1990 to first quarter of 2001 according to the three subsectors identified above, namely networks, products, and services. We compared the number of VC companies receiving initial financing in each vintage year, the returns for these companies and the NAV for three subsectors, as of September 30, 2001. The companies were categorized according to manager documentation and therefore, there may be some overlap among subsectors (e.g. service companies that are also network providers). Results are summarized in Exhibit 5.

Recognizing that investments after 1997 are too young to be significant, nevertheless, we believe some relative observations are worth exploring as a tool to understand what drives the overall sector returns. Network companies achieved the highest subsector peak returns in 1998 (309%), experiencing the sharpest ascent from 1996 to 1998 and the sharpest decline, from 1999 to 2001. Product subsector companies did not achieve the same peak return (290%), but matched returns on the way down and plunged almost as fast. Service subsector companies had similar returns to product subsector companies up until 1996, when they diverged and never achieved the same high peaks as product or network subsector companies (peaked at 153% in 1997) and have plunged to negative returns in 2001. The results tend to

reinforce the thesis stated previously, that increases in end-user demand (services subsector) can lead to exuberant over-investment in networks and products, which will eventually drive returns down. To the extent that fund managers are able to time the market, acquiring network and product companies at the beginning of the cycle when end-user demand is growing (e.g., in 1996-97) and exiting at the peak (2000) when expectations have driven values to unrealistically high levels, they may well outperform service subsector companies. In general, one would expect the service subsector to be less volatile, and the network subsector the most volatile, as Exhibit 5 illustrates. However, further analysis is required to understand the drivers of value within and among the subsectors, and further disaggregation is required to understand key segments within each subsector (e.g., residential broadband, wireless).

## **Conclusion**

Is this the right time to withdraw from existing telecom investments? Probably not—because there are few willing buyers and the administrative costs and penalties of selling could significantly accentuate the losses.

Is this the right time to re-up or invest in new telecom funds? Possibly—if the fund managers are well positioned to exploit the following potentially favorable conditions:

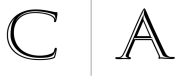
- Long-term fundamentals remain strong, especially for broadband communications services;
- Valuations have decreased significantly (albeit from an elevated peak in 2000);
- Terms and conditions for limited partnerships may be improving due to increased negotiating power; and
- Tighter capital markets have forced out weaker competitors, leaving stronger survivors with more credible business models and clearer paths to profitability.

The characteristics of VC and PE managers potentially most capable of exploiting these conditions include those with:

- Deep technical understanding of telecom technologies and how the future network might evolve;
- Comprehensive knowledge of industry dynamics and how the key players might consolidate in the future;
- Operational experience, particularly in the competitive telecom services industry;
- Disciplined focus on the high-growth sectors and ability to select companies with sound business models and high probability of achieving profitability; and

- Limited legacy portfolio from the 1999 and 2000 vintage years, when valuations were inflated and many business plans were unsound.

For those investors who believe that demand for communications services will continue to grow, now may be an opportune time to invest in attractively priced communications companies in key, fast growing segments and subsectors.

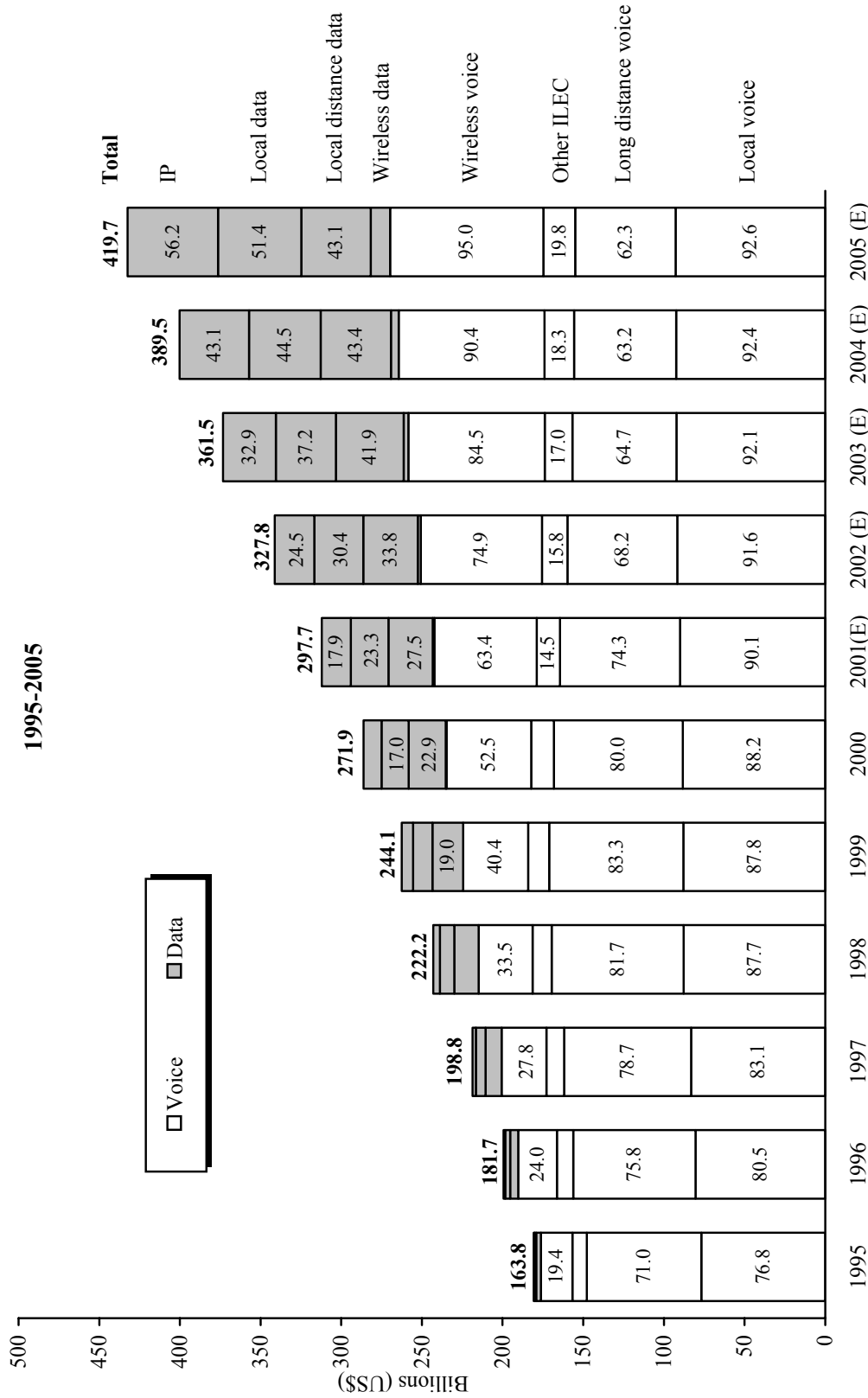


CAMBRIDGE ASSOCIATES LLC

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**EXHIBITS**

**Exhibit 1**  
**U.S. TELECOM SERVICES REVENUE FORECAST**  
**1995-2005**

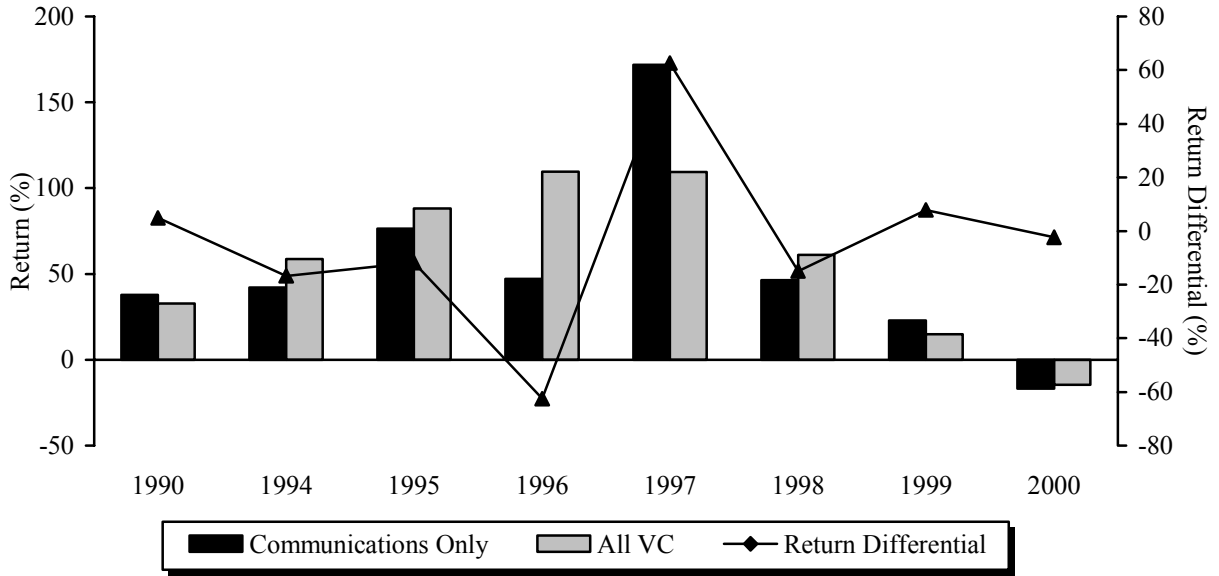


Source: J.P. Morgan Securities Equity Research.  
Note: Columns do not add to totals; total figure reflects actual numbers and therefore excludes the double counting associated with inter-segment eliminations.

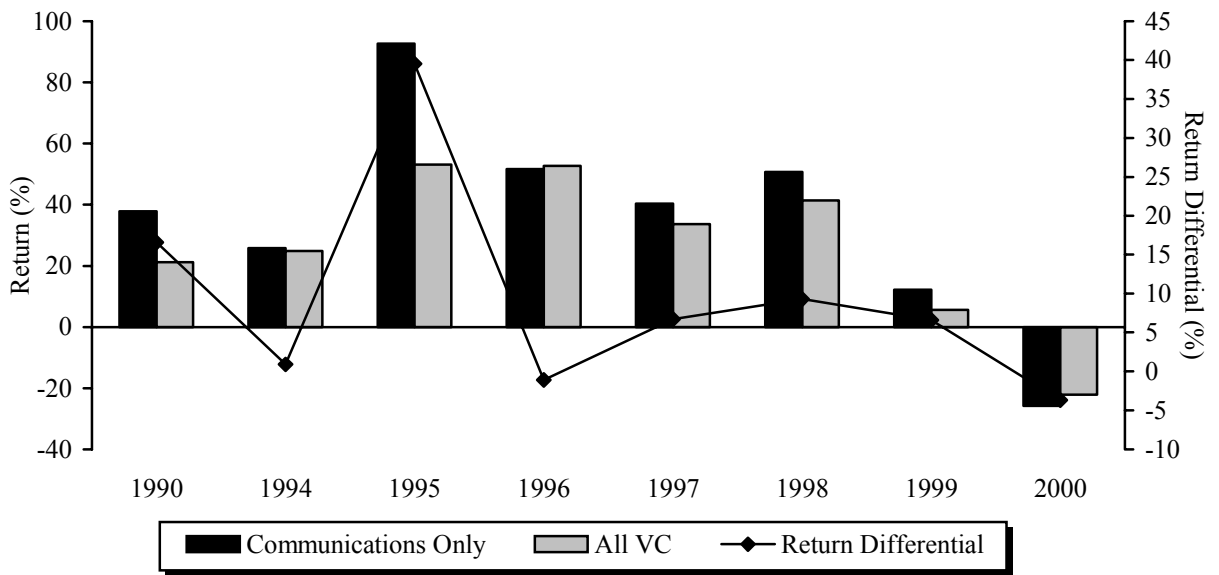
**Exhibit 2**

**TELECOM FUND RETURNS VERSUS ALL U.S. VENTURE FUND RETURNS**

**Mean Telecom Fund Returns Versus All U.S. Venture Fund Returns**



**Median Telecom Fund Returns Versus All U.S. Venture Fund Returns**



Source: Cambridge Associates LLC Non-Marketable Alternative Assets Database.

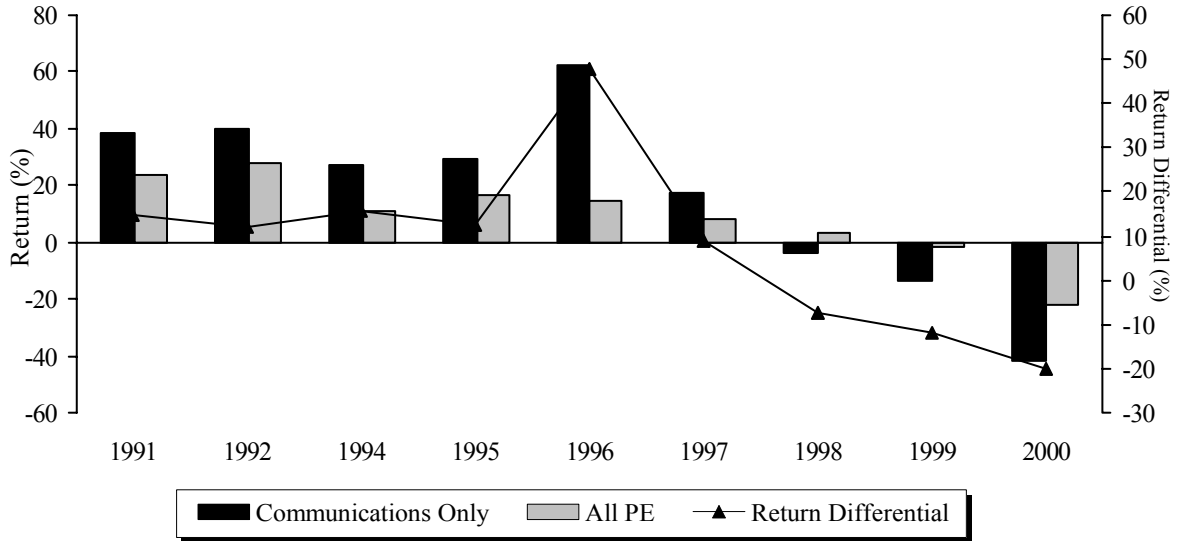
Note: Data as of September 30, 2001.



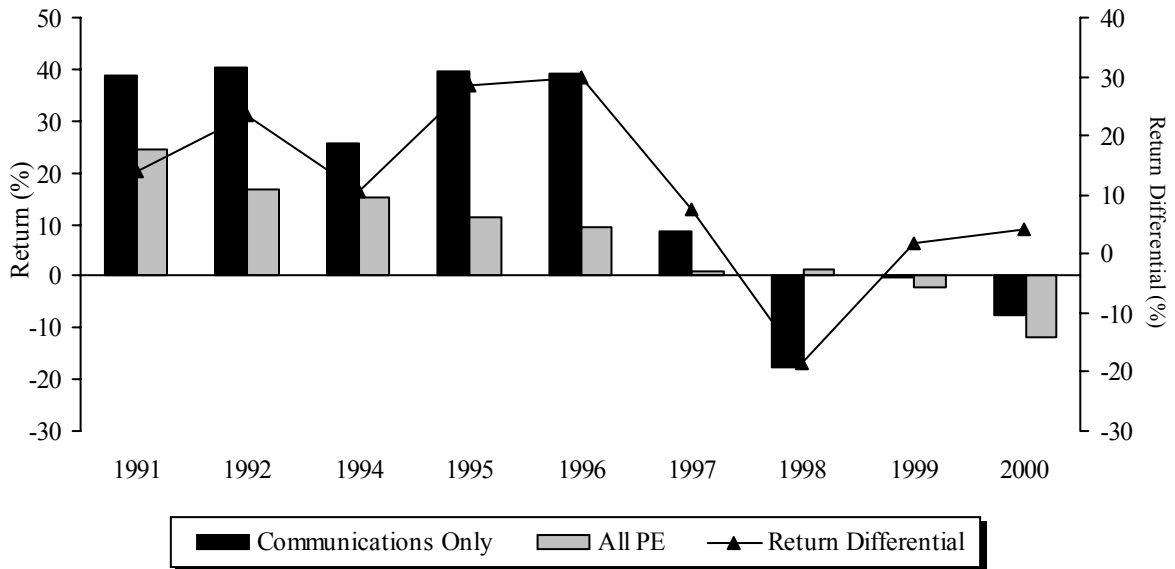
**Exhibit 3**

**TELECOM FUND RETURNS VERSUS ALL U.S. PRIVATE EQUITY FUND RETURNS**

**Mean Telecom Fund Returns Versus All U.S. Private Equity Fund Returns**



**Median Telecom Fund Returns Versus All U.S. Private Equity Fund Returns**

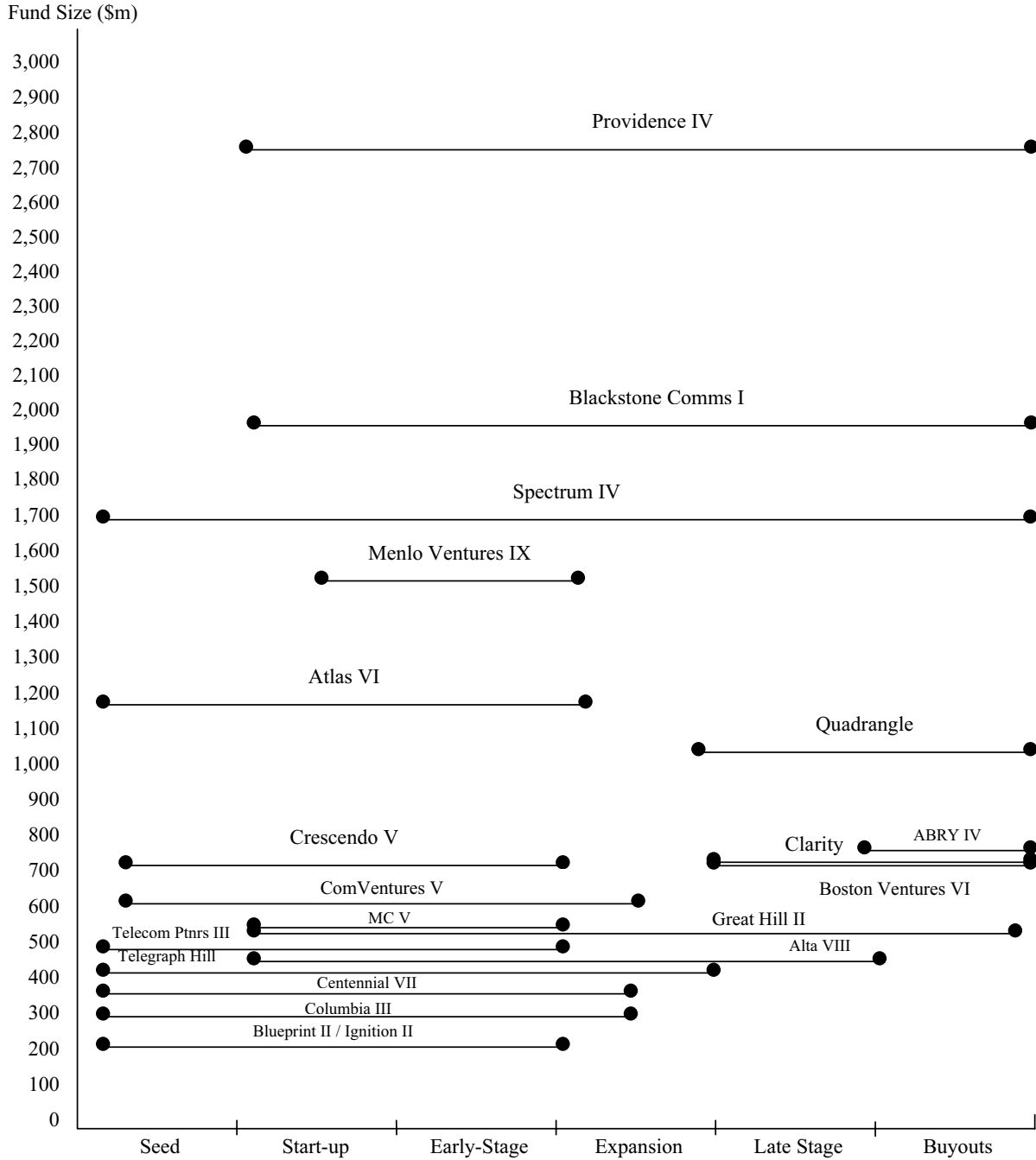


Source: Cambridge Associates LLC Non-Marketable Alternative Assets Database.

Note: Data as of September 30, 2001

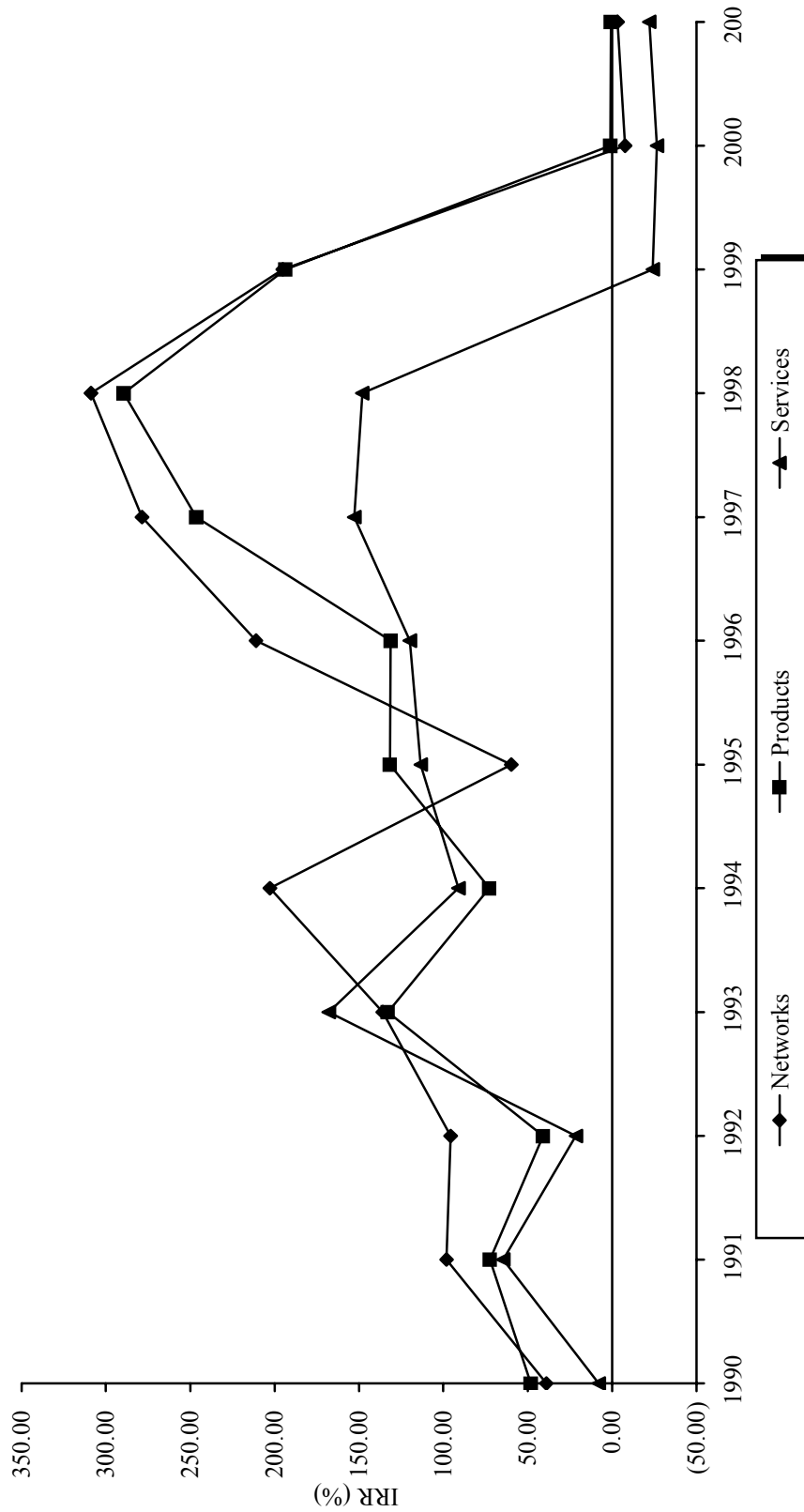
Exhibit 4

COMPARATIVE TELECOM FUND MANAGERS  
BY STAGE AND FUND SIZE



Source: Compiled by Cambridge Associates LLC based on information obtained from fund managers, October 2001.  
 Note: The chart indicates primary focus for initial investments, recognizing that many managers will invest in subsequent financing rounds and may invest opportunistically in other stages.

**Exhibit 5**  
**COMPANY RETURNS BY SUBSECTOR**



Source: Cambridge Associates LLC Non-Marketable Alternative Assets Database.

Note: Data as of September 30, 2001.