

# Pricing an Emerging Industry: Evidence from Internet Subsidiary Carve-outs

Michael J. Schill and Chunsheng Zhou\*

*We examine price behavior in the emerging Internet industry by comparing investor valuation of Internet subsidiary carve-outs with that of the parent. We provide examples of parent firms whose Internet carve-out holdings exceed the market value of the entire parent by a large amount and over an extended period of time. The results suggest that an important clientele of investors place greater value on direct Internet asset holdings than indirect holdings via the parent, and that arbitrage costs accommodate prolonged mispricing. We find that such price behavior is not exclusively an Internet sector result, but occurs in other emerging industries.*

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In the late 1990s, popular opinion held that equity in the emerging Internet industry was richly priced. Economists face some difficulty testing such an assertion using the standard “no-arbitrage principle” because of the difficulty in obtaining well-priced asset comparables. In our paper, we use the development of the Internet equity carve-out transaction to provide the dual-asset features required for testing the pricing characteristics of Internet equity.

In an equity carve-out, a parent company raises money by selling stock in a fraction of a previously wholly owned subsidiary. The attractive feature of the carve-out is that we can use it to compare how investors value two parallel assets, the value of the subsidiary directly traded in the market, and the value of the subsidiary embedded in the consolidated firm. By the law of one price, assets with identical payouts maintain identical prices, and assets with inferior payouts maintain inferior prices. Notwithstanding the various value gains or losses created by such structural ownership changes, the law of one price prescribes a particular pricing relation for equity carve-outs. That is, in a world without market frictions and agency costs, the market value of a parent’s stake in a carve-out must not exceed the total market value of the parent.

The universe of Internet-related carve-outs in the United States is examined through June 2000. A parent company’s Internet subsidiary generally contributes a disproportionate amount of wealth to the parent. An example is provided in which the implied value of the parent’s holdings in the Internet subsidiary is twice the total market capitalization of the parent. In fact, for four of the 12 Internet subsidiary carve-outs in our study, the value of the parent’s holdings exceeds the total value of the parent company. We find that these striking valuation relations hold over extended periods of time (i.e., several months).

The parent-to-subsubsidiary value relation in Internet carve-outs is similar to the fund-to-net-

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*\*Michael J. Schill is an Assistant Professor at the University of Virginia. Chunsheng Zhou is a Professor at Peking University. This research was conducted while both authors were at the University of California at Riverside.*

asset-value relation characteristic of closed-end funds. In both cases, the indirect holdings of the traded assets sell at a discount to the direct holdings. The application of traditional closed-end-fund discount explanations to the Internet carve-out pricing phenomenon is evaluated. Taxes, dilution, illiquidity discounts, and agency costs do not fully explain the magnitude and time-series characteristics of the pricing relation. Internet carve-outs tend to be held by individual investors with aggressive trading behavior and arbitrage in these shares is constrained. We conclude that an important clientele of investors places a greater value on direct asset holdings of emerging industries, such as the Internet industry, than it does on indirect holdings via the parent. Similar price behavior among non-Internet carve-outs from other emerging industries is also observed. Such findings corroborate those of Lee, Shleifer, and Thaler (1991) for closed-end funds: bullishly biased investor clientele and sufficiently large arbitrage constraints allow indirect holdings to trade at substantial discounts to direct holdings.

Our findings also have strong managerial implications. The evidence supports Nanda's (1991) hypothesis of opportunistic carve-out behavior, in which parent companies choose carve-out transactions when the subsidiary is priced richly relative to the parent. In an asymmetric information setting, Nanda's firms prefer carve-outs when the subsidiary is overvalued and the parent is undervalued, and vice-versa for parent equity. Miller (1977, 1995) emphasizes that arbitrage constraints allow such opportunistic financing behavior to persist in equilibrium. Evidence by Slovin, Sushka, and Ferraro (1995) also supports findings that firms conduct carve-outs when outside investors attach higher values to the subsidiary than do managers.

This paper illustrates the potential magnitude of valuation discrepancies available to managers in Nanda's setting. The evidence from our small sample does not support the much broader generalization of Vijh (1999), who uses long-run performance to argue that carve-outs are fairly priced. Vijh suggests that reputational effects may discourage parents from selling overpriced subsidiary equity, since carve-outs generally represent a small fraction of parent market value. Perhaps for emerging industries in which the potential mispricing is particularly large, the reputational effects are dominated by the immediate wealth gains to parents.

The paper proceeds as follows. Section I provides an overview of Internet subsidiary carve-outs in the 1990s. In Section II, empirical tests of various traditional explanations for carve-out pricing behavior are examined. Section III examines in detail opportunistic timing as an explanation for the observed pricing. In Section IV, we compare the Internet industry evidence to that of other industries. Section V summarizes and concludes.

## **I. Internet Subsidiary Carve-outs**

An equity carve-out is defined as an event in which the parent sells equity claims in a subsidiary through a public cash offering, but retains a majority holding in the carved out subsidiary for financial reporting, tax, or control considerations. The transaction enables the parent to raise new capital for both itself and its subsidiary by selling primary shares in the subsidiary. This process mirrors the initial public offering process of an independent company. Following the transaction, the new publicly traded subsidiary becomes a separate entity with distinct equity share certificates. Following the carve-out, investors may purchase claims on the subsidiary in two ways: directly through subsidiary shares or indirectly through the parent shares. This approach lets us test the relative pricing relation of traditional tests of "no arbitrage" pricing efficiency by comparing investor valuations of the parallel asset prices.

The primary source for our sample is the SDC Global Corporate Financings database of Thomson Financial Securities Data, which we modify slightly for a few event omissions. For our sample, a carve-out is defined as a public sale of less than a 50% stake in what had been a wholly owned subsidiary by one parent company. For our sample, both the parent and the subsidiary must be US firms. In practice, the definition of a carve-out can be much broader. Parent companies can use a number of alternative subsidiary restructuring mechanisms, such as spin-offs, private sales, joint-venture carve-outs, tracking-stock carve-outs, and divestiture offerings.<sup>1</sup>

Table I presents summary data for the Internet carve-out sample. The sample of 12 observations is small, but nevertheless large enough to capture the entire universe of US Internet-related carve-outs through June 2000.<sup>2</sup> The 12 subsidiaries provide retail Internet service (CompuServe), maintain on-line retail operations [Expedia (travel), iTurf (apparel), Hotel Reservations Network (accommodations), McAfee.com (computer support), Ticketmaster Online-City Search (entertainment), and uBid (computer hardware and software)], or provide commercial Internet products or consulting services (Digex, eFunds, PFSWeb, Retek, and Xpedior). The carve-outs' respective parent companies operate to varying degrees non-on-line operations in the same industries as their Internet subsidiaries.

The filing date (the date of the original S-1 filing with the SEC, which generally corresponds to the announcement date), the offer date (the first day of public trading), and the fraction of stock ownership retained by the parent is listed. The fraction retained varies from USA Networks' (USAI) 61% ownership of Ticketmaster Online-City Search to the 88% retention of eFunds by Deluxe Corp.

To compare the size of the carve-out relative to its parent, we compute the fraction of total parent value comprised of by the parent's holdings in the subsidiary. The first measure is based on book values. We divide the subsidiary's book equity and debt held by the parent for the earliest date following the offering by the total consolidated book value of the parent as follows:

$$\text{Book Value Ratio} = \frac{B_s S_{s|p} + D_{s|p}}{B_p S_p + D_p} \quad (1)$$

where  $B_s$  and  $B_p$  are the respective per share values of book equity for the subsidiary and parent.  $S_{s|p}$  is the number of subsidiary equity shares held by the parent,  $S_p$  is the number of parent shares.  $D_{s|p}$  is the book value of subsidiary liabilities owed to the parent,  $D_p$  is the book value of total parent liabilities. Although  $B_p S_p + D_p$  is equal to the total assets of the parent,  $B_s S_{s|p} + D_{s|p}$  is only equal to the total subsidiary claims to the parent.

Book value ratios vary between 0.001 for Expedia to more than 0.414 for iTurf (TURF). For most of the carve-outs, the holdings of the subsidiary are modest relative to the parent

<sup>1</sup>For a discussion of the institutional features of these other restructuring transactions, see Slovin, Sushka, and Ferraro (1995), Michaely and Shaw (1995), and Logue, Seward, and Walsh (1996).

<sup>2</sup>We use the industry classifications of IPO Data Systems to construct our Internet carve-out sample. All carve-outs belonging to the "Internet" industry are included in our sample. IPO Data Systems classification with SEC filing and company web site descriptions are verified. Our review resulted in the reclassification of two carve-outs: uBid, classified by IPO Data Systems as a retailer, derives all of its revenue from its on-line auction business and Retek, classified by IPO Data Systems as high-tech, which provides software for Internet retailing. Over this period, there are also several Internet joint-venture carve-outs (Marketwatch.com, barnesandnoble.com, and Net2Phone) and Internet tracking stock offerings (DLJdirect and ZDNet) which are excluded due to the material differences of ownership and risk from the standard carve-out.

Table 1. Equity Carve-out Sample Summary

The sample comprises all standard US Internet carveouts through June 2000. The filing date is the date when the company makes the original S-1 filing with the SEC. The offer date is the first-day of trading, which in all cases is the day following the pricing date. The fraction retained is the percentage of common shares outstanding of the subsidiary held by the parent after the offering. The book value ratio is total subsidiary book equity and debt held by the parent for the earliest reporting date following the offering, divided by the total consolidated assets of the parent. The market value ratio is the total capitalization, which includes both book value of all liabilities and the market value of equity, of the parent's holdings in the subsidiary, divided by the total capitalization of the parent. The market value ratio for the offer date uses the closing prices on the offer date. The month 1 mean market value ratio is the mean market value ratio over the first month after the carve-out.

Subsidiary	Parent	Filing Date	Offer Date	Fraction Retained	Book Value Ratio	Offer Date	Market Value Ratio	
							Month 1 (Mean)	
CompuServe (CSRV)	H&R Block (HRB)	2/20/96	4/18/96	0.801	0.352	0.616	0.551	
Digex (DIGX)	Intermedia Comm (ICIX)	4/27/99	7/29/99	0.813	0.078	0.223	0.254	
eFunds (EFDS)	Deluxe (DLX)	4/4/00	6/26/00	0.879	0.236	0.228	0.201	
Expedia (EXPE)	Microsoft (MSFT)	9/23/99	11/9/99	0.847	0.014	0.003	0.003	
iTurf (TURF)	dELIA*s (DLIA)	1/25/99	4/9/99	0.748	0.414	1.450	1.364	
Hotel Res Net (ROOM)	USA Networks (USAI)	11/9/99	2/24/00	0.706	0.032	0.111	0.089	
McAfee.com (MCAF)	Network Ass. (NETA)	9/23/99	12/1/99	0.833	0.037	0.359	0.385	
PFSWeb (PFSW)	Daisytek (DZTK)	9/23/99	12/1/99	0.801	0.118	1.155	1.017	
Retek (RETK)	HNC Software (HNCS)	9/10/99	11/17/99	0.860	0.293	0.788	1.187	
Ticketmaster Online-CS (TMCS)	USA Networks (USAI)	9/30/98	12/3/98	0.611	0.030	0.273	0.337	
uBid (UBID)	Creative Cmptns (MALL)	7/2/98	12/4/98	0.801	0.123	0.989	1.299	
Xpedior (XPDR)	Metamor Worldwide (MMWW)	10/18/99	12/15/99	0.800	0.182	0.680	0.858	

assets (book value ratios are below 0.20 for eight of the 12 carve-outs).

The total market value of the parent's remaining holdings in the carve-out subsidiary relative to the parent's total market value is also compared. We compute the value of the subsidiary holdings as the product of the closing price of subsidiary shares and the number of shares held by the parent plus the debt owned the parent. Using prices at the close of the first trading day, the value of the holdings is divided by the total capitalization of the parent (including book value of liabilities). The market value ratio is computed as:

$$\text{Market Value Ratio} = \frac{P_s S_{s|p} + D_{s|p}}{P_p S_p + D_p} \quad (2)$$

where  $P_s$  and  $P_p$  are the respective per share market prices for equity for the carve-out subsidiary and the parent.

Financial statement items for days that do not correspond to a reporting date are estimated by straight-line interpolation. Since this ratio represents the fraction of a parent's value of which the carve-out subsidiary holdings is comprised, we generally expect this ratio to be well below one. Even when we assign the residual part of the business a zero value (despite the fact that in all cases it represents the majority of the parent's assets), the value of the parent firm's holdings in the subsidiary should not exceed one. This is not the case.

In Table I, we see that on the close of the first day of trading, the market value ratio for both TURF and PFSWeb (PFSW) are 1.45 and 1.16, respectively. Because such a result may be unique to the price discovery difficulties of the subsidiary's first trading day, we calculate the mean value ratio by using the closing prices during the first month of trading. Mean value ratios over the first month of trading are 1.36 for TURF, 1.02 for PFSW, 1.19 for Retek (RETK), and 1.30 for uBid (UBID).

The relative value relation appears to persist over the first month of trading. Although, the identification of cases where the market value of a parent's holdings in a subsidiary exceeds the entire market value of the consolidated parent firm is notable; even some of the market value ratios below one are impressive, given the relative proportion of assets. Over the first month, the market value ratio of Ticketmaster Online-City Search is ten times its book value ratio; the value ratio of Xpedior is 0.86, but its book value ratio is just 0.18. Understanding the source of such unusual relative valuation provides the focus of this paper.

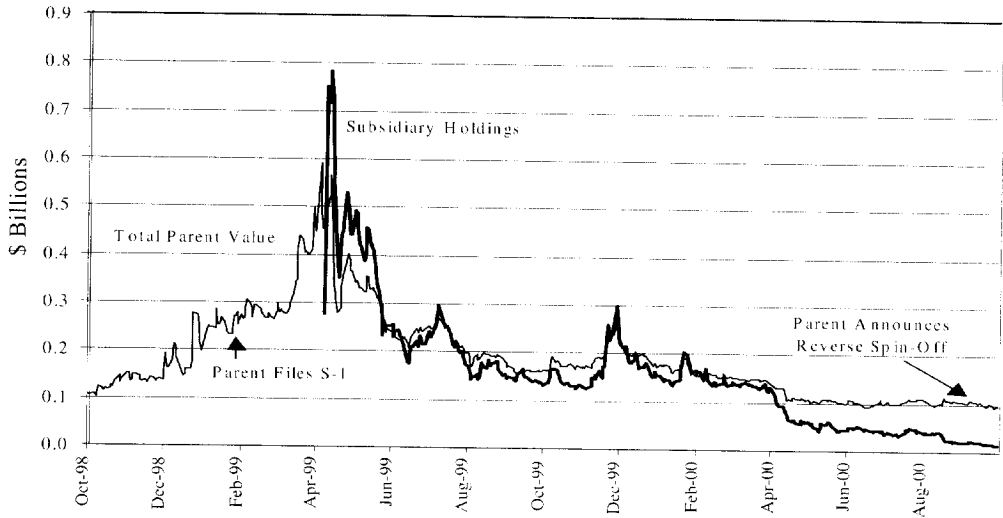
We are not the first to observe examples of subsidiaries whose parent holdings exceed the total equity value of the parent. Laderman (1992), Holderness and Sheehan (1998), Brealey and Myers (1999), McGough (1999), and Partnoy (2000) discuss examples in which the value of a single or collection of subsidiaries exceeds the total value of the parent firm. Cornell and Liu (2000) and Lamont and Thaler (2000) provide detailed discussions of examples of subsidiary holdings in the more general technology sector that trade for more than their respective parent's value.

Figure I shows the movements of the subsidiary holdings to total parent value over time for the four carve-outs whose value ratio exceeds one on the first day, or over the first month of trading. The four carve-outs are TURF, PFSW, RETK, and UBID. Each example shows immediate appreciation in the parents' holdings in the offering during the first day of trading and then continuing for extended periods of time. Nearly three weeks after UBID's carve-out, the value of the parent holdings in UBID exceeded the total value of the parent by 100%. The residual assets of Creative Computer (MALL), which comprised over 80% of the parent's

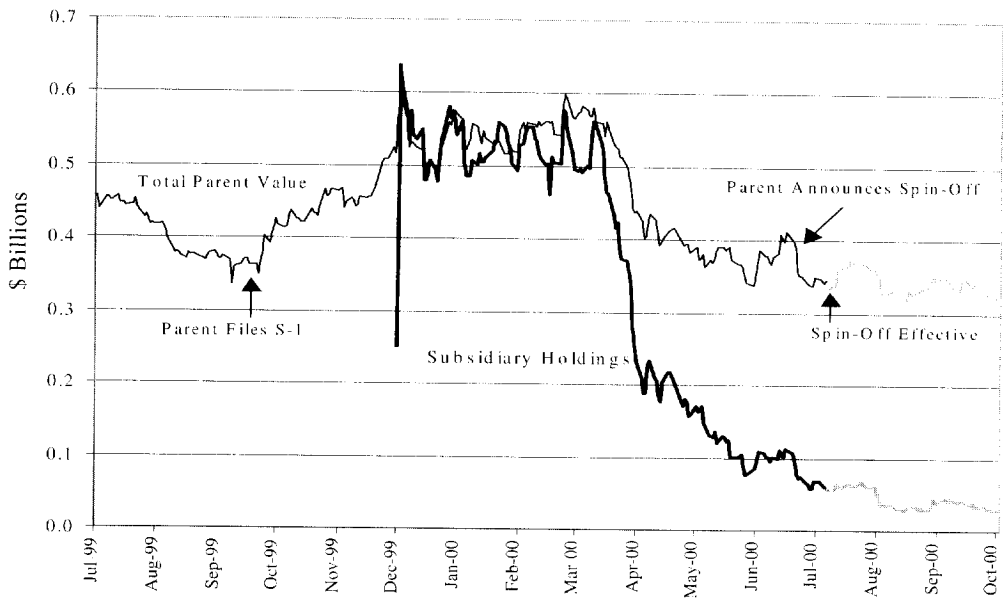
### Figure I. Total Market Value of Parent Relative to Parent's Holdings in Internet Subsidiary

This figure shows the total value of the parent (total liabilities plus market value of equity) relative to the total value of the parent's holdings in the subsidiary (debt owed the parent plus the market value of the shares retained by the parent). After the spin-off effective date, the subsidiary holdings value is calculated as if the parent maintained the pre-spin-off shares. For the total parent value, the value after the spin-off effective date sums both the total value of the parent and the value of the distributed shares.

Panel A. dELIA\*s and its holdings in iTurf

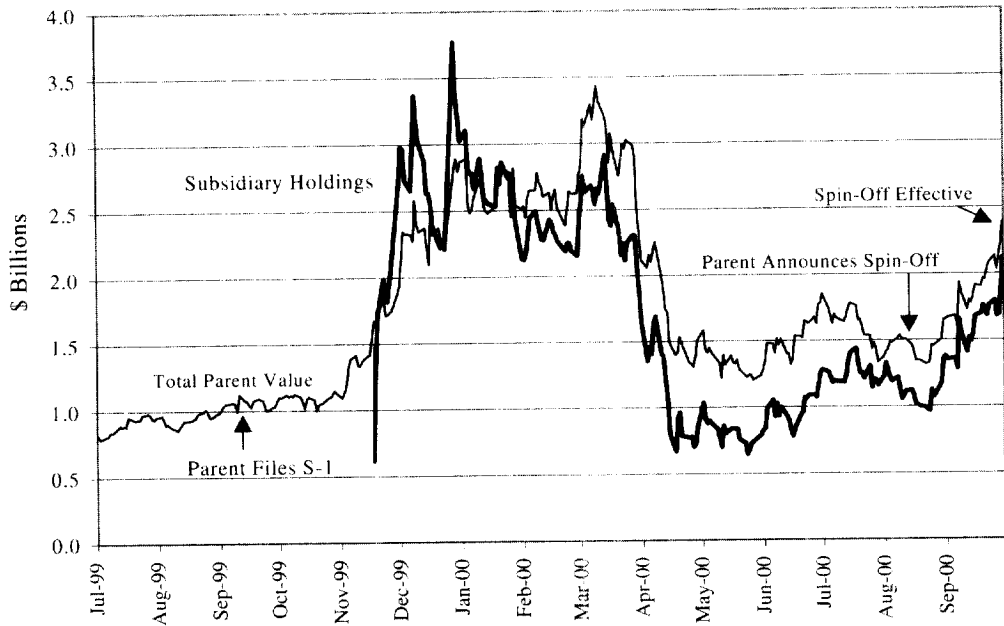


Panel B. Daisytek and its holdings in PFSWeb

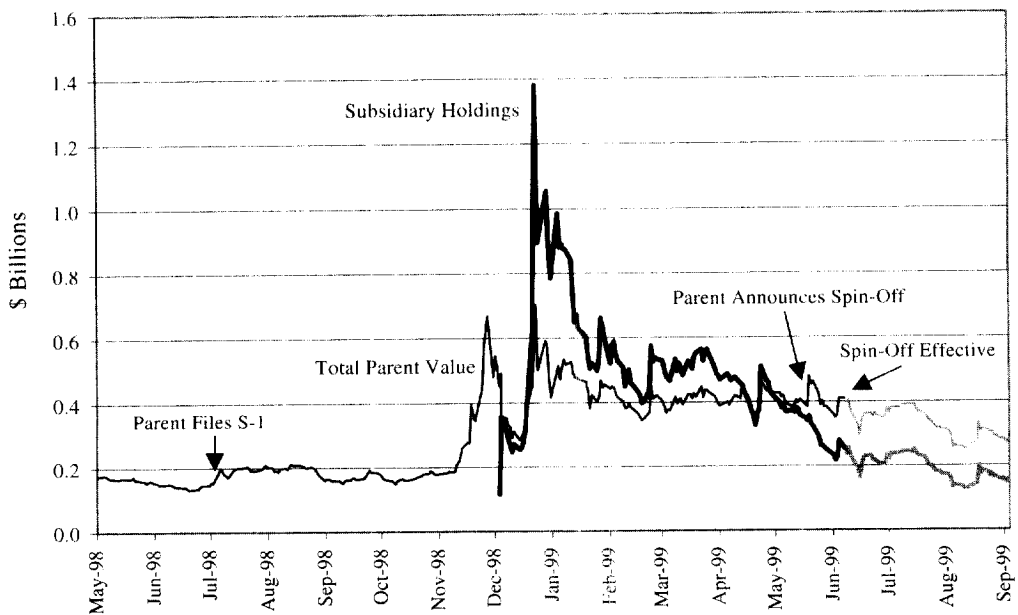


**Figure I. Total Market Value of Parent Relative to Parent's Holdings in Internet Subsidiary (Continued)**

*Panel C. HNC Software and its holdings in Retek*



*Panel D. Creative Computers and its holdings in uBid*



total assets, appear to have traded at an implied value of less than -\$750 million relative to the value for the consolidated parent company of only \$600 million. The pricing patterns emphasize that the subsidiary premium is not a short-run, transitional phenomenon, but one which can and does persist for months following the offering.

Coincidental with the severe drop of Internet stocks in April 2000, the three subsidiaries still trading through April 2000 (UBID was subsequently acquired by CMGI) show a substantial reduction in the value of the subsidiary holdings. The April 2000 value decline is unique to the subsidiary holdings. The consolidated parent values show much less (if any) decrease in value over the April 2000 period. This pattern appears to ignore the substantial drop in value of the parent's most valuable portfolio holding.

## II. Internet Carve-outs and Traditional Explanations

The parent-holding-value-to-total-parent-value relations of Internet carve-outs is similar to the net-asset-value-to-fund-value relations of closed-end mutual funds. In both cases, the indirect holdings of the traded assets sell at a sizeable discount in the market. Because the closed-end fund puzzle has been extensively studied, a review of the closed-fund puzzle literature can shed some light on the puzzle of Internet carve-out pricing. The related nature of Internet carve-out pricing and the closed-end fund discount provides a forum to better understand both phenomena.

### A. Taxes

Subsidiary holding values could be greater than parent values due to tax treatment. For closed-end funds, fund prices might trade at a discount to net asset value because capital gains tax must be paid by the fund if positions within the fund are unwound (Pratt, 1966). The tax liability for assets that have appreciated in value reduces the liquidation value of the funds' assets.

The parent of a carve-out subsidiary might also trade at a substantial discount to the subsidiary if investors anticipate a large tax liability against the parent upon the sale or distribution of the subsidiary holdings. Since the market value of the subsidiary relative to its tax basis can be large, possible recognition of the capital gain exposes the parent shareholders to a large tax liability.

However, the US tax code allows subsidiaries to be spun off to shareholders without capital gain recognition. To avoid capital gain recognition, Section 355 of the US Internal Revenue Code of 1986 requires that the transaction have a valid business purpose rather than merely a tax avoidance motivation, that the parent and subsidiary continue in their respective business operations, that the distribution be sufficiently great so that the parent no longer retains control of the subsidiary, and that the majority of the voting or ownership rights of the parent or subsidiary not be later acquired by a single entity. These qualifications do not appear to be binding for our sample subsidiaries. Parent companies that anticipate a future sale and are exposed to such tax liability are generally careful to follow the tax code provisions.

The UBID carve-out is a case in point. UBID's prospectus fully reveals the parent's

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<sup>3</sup>"The Parent has announced that, subject to certain conditions, the Parent intends to consummate the Offering, to separate the Company, which owns and operates the Parent's online auction business, from the Parent's other operations and businesses and to distribute to its shareholders all of the Common Stock owned by the Parent in no-event prior to 180 days after consummation of the Offering." uBid Prospectus, 1998, page 23.



intention to completely divest of the subsidiary.<sup>3</sup> The upper bound tax liability to MALL shareholders of a UBID distribution is the value of UBID shares times the shareholders' marginal tax rate. The prospectus gives complete details on MALL's compliance with the tax code's requirements for a tax-free spin off, and quotes the positive assurance of its compliance by its auditors. Moreover, the UBID prospectus stipulates that the intended future spin-off is contingent on the transaction's qualification as a tax-free distribution. In June 1999, six months following the original carve-out, MALL effected the tax-free distribution of its 80% stake in UBID, such that its shareholders were not forced to recognize the capital gain in UBID. Yet, if the qualifications were not met, the parent maintained the right to retain their holdings.

PFSW and RETK also conducted similar tax-free spin-offs of residual holdings. These spin-offs illustrate that through prudent management, shareholders of the parent do not necessarily appear to be highly exposed to untimely capital gains recognition, certainly not to the extent required to justify the resulting market value ratios.

Another noteworthy aspect of the tax treatment of carve-out transactions is that of income consolidation. If the parent maintains over 80% of the ownership and voting power of the subsidiary, the tax code allows the parent to consolidate income for tax reporting purposes. For loss-generating subsidiaries, such as the Internet subsidiaries in our sample, full income consolidation provides a valuable tax shield for the parent. Despite the tax shield generated, prospectus disclosure suggests that the parent taxes subsidiary income as a stand-alone business. Thus, the parent, rather than the subsidiary, benefits from the tax shield. Such a policy implies that investors in the subsidiary can receive less benefit from subsidiary losses than do investors in the parent, an implication that contradicts our market-value ratio findings.

The value of tax-timing options is a third tax-related feature of the parent-subsidiary relationship. The impact of capital gains recognition timing has been studied by Constantinides (1983), Bossaerts and Dammon (1994), and Dammon and Spatt (1996). These studies observe that capital gains taxation provides investors with a valuable tax-timing option. Since the US tax code specifies that capital gains and losses are not taxed until the investor sells that asset, investors can time asset sales so as to minimize the present value of net tax payments. The tax-timing option for any security is implicit as investors benefit from the flexibility of recognizing losses and deferring gains.

As with standard options, the tax-timing option of any security increases in value with underlying security volatility. If the stock prices of the Internet subsidiaries maintain greater price volatility than those of the consolidated parents, then because investors are unable to realize the tax-timing feature of the subsidiary, parent holdings could trade at discounts.

To evaluate the merits of tax timing in this context, we follow Bossaerts and Dammon (1994) and assume that all investors are identical and that the same tax rate for capital gains:  $\tau$ . We also assume that all unrealized capital gains and losses remain untaxed, which gives investors the option to time the realization of their capital gains and losses for tax purposes. Throughout the analysis, we ignore the capital loss limit (currently \$3,000 per year) imposed by the actual tax code. Constantinides (1983) shows that under these conditions, the optimal policy is to realize losses immediately and to defer capital gains. The tax-timing option value, ignoring all transaction costs and market imperfections, is:

$$V_{tax} = \tau \cdot \sum_{s=t+1}^{\infty} \frac{1}{1+r_{t,s}} \cdot \max [0, [\min(P_t, P_{t+1}, L, P_{s-1}) - P_t]], \quad (3)$$

where  $P_t$  is the stock price at time  $t$  and  $r_{t,s}$  is the required discount rate from time date  $t$  to date  $s$ .

Under the optimal realization policy, the investor sells and repurchases the asset only when he has a loss. Therefore,

$$\min(P_t, P_{t+1}, L, P_{s-1}) \quad (4)$$

is the investor's tax basis at date  $s$  under the optimal realization policy. Assuming that

$$d \ln(P_t) = \mu \cdot dt + \sigma \cdot dw \quad (5)$$

where  $\mu$  is the drift term of asset price,  $\sigma$  is the volatility, and  $w$  is a standard Wiener process. We can prove:

$$\begin{aligned} V_{tax} &< \tau [P_t - E_t(\min_{s \geq t}[P_s])] \\ &= \tau \left[ P_t - \frac{2\mu}{2\mu + \sigma^2} P_t \right] \\ &= \tau \left[ \frac{\sigma^2}{2\mu + \sigma^2} \right] P_t. \end{aligned} \quad (6)$$

Since the term in brackets cannot exceed one when  $\mu$  is positive, the value of the tax-timing option is at most  $\tau$  percent of the company's market value. Under the current tax code, the capital gains tax rate ranges from 15% to 39.6%. However, because of the capital loss limit (\$3000 annually), the tax-exempt status of some investors, and the wash sale restrictions, the effective tax rate for tax-loss benefit should be much lower. Bossaerts and Dammon (1994) estimate that  $\tau$  is less than 10%.

Moreover, since shareholders maintain a tax-timing option in parent stock, the value discount can only represent the differences in volatility between parents and carve-out subsidiaries. Even if investors in the parent company forfeit all tax-timing benefits, the associated discount is too small to explain the price relation we obtain in Section I. Given these considerations, we attribute only a small fraction of the large market value discount to differential tax liabilities or tax-timing-option effects. The impact of taxable gain liability, tax shields, and tax-timing options appears to be modest and certainly not sufficient to explain the observed value ratios.

## B. Dilution

As with tax treatment issues, off-balance sheet claims not fully recognized in the asset values can bias the value ratios. A high market value ratio is not surprising if the carve-out subsidiary is shielded from a large potential legal liability of the parent. Alternatively, the market value ratio can be upwardly biased if there is a relatively large number of outstanding derivative contracts on the parent equity that were not recognized in the original specification of the value ratio.

One explanation of the value ratios is subsidiary immunity from existing parent litigation liability. If investors anticipate a large legal liability against the parent assets but expect that the carved-out subsidiary is shielded from any such liability, then the parent stock might trade at considerable discounts. To investigate this explanation, we examine the SEC filings for the parent firm following the carve-out. Each parent lists various legal disputes and contingencies. However, none of the pending litigation appears to be economically substantive.

Because of the possibility of dilution effects, the omission of outstanding off-balance-sheet derivative contracts is likely to bias the market value ratio estimates. If the value of outstanding derivative claims on parent assets is large, then the market value ratio will be

upward biased. To investigate the importance of outstanding off-balance-sheet derivative contracts, the market value ratio is recast to consider such claims. The adjusted market value ratio is computed as:

$$\text{Adjusted Market Value Ratio} = \frac{P_S S_{S|P} + D_{S|P} + O_{S|P}}{P_P S_P + D_P + O_P} \quad (7)$$

where  $O_{S|P}$  is the market value of outstanding subsidiary off-balance-sheet derivatives for the carve-out subsidiary held by the parent, and  $O_P$  is the market value of outstanding derivative securities for the parent. Defined properly,  $O_{S|P}$  and  $O_P$  capture all contingent claims including all options, convertible debt, warrants, or other securities that are exchangeable for claims on the parent or carve-out subsidiary assets.

Equation 7 implies that the market value ratio is increasing in subsidiary off-balance-sheet value  $O_{S|P}$ . Since reliable market value estimates of off-balance-sheet contracts are empirically difficult to obtain, to gauge the potential importance of off-balance sheet claims, we estimate lower bounds on the adjusted market-value ratio. The value of all off-balance-sheet contracts on subsidiary assets are set to zero and the value of all off-balance sheet contracts on parent assets to its upper bound, the value of the underlying equity. By setting  $O_{S|P}$  to its lower bound and  $O_P$  to its upper bound, we intentionally further bias the value ratio downward. The true value of  $O_{S|P}$  and  $O_P$  is expected to be substantially different from the respective lower and upper bound values, resulting in a larger market value ratio.

To estimate the adjusted value ratio, we obtain the number of all outstanding derivative securities from the parent's 10-K filing. We use the filing date closest to the carve-out date. The data for Daisytek (DZTK), HNC Software (HNCS), and MALL is reported within six weeks following the carve-out. The data for DLIA is reported within the three months prior to the offering.

We identify all contingent claims that are exercisable, convertible, or exchangeable into parent common equity. Table II provides data on the contingent claims for our sample parent firms. Each of the parent firms maintain a large number of outstanding employee and director stock options granted as part of their incentive programs.

The total number of stock options is three, four, six, and two million, for parent firms DLIA, DZTK, HNCS, and MALL, respectively. Although these options are, on average, highly "in the money" (share price > exercise price), the holders are generally restricted from exercising them. The fraction of exercisable shares to total shares is between 12% and 26%. HNCS also maintains some convertible debt (a \$100,000 convertible subordinated note maturing in 2003), which provides the potential for 2.2 million additional shares. Based on the total number of contingent shares, the potential dilution of parent equity appears modest with contingent shares-to-outstanding shares of between 0.20 and 0.32.

To more fully measure the potential effect of dilution, we need to value the dilution effect of the derivative claims. The value of the underlying security provides an upper bound and zero provides a lower bound for the dilution value of derivative claim.<sup>4</sup> Using the closing price on the underlying common equity of the parent for the date reported, the share price is

<sup>4</sup>Since exercising the stock options and convertible notes generates the issuance of new equity, the value of the dilution cannot be greater than the value of the new equity. In an extreme case in which the exercise price is zero, issuing equity with no proceeds dilutes existing equity by the amount of the prevailing stock price. Although stock options are generally granted at the prevailing stock price, we acknowledge that we may be understating the number of all contingent claims, since we do not include future awards of derivative contracts that investors might anticipate. Our generous valuation assumptions for the outstanding contracts are likely to offset any anticipated dilution from future awards.

**Table II. Value Ratio with Derivative Securities Recognition**

This table provides information on all stock option and other claims convertible to parent equity for dELiA\*s (DLIA), Daisytek (DZTK), HNC Software (HNCS), and Creative Computers (MALL). We base the information on the SEC filing that takes place closest in time to the carve-out. The data for DZTK, HNCS, and MALL is reported within six weeks following the carve-out. The data for DLIA is reported within the three months prior to the offering. The value of contingent claims is the total number of shares exercisable, convertible, or exchangeable into parent common equity, multiplied by the closing price for common shares. The common shares for USAI include 31.5 million Class B shares that maintain a 10-for-1 voting privilege over the non-Class-B shares. The adjusted value ratio is the total capitalization of the parent's holdings in the subsidiary divided by the total capitalization of the parent including the upper bound contingent claim valuation. The value ratio for the offer date uses the closing prices on the offer date. The month 1 mean value ratio is the mean value ratio over the first month after the carve-out.

	DLIA	DZTK	HNCS	MALL
Reporting Date	1/31/99	12/31/99	12/31/99	12/31/98
Common Equity				
Shares Outstanding (million)	14.2	17.3	25.7	10.3
Market Price, Close	\$16.50	\$23.375	\$105.75	\$31.75
Stock Options				
Number Outstanding (million)	3.0	4.0	6.0	2.0
Fraction Exercisable	0.12	0.26	0.16	0.15
Weighted Average Exercise Price	\$6.77	\$13.07	\$33.0	\$4.84
Convertible Debt (millions of shares if converted)	0.0	0.0	2.2	0.0
Contingent Shares/Outstanding Shares	0.21	0.22	0.32	0.20
Value of Contingent Claims (upper bound in millions)	\$50.1	\$92.5	\$874.0	\$63.9
Adjusted Value Ratio				
Offer Date	1.224	1.051	0.745	0.862
First Month Mean	1.174	0.926	1.121	1.125

multiplied by the number of potential new shares to generate an upper bound estimate of  $O_p$  of \$50 million for DLIA, \$93 million for DZTK, \$ 0.9 billion for HNCS, and \$64 million for MALL derivative securities. The value of the subsidiary derivatives is set to their lower bound, which is  $O_{S|P} = 0$ . Combining these estimates with those of Section I gives a lower bound estimate for the adjusted value ratio.

At the close of the offer date, the adjusted value ratios for DLIA, DZTK, HNCS, and MALL are 1.22, 1.05, 0.75, and 0.86, respectively. Despite the strong assumptions, we use to estimate the maximum dilution potential of parent shares, the adjusted value ratio is still above one for both DLIA and DZTK as shown in Table I. The mean adjusted value ratios over the first month following the carve-out for DLIA, DZTK, HNCS, and MALL are 1.17,

0.93, 1.12, and 1.13, respectively. These values are somewhat smaller than the respective 1.36, 1.02, 1.19, and 1.30 estimates reported respectively in Table I. However, the implications are unchanged. The indirect holdings trade at a discount. Valued at an upper bound, the expected dilution due to the derivative securities for the parents explains only a small part of the curious valuation relation.

### C. Liquidity

Another consideration is the difference in liquidity between direct and indirect asset holdings. Given that the parent's holdings may not be highly liquid, if we measure holding value to parent value using market prices, we might inflate the true value of the indirect holdings. Malkiel (1977) finds that closed-end funds that have greater holdings of restricted stock tend to experience larger discounts. Since restricted stock is not registered for public sale by the SEC, it may be underpriced to reflect the cost of poor liquidity. Although the relation is significant, Malkiel acknowledges that the impact of restricted stock is not sufficient to explain the magnitude of the closed-end fund discount. Lee, Shleifer, and Thaler (1991) also dismiss liquidity as an explanation for the closed-end fund discount.

In a carve-out, the parent's holdings can be restricted in two ways. First, the original offering agreement often restricts the parent company from further liquidating their holdings for a certain period of time. Although this restriction may be binding, since the restriction is only for a short period of time (usually less than a year), it should not create a material value impact.<sup>5</sup>

Since the parent's holdings represent substantial blocks of shares in the subsidiary, an alternative consideration is the discount required to quickly liquidate such a block on the open market. Because the market price of UBID reflects a 100% premium, the block-discount hypothesis requires that block holding liquidations must occur at more than a 50% discount.

The block-discount hypothesis faces two challenges in explaining a large discount of a parent to its subsidiary. The first challenge is that if a parent company sells a large block of subsidiary holdings in the open market at a discount, the market value of the subsidiary is affected in the same way. Barclay, Holderness, and Pontiff (1993) show that large block ownership is associated with value reduction. Based on their finding, the subsidiary should trade at a discount in the market because its parent company owns a large block of its shares.

Another challenge is that even though a 50% discount might be plausible for selling a large block in a short period, parent firms can realize the value of their holdings in less costly ways. Parents can spin off their holdings to shareholders through a stock dividend. Parents of carve-outs often use follow-on spin-off transactions. For example, DZTK, HNCS, and MALL announced the spin-off to parent shareholders of their entire subsidiary holdings six months after the original carve-out.

Parents can also do follow-on carve-outs. For example, in the related biotechnology sector,

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<sup>5</sup>Longstaff (1995) provides an estimate of the upper bound of the value of the marketability restriction with an option-based approach. He finds that the opportunity cost for holding restricted shares is high if an investor has perfect timing skill. Despite the potential for a marketability restrictions on parent-held shares, investors may not discount the price of parent shares for a number of reasons. First, the marketability restriction is only binding for those investors with timing skills. Those investors with little timing skills or who plan to hold the shares beyond the restricted period value the parent's restricted shares identically to the unrestricted shares. Second, short sale opportunities allow investors with perfect timing skill to replace the unrestricted share payout using only positions in the parent firm and the unrestricted shares. Consider an investor who owns one share of the parent company and through his ownership of the parent, he indirectly owns some shares, for simplicity, say one share of the subsidiary. Suppose that the investor feels that the best time to sell his indirect holding of subsidiary is at some time  $s < T$ , where  $T$  is the end of the restriction. But he cannot do so because of marketability restriction. He can achieve the same goal by short selling one share of the traded shares in the subsidiary instead.

eight months after their original July 1998 carve-out of Abgenix, Cell Genesys followed with a subsequent carve-out of half of their holdings. Cell Genesys was able to sell its holdings for very little discount at all to the prevailing market price. Examples like this suggest that holdings liquidity is unlikely to justify the pricing behavior.

#### **D. Agency Costs**

Agency costs create discounts for closed-end funds relative to their holdings when management fees are too high or if future portfolio management is expected to be sub par (Boudreaux, 1973). For agency costs to explain the pricing of the Internet stock sample, the incentives of parent-firm managers must be sufficiently divisive as to destroy more than half of the value of their carve-out subsidiary's business. On a book value basis, the residual businesses are relatively large. For each event in our sample, the book value of the residual assets exceeds that of the carve-out assets. The residual value of a parent can have a negative value if the managers of the parent company extract and substantially waste cash flow provided by the subsidiary carve-out. Therefore, we wish to explore the implications for profitability, ownership, and management overlap implied by an agency-cost-based explanation of Internet carve-out pricing.

Jensen's (1986) free-cash-flow argument suggests that managers of positive cash-flow-generating businesses overinvest in unprofitable assets. Thus, if parent management squanders free cash flow provided by a profitable subsidiary, investors might discount the parent-held shares in the subsidiary. If the operating cash flow in the subsidiary is negative, then the discount is not due to the free-cash-flow investment behavior of current management.

To test this implication, financial statement data for the subsidiary during the period following the carve-out is examined. We use the earliest 10-K or 10-Q filing with the SEC after the carve-out and multiply quarterly income statement figures by four to estimate the annual figure. Our results are summarized in Table III.

The carve-out subsidiary business represents a minority of the consolidated firm's operations, comprising from 3% to 27% of consolidated sales. Both subsidiary and parent operating profits (earnings before interest, tax, and extraordinary items) are negative for all four cases.

The return on assets is measured by dividing the subsidiary operating loss by total contemporaneous subsidiary assets. Return on assets varies from -2% for TURF to -33% for PFSW. To examine operating margins, we divide operating profit by total revenue. The operating margins for the four Internet businesses are low, ranging from -10% for UBID to -51% for PFSW. Based on current financial statements, the sampled Internet businesses are not profitable at present.

The negative operating profitability for the three Internet subsidiaries provides little evidence that the value discount of the parent companies is caused by poor use of subsidiary cash flow. Since the measures used are based on historical, not prospective, performance, this evidence does not preclude scenarios in which investors anticipate that management will squander future subsidiary cash flow. We perform additional tests of the potential for investors to expect such management incentives.

Berle and Means (1932) suggest that agency costs are greater if managers own a small portion of the residual claims, since a manager who benefits little from firm value improvements has little incentive to maximize firm value. Based on this argument, agency costs will be greater if the management holdings of the parent are less than that of the subsidiary. To test this implication, managerial ownership data are collected for the parent and carve-out subsidiaries. To identify the fraction of shares beneficially held by executives and officers of the parent, we use the first proxy statement or other SEC filings after the carve-out.

**Table III. Carve-out Subsidiary Profitability**

This table provides profitability information on the carve-out subsidiaries iTurf (TURF), PFSWeb (PFSW), Retek (RETK), and uBid. This information is based on the financial statement filed with the SEC that most closely follows the carve-out. The fraction of consolidated business shows the fraction of total sales and operating profit (before interest, tax, and extraordinary items) attributed to the carve-out subsidiary, multiplied by the fraction of the subsidiary shares owned by the parent. The return on assets is calculated as the ratio of operating profit to total assets. The return on sales is calculated as the ratio of operating profit to total revenue.

Parent	Date of Statements	Fraction of Consolidated Business		Estimated Profitability	
		Sales	Operating Profit	Return on Assets	Operating Margin
TURF	5/1/1999	0.047	0.071 <sup>a</sup>	-0.023	-0.180
PFSW	12/31/1999	0.031	2.311 <sup>a</sup>	-0.328	-0.506
RETK	12/31/1999	0.274	0.900 <sup>a</sup>	-0.046	-0.103
uBid	12/31/1998	0.056	0.329 <sup>a</sup>	-0.137	-0.098

<sup>a</sup>indicates that both the subsidiary and consolidated earnings are negative.

Table IV presents the results of this test. The combined beneficial ownership of executives and directors is reported. In contrast to the traditional agency cost explanation, direct management holdings in the parent are generally greater than in the subsidiary. Management ownership of parent firms DLIA, HNCS, and MALL is 56%, 2%, and 37%, respectively. Direct management ownership of their respective subsidiaries is considerably less at zero, zero and 2%, respectively. In contrast, management's 9% ownership of PFSW exceeds management's 7% ownership of DZTK.

Since the management team of the parent and the subsidiary can be one and the same, we calculate the indirect holdings in the subsidiary that is comprised of management's ownership of the parent. To do so, management's ownership in the parent is multiplied by the fraction of the subsidiary held by the parent. When both direct and indirect ownership are combined, that management's ownership of the subsidiary is still generally below management's ownership of the parent. The ownership profile suggests that management wealth incentives encourage profit maximization of the parent over the subsidiary. This result contrasts with the market value discount that we observe for carve-out parents.

Morck, Shleifer, and Vishny (1988) propose an alternative entrenchment explanation for the relation between management ownership and market valuation. They suggest that control increases with management ownership, so that at certain levels of control, the mechanisms for removing management are eliminated. Thus, management is encouraged to pursue non-value-maximizing activities for their personal benefit, despite the negative value impact of their actions on their portfolio holdings.

The positive correlation between management holdings and subsidiary-holdings-to-parent valuation suggests an entrenchment explanation. Parent firms, such as DLIA, that have strong managerial control of parent assets are able to extract wealth from the subsidiary for their personal benefit without any concerns for possible retaliation by investors asking for management removal. This explanation supports the findings of Barclay, Holderness, and

**Table IV. Management Holdings of Parent and Subsidiary**

This table shows management holding data from SEC filings for parents dELiA\*s (DLIA), Daisytek (DZTK), HNC Software (HNCS), and Creative Computers (MALL), and subsidiaries iTurf (TURF), PFSWeb (PFSW), Retek (RETK), and uBid. We calculate the indirect subsidiary holdings as direct management holdings of the parent, multiplied by the fractional ownership of the subsidiary held by the parent.

Parent	Direct Management Holdings (Parent)	Internet Carve-out	Direct Management Holdings (Subsidiary)	Indirect Management Holdings (Subsidiary)	Direct & Indirect Management Holdings (Subsidiary)
DLIA	0.563	TURF	0.000	0.421	0.421
DZTK	0.067	PFSW	0.091	0.054	0.145
HNCS	0.017	RETK	0.0001	0.015	0.015
MALL	0.366	UBID	0.015	0.293	0.308

Pontiff (1993), who show that closed-end funds with higher managerial ownership experience higher fund-to-NAV discounts. However, since the parent firm also controls the subsidiary, management is likely to maintain at least as great a level of control on the subsidiary assets. To justify the empirical evidence, we question why management's incentives for personal benefit do not also apply to subsidiary control.

To test whether the subsidiary-to-parent value ratio is due to entrenched managers of the parent company, the overlap in parent-subsidiary management teams is examined. If there is significant overlap between the managers of the subsidiary and the parent, then we can reject entrenchment as an explanation for the discounted value of the parent. By using management overlap, we can control for differences in management utility functions. Since management control is similar across parents and subsidiaries, unless the subsidiary ownership is greater, an overlapping management team that extracts private benefits from the parent is unlikely to pursue profit maximization in a subsidiary. If anything, an overlapping management team with similar control levels is likely to extract perquisites at the subsidiary level because the penalty to their own wealth is somewhat less.

To test this implication, we examine the management teams for three of the parents. The entrenchment explanation predicts little overlap in the management teams. The evidence in Table V does not support an entrenchment explanation. The senior managers for the parents of those firms with higher value ratios also maintain an important senior management function within the subsidiary. At DLIA, the chairman and CEO roles for the parent firm are filled by the same individual at its subsidiary TURF. Other senior officers of the parent act as vice presidents and directors for the subsidiary. For MALL, the individual who serves as chairman, president, and CEO also serves as the secretary and a director on the subsidiary's board, and the CFO and VP/sales and marketing positions are held by the same individual at both the parent and subsidiary level. For DZTK and PFSW, there is also a large overlap. The HNCS/RETK relationship is the only example where the management teams do not largely overlap.

There is little support for agency-cost-based explanations. Parent management does not receive positive free cash flow from its Internet subsidiary. Ownership and management of the parent and subsidiary are characterized by large management overlap and management ownership that only slightly favors the parent. These findings do not indicate large consumption of parent wealth. Since the management team is the same, and management ownership is slightly smaller for the subsidiaries, management control or entrenchment is



**Table V. Comparison of Parent-Subsidiary Management Overlap**

This table shows management positions on the most recent proxy statement or S-1 filing that follows the carve-out for parents dELiA\*s (DLIA), Daisytek (DZTK), HNC Software (HNCS), and Creative Computers (MALL) and subsidiaries iTurf (TURF), PFSWeb (PFSW), Retek (RETK), and uBid. "Not applicable" means that the management position at the parent either does not exist or is divided among individuals. "No position" means that the person who holds the respective position is not listed as an officer or director of the subsidiary.

Position in Parent	Position in Carve-Out Subsidiary			
	DLIA/TURF	DZTK/PFSW	HNCS/RETK	MALL/UBID
Chairman	Chairman	Chairman	No position	Secretary/Director
President	Vice-Pres/ Director	President	No position	Secretary/Director
Chief Executive Officer	Chief Executive Officer	Chief Executive Officer	No position	Secretary/Director
Chief Operating Officer	Vice-Pres/ Director	Not applicable	Not applicable	Not applicable
Chief Financial Officer	Vice-Pres/ Director	Not applicable	No position	Chief Financial Officer
Exec. VP - Sales & Marketing	Not applicable	Exec. VP - Sales & Marketing	Director	Exec. VP - Sales & Marketing

effectively the same across parent and subsidiary. Given such an ownership and control structure, agency-based explanations predict that management seeks perquisites from the subsidiary where the personal wealth impact is less. These predictions are inconsistent with the observed market value ratios. An agency-based explanation appears unlikely.

### III. Internet Carve-outs and Opportunism

Zweig (1973) and Lee, Shleifer, and Thaler (1991) suggest that the closed-end funds discount results from market mispricing. Their conclusion requires two key features: investor clienteles (rational and irrational) and arbitrage constraints. In their framework, irrational traders are disproportionately attracted to one type of security (the closed-end fund) and move the price away from the rational investors' value. Market frictions impede arbitrage capital from removing the mispricing so that fund prices and net asset values can diverge in equilibrium.

Miller (1977, 1995) argues that investor clienteles and arbitrage constraints generate mispricing among restructuring transactions such as the equity carve-outs. In his model, carve-outs' prices are set by optimistically biased traders. Short-sale constraints inhibit the arbitrage mechanism. Nanda (1991) contends that companies resort to equity carve-outs when the parent equity is undervalued and the subsidiary is overvalued. If bullish investor sentiment leads to the overvaluation of Internet subsidiaries, parents of Internet subsidiaries

might opportunistically raise new capital at favorable terms.

### A. The Investor Clientele of Internet Carve-outs

Miller (1977, 1995) contends that short-sale constraints allow “faddish” subsidiaries to be sold at upwardly biased prices to particular investor clienteles. Therefore, we might expect that equity in faddish industries such as the Internet to face increased interest by irrational traders. Miller also argues that biases in prices are increasing in return uncertainty since prices are set by the most optimistic. The large uncertainty surrounding valuations in emerging industries suggest that such industries are likely candidates for such mispricing.

Earlier studies characterize institutional investors as sophisticated investors. Michaely and Shaw (1994) associate “the informed investors in the IPO market with institutional investors.” Badrinath, Kale, and Noe (1995) and Field (1997) also use institutional holdings as a proxy for the fraction of shares held by sophisticated traders. We collect institutional holdings data from the *Market Guide* on-line service as reported by Vickers at the end of June 1999.

Table VI indicates that institutional ownership averages 10% for the carve-out subsidiaries. Institutional ownership of the parent firms is much higher, ranging from 24% for MALL to 76% for HNCS. Despite the low power of our test, the mean institutional ownership for the parents and the subsidiaries is significantly different at the five-percent level with a *t*-statistic of -2.88. Since none of the parents pay dividends, the larger institutional ownership levels are not explained by institutional requirements to hold dividend-paying stocks. Subsidiary equity appears to be relatively more attractive to non-institutional investors.

To further examine the likelihood of noise-trader impact on Internet stock valuations, trading data are compared for the Internet carve-outs and parents. The prediction here is that equities exposed to high levels of noise-trader clientele experience extreme levels of trading activity. The emergence of online trading services and electronic communications networks (ECNs), which provide real-time trade execution at deep discount commissions, has sharply increased the accessibility of short-term trading activity by individual investors. The sample period has been characterized as the advent of the “day trader.” These traders might behave in ways consistent with the Zweig (1973) model and increase pricing bias. The impact of individual and short-term buying behavior is examined by looking at share turnover.

We compare the number of shares traded at the time of the carve-out for both the subsidiaries and their parents. Float turnover is then computed as the daily trading volume divided by the number of shares that are available for trading in the secondary market. For each of the Internet subsidiaries, the first-day trading volume greatly exceeds the float (see Table VI). For UBID, each floating share changes hands over five times during the first day of trading.

Float turnover for some of the parent firms is also high. MALL float turns over 1.3 times. In each case, the turnover of the subsidiary shares is much greater than that of the parent. A paired *t*-test of the differences is significant at the 10% level.

Float turnover among the Internet carve-outs is much larger than the turnover experienced by typical IPOs. Krigman, Shaw, and Womack (1999) find that first-day turnover for IPOs ranges from 28% to 70%. To verify that the abnormal volume continues beyond the first trading day, the test is repeated for the one-month anniversary of the carve-out. Although statistically insignificant, again, the carve-out subsidiary turnover exceeds the parent turnover. The heavy trading activity of the Internet subsidiaries is particularly acute for UBID. The daily turnover continues to exceed the float even one month after the offering. The smaller institutional ownership and large float turnover is consistent with the development of Zweig (1973) investor clienteles.

**Table VI. Investor Characteristics**

This table shows institutional ownership data from the Market Guide on-line service as reported by Vickers for parents dELiA\*s (DLIA), Daisytek (DZTK), HNC Software (HNCS), and Creative Computers (MALL) and subsidiaries iTurf (TURF), PFSWeb (PFSW), Retek (RETK), and uBid. We calculate float turnover as the number of shares traded on the first day of trading for the carve-out subsidiary, divided by either the float (the shares available for trading) on the offer date or the mean ratio during the first month of trading (Month 1). We base the float estimation on SEC filings. To avoid double-counting trading volume, we match stock purchases and sales. The table also provides results of a paired *t*-test of differences.

	Subsidiary			Parent	Parent		
	Institutional Ownership (%)	Float Turnover (Offer Date)	Float Turnover (Month 1)		Institutional Ownership (%)	Float Turnover (Offer Date)	Float Turnover (Month 1)
TURF	1.6	1.739	0.236	DLIA	30.4	0.809	0.121
PFSW	20.1	2.325	0.342	DZTK	71.5	0.689	0.120
RETK	12.1	1.506	0.269	HNCS	76.0	0.125	0.138
UBID	4.6	5.009	1.258	MALL	23.9	1.334	0.455
Mean	9.6	2.64	0.53		50.5	0.74	0.21
t-stat (Sub-parent)					-2.88**	2.26*	1.23

\*\*Significant at the 0.05 level.  
\*Significant at the 0.10 level.

The implications of other behavioral models could also explain our observations. The Barberis, Shleifer, and Vishny (1998) model predicts that after a series of good news reports, investors erroneously extrapolate the trend, which leads to asset overpricing. Daniel, Hirshleifer, and Subrahmanyam (1998) argue that investors become overconfident following a series of good news reports, which results in artificially high prices. Given the spectacular performance of Internet-related new issues, it is not surprising that Internet-related subsidiaries would become a favorite for such investors.

## B. Arbitrage Constraints

Pontiff (1996) finds that market frictions constrain the arbitrage process such that closed-end fund prices can deviate from NAV. If arbitrage is costly, these frictions discourage sophisticated traders from eliminating pricing discrepancies.

The same may also be true for our carve-out sample. If the Internet-related carve-outs are priced too high relative to their parents, sophisticated traders can generate arbitrage profits by taking a short position in the carve-out subsidiary and a long position in the parent. However, if the sophisticated traders face high arbitrage costs, the expected profits from such positions might not offset the costs. The costs of arbitrage thus allow mispricing to persist for extended periods of time.

Even without substantial direct transaction costs, the arbitrage is still not a safe strategy unless the arbitrageurs have an infinite time horizon, are never forced to liquidate their positions, and can eliminate all tracking error. In a finite horizon, the discount of the parent company relative to its carve-out could widen. If this happens, an arbitrageur who needs to liquidate will suffer a loss.

In the related seasoned equity offering (SEO) market, Pontiff and Schill (2001) argue that arbitrage costs allow managers to opportunistically and successfully sell overvalued parent equity. If arbitrageurs have difficulty finding a hedging instrument that is perfectly correlated with the mispriced asset, then arbitrage requires accepting a certain level of tracking error or holding risk. Pontiff and Schill find that the cross-sectional variation in arbitrage holding costs explains much of the variation in SEO mispricing. Their finding suggests that SEOs are mispriced and that the holding cost constrains arbitrage. If arbitrage costs allow managers to opportunistically and successfully sell overvalued parent equity, the successful sale of overvalued subsidiary equity is a natural extension.

The importance of holding costs is tested by examining the investor reaction to spin-off announcements for the parent's remaining shares. At the spin-off, the parent shareholders receive a pro-rata dividend of the parent-held shares such that the indirect ownership of the subsidiary effectively becomes direct ownership. Brauer (1984) finds that open-ending announcements force closed-end-fund discounts to zero.

If holding costs are important to carve-out arbitrageurs, a similar effect for our carve-out sample is expected, since the spin-off announcement is identical to the open ending of a closed-end funds. The spin-off of MALL's holdings in UBID gives us an opportunity to examine the impact of arbitrage constraints. At the time of UBID's offering, the parent, MALL, announced that it expected to spin off to parent shareholders its remaining stake in UBID approximately 180 days after the carve-out date. As predicted, after the close of trading on May 18, 1999, MALL announced the spin-off of all of its remaining holdings on June 7 to shareholders of record on May 24 (just beyond the 180-day limit). On the announcement, prices changed substantially. An arbitrage position of one long share in MALL 0.7 shares short in UBID (the appropriate hedge ratio) returned 27% on the announcement day. The respective market value ratio dropped substantially from 0.90 to 0.74.

Lamont and Thaler (2000) examine in detail the importance of arbitrage constraints among technology carve-outs. They find that the short interest for UBID was, at one point, 71% of the float. With such levels of short selling, generating further short position pressure on subsidiary prices becomes difficult because of the inability to find shares to short.

Since the spin-off announcement, the relative valuation of MALL's UBID holdings or a portfolio that replicates those holdings, has continued to trade well below the value of the parent at roughly the same relative value. The market response supports the existence of binding arbitrage constraints. The announcement ended the uncertainty on the length of time until the elimination of noise-trader bias. Arbitrageurs who recognized a price discrepancy between the two securities were able to take a position (e.g., long MALL and short UBID) without any fears of needing to unwind their positions before the parent-held shares became tradable. Panel D, Figure 1, illustrates that the slow convergence of the subsidiary holdings to that of the total parent value over the five months prior to the announcement could reflect the declining magnitude of arbitrage constraints over time.

The risk of unfilled open ending is illustrated by the other three anomalous carve-outs. DZTK also spun off their subsidiary holdings six months after the carve-out. The spin-off occurred in July 2000, long after much of the mispricing had been corrected by the April 2000 drop in Internet prices. The spin-off of RETK was completed ten months, rather than six

months, after the carve-out, contributing to some arbitrage uncertainty.

Seventeen months after the TURF carve-out, DLIA announced a reverse spin-off under which carve-out subsidiary shareholders would receive pro-rata shares of the parent stock to replace their shares in TURF. The direct holdings were replaced by indirect holdings. Given the pricing of such a transaction, arbitrage gains were neutralized. An arbitrageur who took a position in the carve-out 17 months earlier and reversed it at the time of the repurchase received nothing, since any gains were offset by the repurchase ratio. The *ex ante* holding risk of carve-out arbitrage could be large enough to prevent arbitrage pressure from removing the observed relative mispricing.

### C. Announcement Returns

An alternative test of the appropriateness of the opportunism hypothesis as an explanation for the pricing characteristics of Internet carve-outs is performed. We examine the implication that equity carve-out announcements reveal positive information about managers' assessment of parent value.

Earlier studies have also examined the announcement returns for equity carve-outs. Based on a sample of 76 carve-outs between 1965 and 1983, Schipper and Smith (1986) find that carve-out announcements show mean abnormal returns of almost 2% for a five-day window. Klein, Rosenfeld, and Beranek (1991) observe positive 1% announcement returns for their 52 carve-outs in a sample examined over a similar timeframe.

Using a more recent sample of 32 carve-outs between 1980 and 1991, Slovin, Sushka, and Ferraro (1995) estimate announcement abnormal returns of just over 1% for a two-day window. These findings contrast to the negative announcement returns generally associated with equity offering announcements.

Nanda's (1991) model provides an explanation for the opposing result. Since managers issue equity in the subsidiary when equity in the consolidated firm is undervalued by the market, the decision to carve-out the subsidiary reveals the direction of management's value of the consolidated firm. Opportunistic behavior supports Nanda's prediction that parent announcement returns are positive and that arbitrageurs infer that the manager is selling equity in the subsidiary because the parent is undervalued.

To test the response of investors to equity carve-out announcements for the sample, the mean announcement returns of the parent firm around the filing date are estimated. Abnormal returns for this test are calculated as the difference between the daily return and a market model, by using daily returns over the past five years. The CRSP value-weighted portfolio is used as the market portfolio.

Table VII summarizes the results. For the small sample, Internet carve-outs announcements result in a three-day (-1 event day, +1 event day) abnormal return of over 11%. The associated *t*-statistic is 1.75, which is significant at the 10% level for the one-tailed test. This figure is most affected by MALL and DZTK's announcement period returns of 68% and 30%, respectively.

There is no evidence of abnormal return behavior over the (-5,-2) or (+2,+5) event day windows. Although the small sample makes statistical testing difficult, these results suggest that carve-out announcements of Internet subsidiaries produce some positive price impact for the parent that perhaps indicates opportunistic financing behavior.

### III. Are the Internet Carve-outs Unique?

The characteristics of high valuation uncertainty, large noise-trader participation, and arbitrage constraint that allow substantial mispricing to persist in the Internet industry are also features of

**Table VII. Announcement Day Abnormal Returns For Parent**

The event day corresponds to the number of trading days relative to the original S-1 filing with the SEC. We calculate abnormal returns by using a market model that we estimate over the five years prior to the offering. We use the CRSP value-weighted portfolio as the market proxy. We do not report the abnormal return for Deluxe Corp because there was no CRSP value-weighted portfolio available at the time of writing.

Parent	Event Day Window Abnormal Returns (min day, max day)		
	(-5,-2)	(-1,+1)	(+2,+5)
H&R Block (HRB)	-3.4%	4.3%	-10.3%
Intermedia Comm (ICIX)	4.4%	2.2%	-6.3%
Microsoft (MSFT)	3.5%	-0.7%	-1.1%
dELiA*s (DLIA)	-11.1%	16.2%	-0.5%
USA Networks (USAI)	1.6%	0.2%	-2.4%
Network Ass. (NETA)	5.7%	4.4%	-2.2%
Daisytek (DZTK)	-11.8%	29.6%	10.0%
HNC Software (HNCS)	2.3%	2.8%	0.7%
USA Networks (USAI)	-0.5%	-9.2%	-17.6%
Creative Cmpters (MALL)	22.4%	68.4%	-27.3%
Metamor Worldwide (MMWW)	0.8%	6.1%	13.2%
Mean	1.3%	11.3%	-4.0%
(t-stat)	(0.46)	(1.75)*	(-1.15)

\*Significant at the 0.10 level.

other emerging industries. If parent-company managers behave opportunistically towards their Internet subsidiaries, we might expect similar behavior in other industries.

To test for the uniqueness of Internet carve-out valuations, we compute the market value ratio for a sample of contemporaneous non-Internet carve-outs. The Appendix gives the details of these carve-outs. Over the 1996 to 2000 sample period, 19 carve-outs are identified as non-Internet emerging industries (Panel A). These carve-outs are comprised primarily of carve-outs of electronics, telecommunication, and high-tech chemical businesses. We also identify 21 non-emerging industry carve-outs (Panel B). The non-emerging industry carve-outs include such large transactions as DuPont's \$4 billion carve-out of Conoco, CBS's \$2.4 billion carve-out of Infinity Broadcasting, and General Motors' \$1.4 billion carve-out of Delphi Automotive Systems.

The Appendix shows that two emerging-industry, non-Internet carve-outs produce an offer-date value ratio that exceeds the upper bound of one. 3Com's carve-out of Palm produced

an extreme offer date market value ratio of 1.62. Sterling Software's carve-out of Sterling Commerce produced a market value ratio of 1.18. Clearly, examples of a parent's subsidiary holding values that exceed the total value of the consolidated parent are not unique to the Internet industry.

Cornell and Liu (2000) and Lamont and Thaler (2000) report similar findings for technology carve-outs. Cornell (2001) finds evidence of prolonged mispricing during the late 1990s for even such large technology stocks as Intel.

To compare the value ratios of Internet carve-outs with those of non-Internet firms, the offer date value ratio is regressed for the full 52 carve-out sample on the book value ratio, the natural logarithm of the market capitalization of the subsidiary, an Internet dummy variable, and an emerging industry dummy variable. The Internet dummy variable retains a value of one for the 12 Internet carve-outs and zero for the other observations. The emerging industry dummy retains a value of one for the 31 Internet and other emerging industry carve-outs and zero for the non-emerging industry observations.

Table VIII shows the results from a standard OLS regression with heteroskedasticity-adjusted test statistics. The book value ratio provides strong explanatory power with a coefficient *t*-statistic of 6.25. The coefficient on the emerging industry dummy is also large (0.13) with a significant *t*-statistic of 1.6. With a *t*-statistic of 0.44, the coefficient on the Internet dummy is positive but statistically insignificant. There is little evidence of a size effect, since the coefficient on the size variable is insignificant.

The results are similar if the mean first month market value ratio is used as the dependent variable. Since the sample size is small and the dummy variables are correlated by construction, we provide additional specifications that alternate excluding the two dummy variables. When the Internet dummy variable is excluded, the *t*-statistic on the emerging industry dummy increases to 2.15 and 2.22, respectively, for the offer date and month 1 market value ratios. When we exclude the emerging industry dummy variable, the *t*-statistic on the Internet dummy increases to 1.14 and a 1.52, respectively, for the offer date and month 1 market value ratios. The evidence supports disproportionately large value ratios as being common to emerging industries and not unique to Internet subsidiaries.

#### **IV. Summary and Conclusion**

For the small sample of Internet related carve-outs, we observe that directly owned shares in a carve-out trade at a large premium to indirect shares held by the parent. For some carve-outs, the value of the parent's holdings in the subsidiary exceed the total market value of the parent firm.

Agency-cost-based models cannot fully explain the valuation premiums associated with parent's holdings in carve-outs. Subsidiary businesses are relatively small and unprofitable. Management ownership tends to be greater for the parent than for the carve-out subsidiary. Wide management overlap across parents and subsidiaries is common.

The observations do not support the large extraction of wealth from the subsidiary to the parent required for an agency-based explanation. Moreover, only a small fraction of the value difference is explained by taxes, marketability constraints, or dilution.

Overall, the evidence can best be explained with models where clienteles of investors with optimistically biased expectations drive the prices of subsidiaries above parent valuations, and arbitrage costs prohibit market forces from eliminating the disparity between parent-subsidiary valuations (Zweig, 1973; Miller, 1995; Pontiff and Schill, 2001).

**Table VIII. Regression Results**

This table comprises 52 standard US carve-outs effected between January 1996 and June 2000. The market value ratio is the total capitalization, which includes both book value of all liabilities and the market value of equity, of the parent's holdings in the subsidiary, divided by the total capitalization of the parent. The market value ratio for the offer date uses the closing prices on the offer date. The month 1 mean market value ratio is the mean market value ratio over the first month after the carve-out. The book value ratio is total subsidiary book equity and debt held by the parent for the earliest reporting date following the offering, divided by the total consolidated assets of the parent. The Internet dummy variable retains the value of one for the 12 Internet carve-outs and zero for the other observations. The emerging industry dummy retains the value of one for the 31 Internet and other emerging-industry carve-outs and zero for the non-emerging-industry observations. The size variable is the natural logarithm total market capitalization, expressed in millions of dollars, of the carve-out subsidiary at the close of the first day of trading. Coefficient estimates and their respective heteroskedasticity adjusted *t*-statistics appear in parentheses.

	Market Value Ratio					
	Offer Date			Month 1		
	(1)	(2)	(3)	(4)	(5)	(6)
Constant	-0.1065 (-0.48)	-0.1109 (-0.51)	-0.0428 (-0.19)	-0.0094 (-0.02)	-0.0190 (-0.12)	0.0464 (0.26)
Book Value Ratio	2.004 (6.25)***	2.033 (6.49)***	1.975 (5.74)***	1.969 (6.35)***	2.033 (6.57)***	1.944 (5.86)***
Size	0.0250 (0.81)	0.0251 (0.82)	0.0252 (0.76)	0.0130 (0.53)	0.0133 (0.55)	0.0132 (0.49)
Emerging Industry Dummy	0.1304 (1.60)*	0.1510 (2.15)**		0.1141 (1.52)*	0.1591 (2.22)**	
Internet Dummy	0.0536 (0.44)		0.1234 (1.14)	0.1174 (0.93)		0.1784 (1.52)*
Adj. R <sup>2</sup>	0.438	0.447	0.426	0.435	0.433	0.429

\*\*\*Significant at the 0.01 level.

\*\*Significant at the 0.05 level.

\*Significant at the 0.10 level.

We characterize Internet carve-out investors as non-institutional, aggressive traders. Also, pricing discrepancies are eliminated when the parent company announces a spin-off of its holdings consistent with the elimination of binding arbitrage constraints. Other pricing discrepancies within our Internet sample are eliminated following the April 2001 decline of overall Internet sector valuation. In April 2001, valuations of direct holdings of Internet equity decline far more than do the indirect holdings. This finding supports the presence of clientele effects. The evidence gives further credence to similar findings by Lee, Shleifer, and Thaler (1991) for closed-end funds. Our evidence also supports Nanda's (1991) notion of opportunistic carve-out transactions, that



conglomerate firms increase their financing flexibility by raising equity in the division that is most in favor with investors. Parent companies use the carve-out transaction as a way to opportunistically access the excessive investor demand for Internet assets.

This paper quantifies the importance of investor behavior price impact. The persistence and magnitude of valuation inconsistency suggests that overpricing in emerging industries such as the Internet industry might be much larger than previously documented (Schwartz and Moon, 2000a and b). If industry overpricing allows managers to opportunistically carve-out industry-related subsidiaries, then it is likely that such behavior also exists in other transactions, such as takeovers. ■

**Appendix A. Equity Carve-out Control Sample Summary of Other  
Emerging Industries**

Subsidiary	Parent	Filing Date	Offer Date	Fraction Retained	Book Value Ratio	Market Value Ratio	
						Offer Date	Month 1 (Mean)
Agilent Technologies (A)	Hewlett-Packard (HWP)	8/16/99	11/17/99	0.841	0.121	0.157	0.147
Am Port Telecm (APTI)	Tel & Data Systems (TDS)	2/20/96	4/25/96	0.609	0.101	0.180	0.166
ATL Products (ATLPA)	Odetics (ODETA/B)	12/23/96	3/7/97	0.829	0.078	0.576	0.609
Cabot Electrnics (CCMP)	Cabot (CBT)	1/20/00	4/3/00	0.805	0.005	0.188	0.217
Commodore Separation Technologies (CXOT)	Commodore Environmental Services (COES)	9/12/96	4/3/97	0.870	0.183	0.417	0.511
DuPont Photomask (DPMI)	DuPont (DD)	4/12/96	6/13/96	0.695	0.003	0.008	0.007
Logility (LGTY)	American Software (AMSWA)	8/12/97	10/6/97	0.817	0.219	0.543	0.572
Lucent Technologies (LU)	AT&T (T)	2/5/96	4/3/96	0.824	0.034	0.176	0.192
MIPS Technologies (MIPS)	Silicon Graphics (SGI)	4/21/98	6/29/98	0.852	0.008	0.114	0.138
Palm (PALM)	3Com (COMS)	12/13/99	3/1/00	0.943	0.224	1.622	1.234
Sabre Group Hldg (TSG)	AMR (AMR)	8/8/96	10/11/96	0.822	0.038	0.165	0.160
Sterling Commerce (SE)	Sterling Software (SSW)	12/20/95	3/8/96	0.816	0.079	0.750	0.763
Stratos Lightwave (STLW)	Methode Electronics (METHA/B)	4/14/00	6/26/00	0.843	0.381	1.183	1.170
Thermo Fibergen (TFG)	Thermo Fibertek (TFT)	7/3/96	9/13/96	0.680	0.038	0.193	0.139
ThermoQuest (TMQ)	Thermo Instrument Sys (THI)	1/16/96	3/19/96	0.929	0.153	0.209	0.196
Thermo Sentron (TSR)	Thermedics (TMD)	2/1/96	3/27/96	0.709	0.187	0.105	0.108
Unigraphics Sols (UGS)	EDS (EDS)	3/19/98	6/17/98	0.862	0.013	0.022	0.021
Williams	Williams	4/9/99	9/30/99	0.853	0.028	0.682	0.786

**Appendix B. Equity Carve-out Control Sample Summary of Non-Emerging Industries**

Subsidiary	Parent	Filing Date	Offer Date	Fraction Retained	Book Value Ratio	Market Value Ratio	
						Offer Date	Month 1 (Mean)
Abercrombie & Fitch (ANF)	Limited (LTD)	7/17/96	9/25/96	0.842	0.011	0.146	0.149
Am States Fincl (ASX)	Lincoln National (LNC)	3/15/96	5/22/96	0.833	0.017	0.113	0.114
Assoc. 1st Capital (AFS)	Ford Motor (F)	2/9/96	5/7/96	0.807	0.016	0.254	0.256
Atria Communities (ATRC)	Vencor (VC)	6/26/96	8/20/96	0.631	0.026	0.033	0.034
B A Merchnt Services (BPI)	BankAmerica (BAC)	10/11/96	12/18/96	0.652	0.0003	0.001	0.001
Conoco (COC)	DuPont (DD)	7/29/98	10/22/98	0.695	0.199	0.164	0.167
Convergys (CVG)	Cincinnati Bell (CSN)	5/26/98	8/12/98	0.913	0.408	0.582	0.551
Delphi Auto Sys (DPH)	General Motors	11/16/98	2/4/99	0.801	0.018	0.035	0.035
Hartford Life (HLI)	ITT Hartford Group (HIG)	2/10/97	5/21/97	0.814	0.012	0.392	0.405
Infinity Broadcasting (INF)	CBS (CBS)	9/18/98	12/9/98	0.818	0.360	0.523	0.567
Metris (MTRS)	Fingerhut (FHT)	8/26/96	10/25/96	0.831	0.084	0.229	0.264
Midway Games (MWY)	WMS Industries (WMS)	9/13/96	10/29/96	0.868	0.223	0.907	0.990
Modem Med. Poppe T (MMPT)	True North Communications (TNO)	11/27/98	2/5/99	0.508	0.027	0.031	0.066
Monterey Resources (MRC)	Santa Fe Energy R (SFR)	9/18/96	11/13/96	0.828	0.131	0.550	0.553
Omega Protein (OME)	Zapata (ZAP)	1/27/98	4/2/98	0.597	0.270	0.724	0.773
Priority Healthcare (PHCC)	Bindley West Industries (BDY)	8/27/97	10/23/97	0.836	0.039	0.123	0.113
Republic Services RSG)	Republic Industries (RII)	5/13/98	6/30/98	0.639	0.057	0.114	0.113
Ryerson Tull (RT)	Inland Steel Industries (IAD)	5/7/96	6/20/96	0.867	0.166	0.575	0.572
Shochet Holding (SHOC)	Firebrand Financial (FFGI)	12/8/99	3/15/00	0.535	0.088	0.162	0.125
Southern Pacific Fund (SFC)	Imperial Credit (ICI)	4/5/96	6/13/96	0.584	0.019	0.065	0.059
TransAct Technologies (TACT)	Tridex (TDX)	6/27/96	8/22/96	0.803	0.325	0.692	0.713

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