A Motivational Study Of Off-Balance Sheet Financing: The Case Of Research And Development Limited Partnerships

THOMAS M. CARMENT
College of Business & Industry
Northeastern State University
Tahlequah, OK 74464

HAMID POURJALALI
School of Accountancy
University of Hawaii at Manoa
Honolulu, HI 96822

DAVID A. DURKEE
School of Accountancy
College of Business and Economics
Weber State University
Ogden, UT 84403-3803

This research was supported in part by grants from the Faculty Research Committee of Northeastern State University and the University of Delaware. We wish to acknowledge the helpful comments and suggestions received from Terry Shevlin, Partha Sengupta and the Oklahoma State University School of Accounting Workshop.

Received on February 20, 2001. Final version was accepted on December 12, 2001.

The announcement of a research and development arrangement represents a new class of claims entering the market and signals additional future research and development. The purpose of this paper is to explain the differences observed in the magnitude of abnormal returns of the sponsor firms.A previous study (Durkee and Carment, 1999) indicates that the unexpected positive return of the sponsor firms on the day before public announcement (event day -1) is highly significant using a two-tailed t-test. This evidence is consistent with the proposition that the voluntary announcement of an R&D limited partnership results in an increase in the wealth of the common shareholders of R&D sponsor firms. The results of this study indicate that the abnormal returns are more fully explained when some measures of risk associated with sponsor companies are included.

THE MID-ATLANTIC JOURNAL OF BUSINESS
Volume 37, Number 4, December 2001

AUTHORS IN THIS ISSUE

Professor Hamid Pourjalali is the Director of the School of Accountancy at the University of Hawaii at Manoa. He has been at the University of Hawaii since the Fall of 1996 and is a professor of Financial and Managerial Accounting. He has served in other capacities such as Director of Leadership for Healthcare Providers and Acting Director of the Japanese/Chinese focused MBA program. His areas of expertise are Financial Accounting, Managerial Accounting, and International Accounting.

David Durkee is an associate professor of accounting at Weber State University in Ogden, Utah, where his major concentration is international and financial accounting. He previously taught at the University of Delaware. Prior to receiving his Ph.D. from Oklahoma State University, he worked for Andersen.

Professor Thomas Carment is the Department Chair of Accounting and Finance at Northeastern State University (Oklahoma). He has been at Northeastern State University since the fall of 1979 and is a professor of Accounting. He served previously as Director of the MBA program. His areas of expertise are Financial, Managerial and Governmental Accounting. Carment is a member of the AAA, IMA and AICPA.

Mike Schraeder has been a graduate research assistant for the Thomas Walter Center for Technology Management at Auburn University since August 2000. His research interests include employee attitudes in the midst of strategic and technological changes. He recently completed his PhD. in management at Auburn University. In addition to the PhD., Mike has a Bachelor of Arts in Education (1989) from the University of Wyoming, an MBA from Auburn University-Montgomery (1994) and a Masters of Science degree in human resource management from Auburn University (2000).

Dr. Jeffrey M. Humphreys is director of the Selig Center for Economic Growth and director of Economic Forecasting in the Terry College of Business at the University of Georgia. He has published over 150 articles regarding the buying power of racial and ethnic groups, economic forecasting, economic impact, retailing, the hospitality industry, transportation, and economic development. In addition to his responsibilities at the University of Georgia, Dr. Humphreys writes a column for a leading business magazine, serves on several boards, and works as a private consultant in economic and marketing research.

David R. Kamerschen is a Distinguished Professor of Economics and Jasper N. Dorsey Chair holder at The University of Georgia. He earned his PhD from Michigan State University. Professor Kamerschen is the author or editor of 10 different books, some with several different editions. He has also penned about 195 articles in professional journals. He has been selected for inclusion in all three editions of Who's Who in Economics: A Biographical Dictionary of Major Economists, which include biographies of the 675-1000 most cited living economists as determined by the Social Sciences Citation Index.

The market reacts more positively toward those firms that are expected to survive. This observation is notable because the market reaction to the issuance of R&D contracts may also be used (to some degree) as predictive of the future survival of the sponsored firms.

Introduction

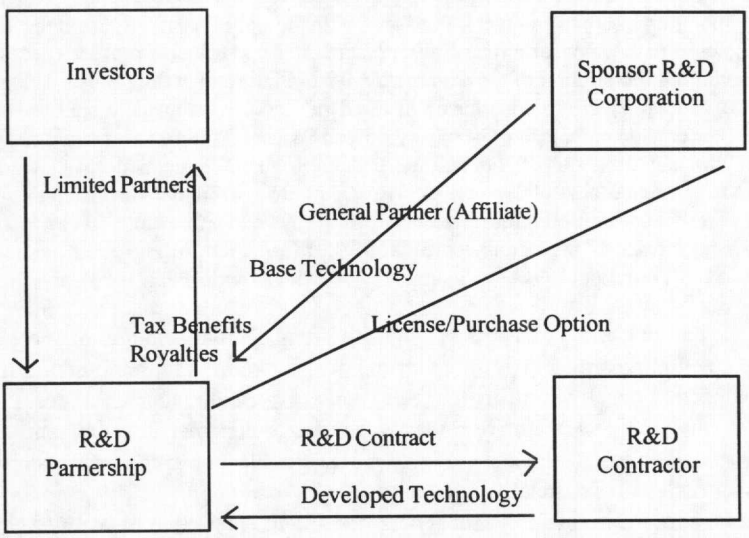
When a sponsoring firm forms a Research and Development Limited Partnership (RDLP) with investors, it transfers the right to certain existing base technology to the RDLP in return for managerial control (as general partner) and the right to purchase the technology developed by the RDLP. The RDLP is a contract between the sponsor and limited partners. When the RDLP contract is executed, it typically specifies that the sponsor, which has the basic technology for a particular project, is the general partner and manages the R&D activities for a fee. Research and development (R&D) activities of the partnership may be contracted out or performed by the sponsor or an affiliate of the sponsor. The limited partners contribute cash in return for a share in financial benefits of partnership activities (e.g., tax credits and deductions, and income from developed technology). The contract creates claims against assets transferred by the general and limited partners. RDLPs are significant because they enable investors to focus their funds into specific business activities, giving the marketplace greater control over the resources of the firm, while firm is able to share the risk associated with R&D activities. Unlike the management of corporations, the general partner of an RDLP has limited discretion over investment and dividend policies, since cash flow is usually strictly monitored in accordance with prearranged agreements among the partners. A typical RDLP relationship is illustrated in Figure 1.

Assuming market efficiency, the announcement of a firm's R&D arrangement may be used by common stock investors as a signal that alters their beliefs about the probability of future returns. Shevlin (1991) uses an option pricing framework and finds results that are consistent with investors capitalizing in-house R&D. His results are also consistent with investors viewing RDLPs as giving rise to both a debt obligation and an asset of the sponsoring R&D firms and increasing the market value of the equity of the R&D firms. Durkee and Carment (1999) are consistent with Shevlin (1991) and show a significant and positive market reaction by sponsoring R&D firms to the announcement of RDLPs.

However, the degree of this reaction should also be related to the firms' specific conditions. That is, we cannot expect that mere disclosure of RDLPs would result in a change in the market's evaluation of future cash flows. Other factors in addition to this disclosure should also be effective. For example, there is evidence that the previous level of firms' involvement in Research and Development Shevlin (1991) affect the firms' market value. In this paper we hypothesize that the perceived risk of firms and their leverage level are also possible factors affecting the degree and amount of abnormal returns. Our findings will provide evidence as to which of these factors best explain the magnitude of the market reaction to the announcement of RDLPs.

Four additional sections follow. The variables and model specification with the related authoritative and research literature are discussed next. Section three pre-

Figure 1
Structure of R&D Royalty Parnerships



Source: Shevlin (1987, 3, 483)

sents particulars of our test methods. Test results are presented and discussed in section four. Section five contains a discussion of the results and concluding comments.

Variables and Model Specification

With Statement of Financial Accounting Standards (SFAS) No. 68, "Research and Development Arrangements" (1982), the FASB concluded that accounting treatment depends on who bears the financial risk among the parties to the R&D contract. The sponsoring firm must continue to expense R&D outlays in accordance with SFAS No. 2, "Accounting for Research and Development Costs" (1974) where the risk of failure is not actually transferred to others. Where risk is transferred, the arrangement is treated for accounting purposes as a contract for services, with the additional requirement that terms be disclosed in the sponsor's financial statements. The RDLP also provides necessary funds without the dilution of the existing ownership interests in the sponsor (Peters & Fusfeld, 1986, p. 7). Prior studies have addressed the market reaction to the announcement of R&D information. Canibano, Garcia- Ayuso, and Sanchez (2000) give an excellent literature review and discussion of prior research and development studies and current working papers. Canibano et al, (2000) conclude, "R&D has always found to be related to subsequent earnings and stock returns reactions" (p. 124). Several prior studies have addressed the market reaction to the announcement of R&D information. Among these studies are Zantout and Tsetsekos (1994), Sougiannis (1994), Megna and Klock (1993), and Bushee (1998).

Zantout and Tsetsekos (1994) show that announcements of increased R&D spending exert significant abnormal positive returns for announcing firms and abnormal negative returns for their rivals at the announcement date. These results, they suggest, stem from the widespread belief that R&D expenditures automatically translate into the production of profitable innovations that endow the sponsor firm with a competitive advantage in its market niche. This competitive advantage for the innovating firm is regarded as a threat to rival firms and a signal of impending financial decline for these rivals that lack the innovative edge.

Sougiannis (1994) examined the long-term effect of R&D expenditures on earnings and market value of equity. His results illustrate that on average, a one-dollar increase in R&D expenditures results in a two-dollar increase in profit and a five-dollar increase in market value over a seven-year period (page 44). Similarly, the study by Megna and Klock (1993) depicts the effect of R&D on the valuation of a firm. Their study sought to determine the correlation between intangible assets and the q ratio that is defined as "the ratio of the market's valuation of the financial claims on a firm to the cost of replacing that firm's asset" (page 265).

The intangible assets considered in the study included a company's stock of patents, a company's stock of R&D, rivals' patents, and rivals' R&D. They found that R&D and patent ownership play a role in a firm's market valuation. As in the Zantout and Tsetsekos (1994) study, R&D and patent ownership by one firm influenced the valuation of competing firms as measured by the q ratio. Patent ownership negatively affected the

q ratio of rival firms. However, R&D of a firm showed a tendency to positively affect the q ratio of rival firms. They suggest that this observation could be attributed to the " conventional wisdom that knowledge from R&D... is frequently transferred by defecting employees to rival companies" (page 269).

Bushee (1998) provides evidence that managers are less likely to cut R&D when other institutions with long-term earnings goals invest in the company. On the other hand, he suggests that managers of those firms that are invested by institutions with transient ownership characteristics (such as high portfolio turnover) reduce R&D to boost earnings. An RDLP is similar to a situation in which the investor invests in a company with long-term earnings goals, which should result in a higher degree of R&D involvement by the management and consequently should be considered favorably by the market.

Aboody and Lev (2000) state" R&D is unique (firm-specific) relative to other forms of capital. It is not traded in organized markets and disclosure in corporate reports about the productivity and value of R & D activities is deficient relative to the disclosure of tangible and financial assets." (p.2765). Aboody and Lev (2000) cite their prior research stream that indicates changes in disclosed R&D expenditures are positively associated with stock returns. They find results that are consistent with the proposition of insider gains from R&D information asymmetry.

Durkee and Carment (1999) results are consistent with the proposition that common shareholders revised their expectations of future cash flows upward with the announcement of an RDLP. Another aspect of RDLPs is that unlike common stock, revenue sharing and distributions to the partners are established by contract rather than by the discretion of management and the Board of Directors of the sponsoring firm. The RDLP protects limited partners by limiting risk to their invested capital, but it restricts them to the potential benefits of a particular R&D program, a defined pool of resources which they control through the partnership agreement. Given this limitation, why do sponsor firms enter into RDLPs? We suggest several possible explanations.

First, there may be limitations on the ability of sponsoring firms to raise capital. For firms that are close to their debt covenants, issuing new shares may be a more feasible option than debt financing. But, issuing new shares increases a firm's cost of capital and reduces the current stockholders' future cash flow resulting from research and development efforts. Therefore, financing arrangements such as RDLPs which neither impact debt covenants nor restrict additional equity capital are attractive financing alternatives. The funds in RDLPs are not regarded as debts of the sponsor. This factor may be especially important in allowing sponsor firms to remain compliant with debt covenants or enable them to attain improved terms on loans that are up for renegotiation. Beatty, et al. (1995) suggest that imminent renegotiation of debt may have played a major role for a number of RDLPs (page 429). In effect, an RDLP increases the investment opportunity set of sponsoring firms by providing low-cost financing. RDLPs also enable sponsor companies to list R&D costs off balance sheet.

Second, size of the sponsoring firm may also have a predictable effect on security returns. The relationship between earnings reports and security price behavior is well known. Differences in security price reactions to announcements have been linked

previously to the size of companies. Evidence in Atiase (1985), for example, shows that the amount of private pre-disclosure information production and dissemination varies directly with firm size. Also, Banz (1981) finds that small firms have higher risk-adjusted returns, on average, than average-size or large firms. He suggests one explanation may be that "lack of information about small firms leads to limited diversification and therefore to higher returns for the 'undesirable' stocks of small firms" (p. 17). These findings imply a greater security price reaction to the "good" news of an RDLP announcement by smaller firm sponsors.

Size may also proxy for factors other than pre-disclosure information dissemination and risk. The fact that RDLP sponsors tend to be small may suggest that RDLPs offer differential benefits (e.g., more tax benefits). In addition, RDLPs are a more significant source of financing for smaller firms than they are for larger firms. We make no attempt here at separating these effects. However, we test to see if the magnitude of the abnormal return can be explained by the company size. We expect a negative relationship between the size and the extent of abnormal returns.

Third, it is intuitive that when a company transfers some of the risk involved in Research and Development projects to others through RDLP's contracts, the market reacts positively. The degree of this reaction should be stronger for firms that are able to transfer more risk than for other firms.

Fourth, similar to past R&D expenditures, it is possible that firms with high-level investment in Property, Plant, and Equipment (PPE) are more able to carry out future research. If this proposition holds, then we expect that the sponsor-firm's prior-investment in PPE expenditures may also provide positive signals to investors in RDLPs (such as improved probability of successful research).

Fifth, there is evidence that tax considerations are a partnership-promoting factor. Shevlin (1987) suggested negative signaling for the sponsoring firm because the future tax benefit would be transferred from the firm to the RDLPs investors. However, tax considerations are not the primary driving force behind RDLP formation (Beatty et al., 1995). Beatty et al. (1995) report that the formation of RDLPs was not significantly affected by the passage of the Tax Reform Act of 1986, which reduced the tax benefits associated with coupling passive activity losses to passive activity gains (pages 413, 429).

Firms enjoying a low marginal tax rate (MTR) are expected to comprise a larger proportion of RDLP companies. The value of higher earnings figures is thought to be a greater benefit than the tax deductibility of R&D for low MTR firms that have a relatively small tax liability (Beatty, Berger, and Magliolo, 1995). Investors with higher MTRs who value the tax deductibility and wish to offset gains with the initial losses usually generated in RDLPs are the predicted partners of low MTR firms in the R&D partnership (Beatty et al, 1995). Given that the market acts rationally, investors in RDLPs enter into the contract expecting future earnings/cash flows from the tax benefits of a shift in R&D deductions. As a consequence, the cost of financing R&D in RDLPs becomes lower since investors receive tax benefits from entering into RDLP contracts. These tax benefits have been addressed in prior studies (e.g. Shevlin 1987). Since the marginal tax rate of investors in RDLPs is not available, the effect of these benefits on the magnitude of the abnormal

returns is not addressed in this study.

Method

The event of interest in this study is the first public announcement by a sponsor of an R&D arrangement. Using the reporting requirements of SFAS 68, the NAARS financial statement database was examined to search the financial statements of firms sponsoring RDLPs. The test period selected includes 1980 through 1987. Nakamura (1999) shows that this period contains a macroeconomic cycle of both increasing and decreasing book and R&D adjusted economic profits. Although SFAS 68 requires sponsors to make financial statement disclosure of R&D arrangements entered into after December 31, 1982, sponsors often made such disclosures voluntarily for earlier periods. Once R&D arrangements were identified, we requested sponsor firms to send us the date of the first public disclosure of the R&D arrangement and a copy of the first press release, if available. Two follow-up requests were mailed to firms not responding.

A search of NAARS yielded a total of 106 firms sponsoring R&D arrangements during the test period. A total of 48 firms (45 percent) responded to our requests for information. The responses were then analyzed on a firm-by-firm basis to determine which were usable. Ten firms were eliminated because their R&D arrangements did not meet the SFAS 68 definition. Seven firms were eliminated because adequate market price information was not available for the estimation and test periods. Five firms indicated that their R&D arrangements were private placements with no public disclosures. Ten additional RDLPs were eliminated because other events announced during the RDLP announcement period were considered to be potentially confounding (from a search of the Wall Street Journal Index). The selection criteria left a total of 26 sponsor firms and a final sample of 44 R&D arrangements. Announcement dates range from the earliest on August 22, 1982 to the latest on June 15, 1987. Announcement dates were distributed as follows:

Year	Number of Announcements
1980	1
1982	6
1983	11
1984	13
1985	4
1986	4
1987	5
	44

Table 1 presents a reconciliation of sample size. The final sample of 39 observations (5 firms didn't have stock price information on CRSP) meets the following

Table 1
Reconciliation of Test Portfolio

	Total Firms	Total R&D Arrangements
Number of firms sent requests for information on R&D arrangements	106	
Number of firms responding	48 (45%)	
Number of firms whose R&D arrangements did not meet the SFAS 68 definition (joint ventures etc.)	10	
Number of firms excluded because of incomplete market information	7	
Number of firms whose R&D arrangements were private placements with no formal public announcement preceding the publcation of financial statements	5	
Preliminary totals	26	54
R&D arrangements excluded because of confounding events in the test period or because they did not meet the SFAS 68 definition	--	10
Number of observations for which the market data is available	26	44
Number of observations for which the COMPUSTAT data is available	24	39
Number of observations for which the ZETA value is available	17	28

Table 2
Summary of Standard Industrial Classification (SIC)
Codes of Firms Sponsoring R&D Arrangements in Test Portfolio

Number of Firms/ R&D Arrangements	The first Two-Digit SIC Code of Sponsor Firms	SIC Description
7/18	28	Chemicals and allied products
3/3	35	Machinery except electrical
2/3	36	Electrical Machinery
10/16	38	Instruments and related products
2/2	73	Business services
2/2	87	Engineering, Accounting, Research, Management Services
26/44		

criteria:

1. RDLPs are disclosed in the sponsor's financial statement footnotes available in the NAARS database.
2. The date of the first public announcement of the RDLP can be determined.
3. The common stock of firms sponsoring RDLPs was traded actively and trading information is available in machine-readable form from the CRSP database.

The RDLPs included in the sample tend to be sponsored by small publicly traded firms. The average total assets on the year before the announcement for the sample was only 405 million dollars. The potential for observable market reaction to a public announcement is more likely for smaller firms, where RDLPs represent a significant form of financing. Table 2 is a summary of the Standard Industrial Classification (SIC) codes of sponsor firms in the sample. Table 3 provides Statistics of selected variables for the sample firms.

Durkee and Carment (1999) test the increase in the wealth of existing shareholders of sponsoring firms when RDLPs were first announced publicly by calculated the average amount of return around the announcement date of RDLPs (to see if they were statistically different from zero for both the unadjusted returns and market adjusted returns). They did not use the market model because of several problems in applying it to the sample. Most firms in the sample (the same sample as this study) are over-the-counter firms and the market model does not perform well for over-the-counter firms. Beta estimates are biased due to thin trading (McInish and Wood 1985). Brown and Warner (1980) examine the econometric properties of several models and conclude that the Market Adjusted Returns approach is as likely to detect abnormal performance as the market or Risk Adjusted Returns approach when applied in event time. Lys and Sivaramakrishnan (1987) also find their results to be insensitive to whether raw returns or market model excess returns are used as a measure for the information inferred by investors from the equity-for-debt swap transaction.

The market adjusted return for security i at day t is calculated as

$$a_{i,t} = R_{i,t} - R_{m,t} \qquad (1)$$

where $R_{m,t}$ is the return on the CRSP NASDAQ Composite return for day t and $R_{i,t}$ is the return for security i at day t. The cumulative excess returns (CER) for portfolio m during the event period are calculated as

$$CER_i = Sa_{it} \qquad (2)$$

where t is an appropriate time period around the event date for security i.

The objective of this paper is to find explanations for differences observed in

CERs. Given the description provided in section two above, size and closeness to debt covenants may be amongst the reasons for these differences. We used the log of total assets and debt-to-equity ratios for the fiscal year preceding the event date are used as measures of size and closeness to debt covenants, respectively.

We included the value for Zeta® as an indication of financial difficulties for the firm prior to entering the RDLP contract. Altman (1983) built a discriminate function using financial variables. The discriminate scores (named Z scores) measure the degree of financial distress. Zeta® values are computed in a similar way by Zeta® Services, Inc. and are used as a measure of financial distress. As Zeta® decreases, financial distress increases.

In addition, we included a dummy variable that shows weather the firm survived as an independent entity and continued being traded in the capital market until December 31, 1997. We included this variable to capture the effect of other information that was unavailable to us (i.e., could not be measured or collected) but that the market incorporated in the valuation of RDLPs. Our assumption is that the market is efficient enough to predict the risk associated with the company's going-out-of-business ex-ante and the abnormal returns can signal this efficiency. Our expectation is that the abnormal return has a positive association with the firm's expected survival and an ex-post dummy variable can measure this effect.

Furthermore, both the amount and the log of Research and Development and (the net value of) Property, Plant and Equipment as reported in financial statements of the sponsor company in the year before the RDLP's announcement were included in the model. If our prediction is correct, there is a positive association between the value of these variables and the magnitude of abnormal returns surrounding the RDLP announcements. To test whether outliers drive any significant differences, the tests were repeated with outliers removed.

Results

Table 4 provides statistical information regarding the test of mean of returns in the sample. Furthermore, Table 4 reports the averages of market-adjusted returns using three different measures for overall market performance (market-adjusted for value-weighted-return—including all distributions—, for equal-weighted-return —including all distributions—, and for Return-Composite-return). In all cases, but one, the means are statistically different from zero at .05 level (in one case the mean is significant at 0.1 level). Given that the results are independent of the market measure used, we will continue to use only one market indicator (NASDAQ Composite return) for our future tests. We chose this measure since most of the firms in the sample are traded over-the-counter.

We used regression analysis to test the effect of variables mentioned in Section 3 above. However, the sample size is not large enough to accommodate all independent variables suggested in this study at once. We decided to test our hypotheses by including only a few of the variables in the model to determine if those included can explain the variation in returns.

Table 3
Statistics of selected variables for the sample frims in the year before the announcement of RDLP

Variable*	N	Mean	Std Dev	Minimum	Maximum
Property, Plant and Equip. Net	39	12.5174	31.2843	0.125	103
R&D expense	39	85.9267	197.5154	0.686	648
Total Assets	39	249.256	559.0124	2.593	1842
Market value of company	37	405.2547	732.6595	2.336	2405.54
Total Liability	39	104.5413	255.6575	0.797	840
Total Debt	39	48.322	117.7415	0	388
Tax Rate (%)	39	0.1391	0.5302	0	0.7417
Debt to Equity Ratio	39	0.3575	0.6285	0	3.5463
Growth Rate	37	3.026	2.451	0.3312	9.8291

*All Variables are reported for the year before the announcement of RDLPs.
Debt-to-Equity = (Total Debt/(Total Assets - Total Debt));
Growth Rate = (Market value of company/(Total Assets - Total Debt))

Table 4
Average return for sample companies and its difference with the three market returns for days prior to announcement of RDLPs (numbers in parentheses represent standard deviations)

	Cumulative Return (total days -2,-1,0)	Cumulative Return (total days -1,0)	Average Return in day 0
Sample firms	0.020*	0.016*	0.012*
	(0.051)	(0.047)	(0.033)
Difference with the Value Weighted Return (including all distributions)	0.017*	0.013*	0.01*
	(0.048)	(0.044)	(0.032)
Difference with the Equal Weighted Return (including all distributions)	0.018*	0.014*	0.010*
	(0.049)	(0.046)	(0.033)
Difference with the NASDAQ Composit Return	0.017*	0.013*	0.009
	(0.048)	(0.044)	(0.032)

Number of observations: 44
*All significantly different from zero (at least at 0.05 level)

First, we tested the correlation among the independent variables by using the Pearson Correlation Coefficients test. The results of our test are provided in Table 5. Most of our independent variables are significantly correlated with one another. For example, there is a high degree of correlation (at 0.001 level) between debt-to-equity ratio, Log of total assets, and Zeta®. This correlation is expected. While the method of calculation of Zeta® is not publicly known, one can expect to find a negative correlation between this variable and debt-to-equity ratio and a positive correlation with total assets (as found in Table 5). In general, higher leveraged companies are considered riskier, and larger companies have a better chance of survival. The same variable is also significantly correlated with the log values of R&D and PPE. As can be expected, R&D and PPE values are also correlated with the total assets. The Survival Effect dummy variable ("one" if the company continued being traded until December 31, 1997, otherwise, "zero") is correlated with only the log of R&D at the 0.02 level. This suggests that those firms that were more involved with R&D had a better chance of survival than others.

Three different measures of Cumulative Excess Returns (CER) were used as the dependent variable. CUM_2 represents the total returns for two days prior to and the day of announcement. CUM_1 represents the total returns for the day prior to and the day of announcement. And finally CER_0 represents the total returns for the day of announcement. Neither debt-to-equity ratio nor log of total assets explains the magnitude of the CERs observed surrounding the RDLP announcement date. To test the effect of debt covenants and size, we included the values for debt-to-equity ratio and log of total assets as explanatory variables.

Our evidence suggests that the magnitude of returns is independent of the size and debt-to-equity ratio of the company.

To test the effect of remaining variables, again we used the three measures of Cumulative Excess Returns (CER_0, CUM_1, or CUM_2) as the dependent variable and log of R&D, log of PPE (RND, and PPEG) for the year prior to the announcement of RDLPs, Zeta® (ZETA) and the survival variable (SER) as independent variables. The model is summarized below:

$$\text{Model: } CER_0, CUM_1, \text{ or } CUM_2 = \text{INTERCEPT} + ZETA_{t-1} + SER + RND_{t-1} + PPEG_{t-1}$$

Furthermore, two different values for excess returns were used: the market-adjusted returns and unadjusted returns. This resulted in testing the three models in 2 different settings (total of six regression analysis). The results are reported in Tables 6, 7 and 8 below. It is interesting that the degree of significance is higher when the market-adjusted returns (versus unadjusted returns) are used as dependent variables. Table 9 provides a summary of this information for comparison purposes. In general, we find that log values of R&D and PPE may be determinants of the magnitude of returns on market reaction to RDLP.

We predicted a positive relationship between the magnitude of returns and R&D and PPE. However, PPE continues to show a negative and significant relation with the magnitude of returns in most cases. To be sure that our results are not affected by the

Table 5
Pearson Correlation Coefficients (Prob > [R] under Ho: Rho=0)/number of observations for some selected variables considered in this study

	Zeta	Survival Effect	Log of R&D	Log of Gross PPE	Log of total assets	Log of Total Debt
Survival Effect (SER)	0.30074 0.1274 27					
Log of R&D (RND)	0.64 0.0008 24	0.36144 0.0238 39				
Log of Gross PPE (PPE)	0.66502 0.0004 24	0.30662 0.0576 39	0.94716 0.0001 39			
Log of total assets	0.70921 0.0001 24	0.28399 0.0798 39	0.95215 0.0001 39	0.92895 0.0001 39		
Log of total Debt	0.24948 0.4111 13	0.04759 0.8334 22	0.67026 0.0017 19	0.73918 0.0003 19	0.72515 0.0004 19	
Debt-to-Equity Ratio	-0.53691 0.0068 24	0.08057 0.6258 39	-0.0468 0.7772 39	-0.00921 0.9556 39	-0.16828 0.3058 39	0.05406 0.826 19

Zeta(R) = Zeta(R) values are computed by Zeta(R) Services, Inc. and are used as a measuer of financial distress. As Zeta(R) decreases, financial distress increases.
(SER) or Survival Effect = Dummy variable. "One" if the company continued being traded until December 31, 1997, otherwise, "zero."
(RND) or Log of R&D = Log of Research and Development expenditures in the year proceeding to RDLP announcement.
(PPEG) or Log of Gross PPE = Log of Gross property, plant, and equipment balance in the year proceeding to RDLP announcement.
Log of total assets = Log of Total Assets balance in the year proceeding to RDLP announcement.
Log of Total Debt = Log of Total Debt in the year proceeding to RDLP announcement.

Table 6
Regression analysis for Return on day 0

Model: $CER_0 = INTERCEPT + ZETA_{t-1} + SER + RND_{t-1} + PPEG_{t-1}$
Number of observations: 24

Panel A: Market Return Adjusted

INTERCEP	ZETA	SER	RND	PPEG
-2.34	0.25	1.423	1.986	-2.105
0.0304	0.8053	0.1709	0.0616	0.0488
R-square	0.2765			
Adj R-sq	0.1241			

Panel B: Unadjusted returns

INTERCEP	ZETA	SER	RND	PPEG
-1.612	0.499	1.286	1.422	-1.586
0.1234	0.6232	0.2137	0.1712	0.1292
R-square	0.2053			
Adj R-sq	0.0380			

Table 7
Regression analysis for Returns for days -1 and 0

Model: $CUM_1 = INTERCEPT + ZETA_{t-1} + SER + RND_{t-1} + PPEG_{t-1}$
Number of oberservations: 24

Panel A: Market return adjusted

INTERCEP	ZETA	SER	RND	PPEG
-3.567	-0.792	3.629	2.983	-3.018
0.0021	0.4384	0.0018	0.0076	0.0071
R-square	0.5751			
Adj R-sq	0.4857			

Panel B: Unadjusted returns

INTERCEP	ZETA	SER	RND	PPEG
-2.622	-0.274	3.276	2.178	-2.288
0.0168	0.7869	0.004	0.0422	0.0338
R-square	0.4862			
Adj R-sq	0.3780			

Table 8
Regression analysis for Cumulative Returns for days -2, -1, and 0

Model: $CUM_2 = INTERCEPT + ZETA_{t-1} + SER + RND_{t-1} + PPEG_{t-1}$
Number of observations: 24

Panel A: Market return adjusted

INTERCEP	ZETA	SER	RND	PPEG
-3.432	-1.715	2.873	3.435	-3.314
0.0028	0.1026	0.0097	0.0028	0.0036

R-square 0.5749
Adj R-sq. 0.4854

Panel B: Unadjusted returns

INTERCEP	ZETA	SER	RND	PPEG
-2.285	-0.655	2.255	2.344	-2.447
0.034	0.52	0.0361	0.0301	0.0243

R-square 0.4133
Adj R-sq. 0.2898

Table 9
Comparitive Adjusted R^2 for different
models reported in Tables 6, 7, and 8 above

Panel A: Market return adjusted

Dependent Variable	Model	$ZETA_{t-1} + SER + RND_{t-1} + PPEG_{t-1}$ (n=24)
CER_0		Adj $R^2 = 0.12$
CUM_1		Adj $R^2 = 0.49$
CUM_2		Adj $R^2 = 0.49$

Panel B: Unadjusted returns

Dependent Variable	Model	$ZETA_{t-1} + SER + RND_{t-1} + PPEG_{t-1}$ (n=24)
CER_0		Adj $R^2 = 0.04$
CUM_1		Adj $R^2 = 0.38$
CUM_2		Adj $R^2 = 0.29$

high correlation between R&D and PPE, we tested the model by including only the log of PPE. The negative sign of the PPE coefficient continued; however, the variable became statistically insignificant in most cases. It is possible that the market does not consider the high degree of investment in PPE as an indication of future successful efforts in Research and Development. Another explanation could be that investors in RDLPs have a larger income deduction (or tax savings) when the RDLP needs to obtain its own PPE rather than obtaining it from the sponsor firms. We do not have any strong evidence supporting either of these arguments.

Another interesting finding in Tables 7 and 8 is that SER (survival effect) is significant in all models. As expected, the market is able to anticipate the possibility of firms' survival and shows a more positive reaction to good news for those firms that were still being traded on December 31, 1997 (the last day for which CRSP data was available).

Further Analysis and Concluding Remarks

Durkee and Carment (1999) have provided strong evidence of positive market reaction for firms who sponsor RDLPs. In this study, we attempted to determine if investors view RDLP more positively for smaller firms, given that the RDLP financing is a more significant source of financing for smaller firms and the fact that the market is more volatile for smaller firms. The results based on our sample, however, are not strongly supportive of this conclusion. We found no significant reaction for firms with higher debt-to-equity ratios.

Several possible explanations related to this finer partitioning of residual claims may account for positive excess returns to the sponsor at the RDLP announcement. Risk sharing, the parsing out of tax benefits to limited partners, future dividend signaling, reduction of asymmetric information, and off-balance-sheet financing may explain the result.

It may be that sponsor firm shareholders view the RDLP positively because the partitioning of residual claims, in effect, shifts the risk of R&D projects to other parties who are more efficient in bearing risk. This argument is weakened somewhat by the fact that risk-averse, limited partners will demand risk premiums for risky projects, increasing the cost of limited partnership funds to the RDLP sponsor. However, we were able to provide evidence that the risk associated with the sponsor company itself, has been a factor for the magnitude of returns on the announcement of RDLPs.

The parsing out of tax benefits is also relevant since tax benefits allocated to limited partners are an implicit part of their risk premium. A reasonable assumption is that these tax benefits are a major motivation for limited partners to invest in an RDLP. The amount of R&D could signal the extent of mentioned tax benefits, and our results strongly supported this proposition.

It is difficult to test weather the announcement of an RDLP is a dividend-signaling event, given the fact that most R&D projects will produce cash inflow in several periods after they actually start. Furthermore, dividend policy can be changed as a result of several factors other than the results of RDLP contracts. We tried to see weather the

dividend policy of the sponsor firms changed in the year following the announcement date. Based on our findings, it is doubtful that RDLPs affect the dividends policy of sponsor firms in the year following RDLP contracts.

The market may be motivated partially by the expansion of the opportunity set (through availability of new information) implicit in the announcements of RDLPs. A review of the announcements indicates that data related to the base technology is commonly included with the RDLP announcement itself (i.e. announcements of the proposed development of technology, extensions of existing technology to new products or markets, and general statements of objectives). The question of whether this is a reduction of asymmetric information is difficult to answer conclusively. However, it is intuitive to consider that investors in RDLPs become more informed regarding the growth possibilities of the sponsor firms before they enter into the contractual agreement.

Off-balance-sheet financing is one device employed by management to reduce the probability of violating debt covenants, which are based on balance sheet items such as leverage. Companies close to their debt covenants may avoid technical default with an RDLP because capital raised by the RDLP is not recorded as a liability on the sponsor's books. Results from testing leverage indicate no conclusive difference in market reaction between firms with high and low leverage. Since RDLP sponsors are typically small, high tech companies, technical loan default may be less of a problem to them than their inability to obtain initial capital through more traditional financing (regardless of existing leverage).

Our results also indicate that those firms with higher levels of Research and Development spending show a higher level of unexpected returns, while those firms with larger investment in gross property, plant and equipment show a lower level of unexpected returns. When some measure of risk of the sponsoring companies is included, the abnormal returns are better explained. The market reacts more positively toward those firms that survived (ex-post), as if the market can predict the survival of the firms ex-ante. This observation is notable because the market reaction to events such as the issuance of R&D contracts may also be used as (a part of) a predictive model for future survival of firms. Our results were inconclusive regarding the association of the magnitude of abnormal (or unexpected) returns with the size or debt-to-equity ratio of the sponsoring firms. Our study contributes to both accounting and finance literature with providing further evidence on association of non-financial and financial information and their effect on the announcement of good (RLDP) news. This study is important in that it can partially explain the magnitude of abnormal returns observed for the firms entering into RLPD contracts. However, there are several qualifications on interpreting these results.

Some limitations of market studies can also mentioned here, such as failure to identify the correct signal date and limited industry diversification. The sample is also biased since only those firms that announced their arrangements to the press were contacted. In addition, only those who responded to our requests were included. It is possible that the market reacted differently for those firms not included in our study.

Additionally, it is possible that we were not successful in eliminating confounding events in our study. While the Wall Street Journal Index was searched and some RDLPs were eliminated from the sample because of possible confounding events, con-

founding events for over-the-counter firms in the sample may not, of course, have been published in the Wall Street Journal.

References

Aboody, D., & Lev, B. (2000). Information asymmetry, R&D, and insider gains. *Jour nal of Finance*, 55(6), 2747-2766.

Altman, E. I. (1983). *Corporate Financial Distress,* New York, John Wiley.

Amir, E., & Lev B. (1996). Value relevance of non-financial information: The wireless communication industry. *Journal of Accounting & Economics*, 3-30.

Atiase, R. (1985). Pre-disclosure information, firm capitalization, and security price behavior around earnings announcements. *Journal of Accounting Research*, 21-36.

Banz, R. (1981). The relationship between returns and market value of common stocks. *Journal of Financial Economics,* 3-18.

Beatty, A., Berger, P.G., & Magliolo, J. (1995). Motives for forming research & development financing organizations. *Journal of Accounting & Economics*, 411-442.

Brown, S., & Warner, J. (1980). Measuring security price performance. *Journal of Financial Economics*, 205-258.

Bushee, B. J. (1998). The influence of institutional investors on myopic R&D investment behavior. *The Accounting Review*, 73 (3), 305-333.

Canibano, L., Garcia- Ayuso, M. & Sanchez, P. (2000). Accounting for intangibles: A literature review. *Journal of Accounting Literature*, 19, 102-130.

Durkee, D., & Carment, T. (1999). The market effect of a change in ownership claims: a test of research and development limited partnerships. *Pennsylvania Economic Review,* (2), 32-44.

Duke, J., & Hunt, H. (1990). . An experimental examination of debt covenant restric tions and accounting-related debt proxies. *Journal of Accounting & Econom ics,* 12, 45-63.

Financial Accounting Standards Board.(1974). *Accounting for Research and Development Costs, Statement of Financial Accounting Standards No. 2.*

Financial Accounting Standards Board (1982*). Research and Development Arrangements, Statement of Financial Accounting Standards No. 68.*

Lys, T., & Sivaramakrishnan, K. (1988). Earnings expectations and capital restructuring: The case of equity-for-debt-swaps. *Journal of Accounting Research*, 273-299.

McInish, T. H., & Wood, R.A. (1985). A new approach to controlling for thin trading. *The Journal of Financial Research*, 69-75.

Megna, P., & Klock,M. (1993). The impact of intangible capital on Tobin's q in the semiconductor industry, *AEA Papers and Proceedings*, 265-269.

Nakamura, L. (1999). Intangibles: What put the new in the new economy? *Business Review, Federal Reserve Bank of Philadelphia,* July/August, 3-16.

Peters, L. S., & Fusfeld, H.I. (1986). *Research and Development Limited Partnerships (RDLPs) and Their Significance for Innovation.* Center for Science and Technology Policy, New York University Graduate School of Business Administration.

Shevlin, T. J. (1987). Taxes and off-balance-sheet financing: Research and development limited partnership. *Accounting Review*, 62 (3), 480-509.

Shevlin, T. J. (1991). The valuation of R&D firms with R&D limited partnerships. *Accounting Review*, 66 (1), 1-22.

Sougiannis, T. (1994). The accounting based valuation of corporate R&D. *The Accounting Review*, 69, 44-68.

Zantout, Z. Z., & Tsetsekos, G.P. (1994). The wealth effects of announcement of R&D expenditure increases, *The Journal of Financial Research*, 205-216.

Endnotes

1. RDLPs have been a preferred approach in providing financing for areas of relatively high-risk activity. A limited partnership limits the personal liability of limited partners to the amount of their investment and offers tax advantages that compensate for risk taking. From the firm's point of view, the RDLP permits funding of R&D activities, which may otherwise have to be postponed due to the firm's finite resources.
2. SFAS 68 covers R&D arrangements that are partially or completely funded by other parties. Under the provisions of SFAS 68, to the extent that the firm sponsoring the R&D arrangement obligates it to repay any of the funds provided by others (regardless of the outcome of the R&D project), the financial risks have not been transferred. In this case, it is presumed that a liability exists and the firm must charge R&D costs to expense as incurred.
3. Myers (1984) and Myers and Majluf (1984) argue that firms follow a pecking order when seeking new financing. Internal sources are preferred to external sources and less risky alternatives to more risky.
4. However, we did not measure the degree of risk transferred by new contracts nor did we compare companies included in the sample. In general, we expect that market reaction is different for different risk levels perceived for each sponsor firm, but because of the difficulty of measuring the degree of risk transferred in an RDLP contract, we are unable to suggest a direction regarding the magnitude of market reaction to new contracts
5. Market participants should consider RDLP projects more favorably when the sponsor firms show heavy prior investments in R&D. Amir and Lev (1996) provide evidence that both financial and non-financial information affect the market and they act in a complementary manner. This proposition is similar to that of Amir and Lev (1996) in that we suggest that there is a complementary relationship between the R&D costs prior to the RDLP announcement (financial information) and the announcement of the RDLP, which represents the existence of a new class of contract (non-financial information).
6. SFAS 68 applies to arrangements through which other parties fund research and development activities. Arrangements were excluded from the study where there was active funding participation by all parties to the contract (e.g., joint ventures). There are few, if any, R&D arrangements that are designed to obtain off-balance sheet financing where the sponsor admits to not meeting the qualifications of SFAS 68 (as a contract for services).

7. Details of sponsor names, RDLP announcement dates, cumulative return for three days (two days prior and the announcement date), cumulative return for two days (the day before and the day of announcement), and returns on the day of announcement for both the sample and the market (market return is defined as NASDAQ Composite Return) are available from authors upon request.
8. An outlier is defined per Juran and Gryna (1980, 63) as lying outside the interval $\mu \pm s/\sqrt{n}$ calculated for the period -50 to +50 with the 30-day period surrounding the event date excluded.
9. We also divided the sample firms into different leverage and size portfolios. When the RDLP offering amount was compared to total assets of the sponsor firms, we found that it amounted to 11.67 percent of larger firm's assets, and 45.26 percent of smaller firm assets. This represented a significant difference between the two groups. The RDLP offering amounted to 29.25 percent for highly leveraged firms and 37.16 percent for low leveraged firms. Again, no relationship between leverage and size and the magnitude of returns for the two groups of the sample firms was found.
10. To see if a possible tax saving by sponsor firms could be a motivation for entering into RDLPs, we included the sponsor-firms' average tax-rate in the model. We did not find a significant association between the magnitude of returns and the mentioned tax rate. It is not possible for these authors to find the investors' degree of tax-savings, given that each individual would have a different tax condition and such information is not publicly available. The results (or lack of results) of regressions are available upon request.
11. When gross amounts of R&D and PPE (or adjusted for total assets amounts) were used, most of the results became statistically insignificant.
12. Duke and Hunt (1990) suggest that for many restrictions (over 60%) which relate to retained earnings, working capital, and net tangible assets, the debt-to-equity ratio is a good surrogate for the closeness to and/or existence of debt covenant restrictions (p.56).
13. A simple mean and t test were run on the dividend payout ratio (cash dividends declared on common stock/net income before extraordinary items) for the year before the announcement date and the year following. RDLP-sponsoring firms had an average dividend payout ratio of 1.86 percent for the year before the announcement and 1.62 percent for the year of the announcement. The difference between the two years is negative and non-significant.
14. To find if the growth rate of the sponsor company can explain the magnitude of the returns surrounding the announcement date of RDLPs, we included the market to book ratio as the overall market valuation of future growth for the company. If the company is expected to have a high growth rate, the RLDP would result in a possible confirmation of this expectation and a positive abnormal return is expected. The results of our study did not confirm this hypothesis and the higher value of this variable did not significantly explain the return observed in our sample. It is possible that our measure did not measure this rate properly, or the value of growth possibilities of sponsoring firms was already incorporated in their market values.
15. Shevlin (1987) found support of off-balance-sheet financing motivations for firms to sponsor RDLPs.

16. Two other explanations for a manager's preference for RDLPs may be that (1) compensation is enhanced when it is based on net income that does not include R&D expenses (which are passed on to limited partners) and (2) the RDLP gives the manager the opportunity to be closely and personally aligned with the R&D activities (e.g., by becoming the general partner or a limited partner).
17. The financial press generally viewed the RDLP as a "good news" event and portrayed the transaction as a positive financial development for sponsor firms.
18. As Wright and Groff (1986) demonstrate, it is difficult to identify these confounding events using standard sources of information.