EQUIPMENT FINANCIAL LEASING PRACTICES AND COSTS: AN EMPIRICAL STUDY

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Introduction

The literature on leasing provides an abundance of information from two perspectives. On the trade press side are publications claiming advantages or disadvantages of leasing [1, 2, 7, 10, 13]. These tend to approach the subject on descriptive, intuitive, or authoritative bases and do not provide theoretical or analytical guidelines. On the other side, there have been numerous theoretical treatises on how to compare the cost of leasing with purchase alternatives [3, 5, 12] or what to expect under efficient capital markets [6, 9, 11]. The theoretical literature has refined our ability to understand and analyze leases, and it has clarified what we should expect to observe in practice.

If financial lease contracts can be considered debt instruments, and if the relevant capital market is efficient, we should expect the cost of leasing to approach the cost of debt [6] (or at least the cost of debt plus a risk premium for salvage value uncertainty). While there is not an abundance of empirical work on leasing, two such studies have inferred high returns for leasing firms or high costs of leasing for asset users. McGugan and Caves [8] reported evidence of profit rates for leasing firms in excess of competitive norms. In general this could only be true if rates of return on individual contracts were high. In another study, Gudikunst and Roberts [4] evaluated specific lease contracts using analytical methods proposed in the academic literature. They found that virtually every lease contract studied was more costly than the alternative, regardless of the analytical method used. One objective of this research is to secure information on costs of leasing, but the general goal of the paper is to perform a systematic descriptive study on a sample of lease contracts. The study was made possible because four leasing firms allowed contracts in their files to be examined.

Data were gathered on 520 retail financial lease contracts for several categories of equipment. These contracts were studied and descriptive material relating to asset costs, asset types, maturities, prepayments, collateral, default remedies, and treatment of investment tax credit was generated. Estimates of leasing cost rates were computed; univariate and multivariate relationships of these variables with cost rates were obtained.

Data Source

Data were obtained from the records of four non-bank leasing firms in Salt Lake City, Utah. These four lessors

had offices in Arizona, California, Colorado, Idaho, Oregon, Texas, Utah, Washington, and Western Canada. Because access to information was limited to contracts still on the lessor's books no *ex post* data on contracts that had terminated was available. Further, the identity of any lessee had to be confidential, and contact with individual lessees with reference to specific lease contracts was prohibited.

The Sample and Sample Statistics

The 520 financial lease contracts in the sample were written in Salt Lake City, Utah, during the period 1970 through March of 1975. Every lease contract studied was a financial lease; the lessee was responsible for asset selection and physical acquisition, maintenance, taxes, insurance, and liability. The leases were all non-cancellable. Default remedies were repossession, declaration of all remaining payments due and payable, and deficiency claims.

Outlay Cost of Assets

The distribution of outlay cost for the sample is shown in Exhibit 1. Contracts included in the sample ranged from $134 to $200,000 in outlay cost to the lessor. The sample mean was $9863. Exhibit 1 shows that the asset cost distribution was highly skewed upward. Thirty-nine percent of the contracts were less than $2500, and only 3.7 percent were larger than $40,000.

Exhibit 1. Outlay Cost of Assets

Outlay Cost	Number of Contracts	Percent
Less than $2,500	206	39.6
$2,501–$5,000	90	17.3
$5,001–$10,000	85	16.3
$10,001–$20,000	67	12.9
$20,001–$40,000	53	10.2
$40,001–$200,000	19	3.7
Mean $9863	520	100.0

Prepayment Requirements

Almost every contract required some prepayment, the equivalent of the down payment on a loan. Prepayments for this sample ranged from zero to 19.5 percent of original cost, with a mean of 9.5 percent. Sixty-five percent of the contracts required prepayments in the 10.01 to 15.00 percent range. Exhibit 2 shows the distribution of required prepayments for the sample.

Exhibit 2. Prepayment Requirements

Prepayment (Percent)	Number of Contracts	Percent
Zero	2	.4
0.01–5.00	78	15.0
5.01–10.00	98	18.9
10.01–15.00	339	65.1
15.01–20.00	3	6
Mean 9.3	520	100.0

Length of Lease Period

With few exceptions, the sample leases required monthly payments. For the leases included in this study, contract maturities ranged from 12 to 84 months, as summarized in Exhibit 3. Most of the terms were 3 or 5 years. For example, forty percent carried 36-month maturities, and slightly less than 38 percent carried 60-month maturities.

Exhibit 3. Length of Lease Period

Months	Number of Contracts	Percent
6–12	7	1.3
13–24	60	11.5
25–36	208	40.0
37–48	44	8.5
49–84	201	38.7
Mean 44	520	100.0

Collateral

In this sample, 121 contracts, or 23 percent, were secured by personal guarantees, by third party guarantees, or by claims on assets of the lessee. While not called for in the master contracts, such collateral was obtained through separate documentation of specific guarantees, co-signatures, and filing of security interest notices with appropriate authorities.

Treatment of Investment Tax Credit (ITC)

Investment tax credit may be retained by lessors or passed on to lessees. Seventy percent of the 520 contracts in the sample were written such that lessors retained the investment tax credit.

Lessor

Information categorized by the lessor firm (Exhibit 4) indicated some differences in mean outlay cost of contracts and in prepayment percentages among firms. Av-

Exhibit 4. Outlay Cost, Prepayment, Maturity, Collateral, and Investment Tax Credit Retention by Leasing Firm

Company	1	2	3	4	Total Sample
Number of Contracts	125 (24.0%)	278 (53.5%)	104 (20.0%)	13 (2.5%)	520 (100.0%)
Mean Outlay Cost	$15,938	$9,436	$2,817	$16,669	$9,863
Mean Prepayment (prepayment as % of cost)	6.44	11.36	8.45	5.06	9.45
Mean Maturity, months	45	46	40	43	44
Collateral Required (percent of contracts)	25	28	0	100	23
ITC retained by lessor (percent of contracts)	77	77	52	0	70

erage maturities appeared to be about the same among firms, except for Firm 3 which wrote smaller asset cost leases and shorter maturities than the others. Contracts showed substantial differences by lessors regarding percent of contracts requiring collateral and percent of contracts where the lessor retained the ITC.

Asset Category

Contracts were grouped by asset category in Exhibit 5 showing that the largest outlay cost was for construction and the smallest was for office equipment. Prepayments were also highest for construction equipment, while the lowest were for autos and trucks. Average maturities ranged from 42 months for autos and trucks to 48 months for hospital and medical equipment. Collateral was required most frequently on autos and trucks, and the ITC was retained by lessors most frequently on construction equipment. Comparison of Exhibits 4 and 5 suggests that contracts written by different lessors were more divergent in characteristics than contracts written for different asset categories.

Analytical Investigation

It was possible to compute *ex ante* rates of return on investment for the lessors; for them the lease is a capital budgeting decision. Cost rates (in percent) to lessees are identical if the outlays, depreciation methods, tax rates, and salvage values would be the same as for lessors. While it was not possible to calculate cost rates to les-

Exhibit 5. Outlay Cost, Prepayment, Maturity, Collateral, and Investment Tax Credit Retention by Asset Category

Asset Category	Autos & Trucks	Hospital & Medical	Office	Manufacturing	Construction	Miscellaneous	Total Sample
Number of Contracts	86	59	161	77	30	107	520
Mean Outlay Cost	$11,000	$9,100	$7,100	$8,900	$12,600	$9,400	$9,863
Mean Prepayment (prepayment as % of cost)	7.87	10.92	9.55	10.45	10.59	8.66	9.45
Mean Maturity, months	42	48	44	46	43	44	44
Collateral Required (percent of contracts)	41	14	15	27	33	21	23
ITC retained by lessor (percent of contracts)	73	78	69	78	80	57	70

sees due to these requirements, cost rates could nevertheless be inferred. For the financial leases in this sample, outlays were the same for lessors as they would have been if the lessees had purchased. Depreciation methods were not necessarily the same, but lessees would have had the same options as lessors. Tax rates were probably not the same for lessors and lessees; for this reason we present results before tax (or zero tax) and for tax rates of 50, 40, and 30 percent. Salvage value estimates were provided by lessors, and we assumed that lessees' estimates would have been identical. The seriousness of this assumption was explored with a sensitivity study on salvage values. In the material which follows, rate of return, cost rate, cost of leasing or implied cost all refer to the same thing, *ex ante* rate of return for the lessor and implied cost to the lessee. (Some lease contracts involved specific out-of-pocket costs to the lessor. These include finders fees or commissions. These costs were intentionally excluded from this study. Accordingly, while r will estimate the implied cost of credit for the lessee, it will overstate the rate of return on investment for lessors. The objective was to estimate the financing related returns and costs to make them comparable with published interest rates.) It was obtained by solving for r in the following model:

$$C = (1-t)\sum_{i=1}^{n} L_i \left(\frac{1}{1+r}\right)^i + t\sum_{i=1}^{n} D_i \left(\frac{1}{1+r}\right)^i + S_n \left(\frac{1}{1+r}\right)^n + P + ITC$$

where:

- n = Life of the lease in months, or number of monthly lease payments required,
- C = Original cost of asset, $,
- t = Marginal tax rate,
- D_i = Depreciation, period i; i = 1, 2, 3, . . . , n, $,
- L_i = Lease payment required at end of period i; i = 1, 2, 3, . . . , n, $,
- P = Prepayment, time zero, $,
- S_n = Salvage value estimate, time n, (no tax; book value = salvage estimate), $,
- ITC = Investment tax credit, if retained by lessor, time zero, $,
- r = Internal rate of return per month (to annualize, multiply by 12).

If tax is ignored, t is zero in the above equation, and r is a before tax cost rate. If tax rates are included, then the r is an after-tax cost rate. Use of the latter is necessary to account for tax shelters in depreciation and lease payments.

Aggregated Results

Exhibit 6 shows results of calculations of cost rates on the entire sample. The mean before-tax implied costs were just under 25 percent. After-tax these cost rates became 18.69, 20.80, and 22.98 percent per year for tax rates of 50, 40, and 30 percent, respectively.

Exhibit 6. Aggregate *Ex Ante* Cost Rates on 520 Lease Contracts

	Per Cent Per Year	
	Mean	Standard Deviation
Before-Tax Rate	24.98	7.27
After-Tax Rate (50%)	18.69	5.98
After-Tax Rate (40%)	20.80	6.35
After-Tax Rate (30%)	22.98	6.81
After-Tax Rate (50%) and Zero Salvage	16.08	5.00
After-Tax Rate (50%) and Twice Expected Salvage	21.25	7.23

As the salvage value is subject to uncertainty, a sensitivity analysis was made on that variable. Using a 50 percent tax rate in each case, the mean cost rate was 18.69 percent using the estimated salvage, 16.08 percent using a zero salvage, and 21.25 percent using twice the estimated salvage. This sensitivity analysis indicated that cost rates were not very sensitive to deviations in the salvage values. Reasons for this are that *ex ante* salvage estimates were rather low (sample mean was 8.52 percent) and that high discount rates (on the order of 20 percent) reduced the impact of deviations in salvage values. Among other things, this infers that moderate deviations between lessors' and lessees' salvage value estimates were not important. The only way substantial differences could exist would be if lessees expected much greater salvage values than indicated by lessors' estimates. If this were the case, cost rates inferred by this study were understated.

Multivariate Analysis of Factors Influencing Cost Rates

A stepwise multiple regression analysis was performed on before- and after-tax interest rates observed on the 520 financial leases. The regression results did not necessarily represent supply or demand functions for leasing. They were descriptive of the contracts in the sample, which were presumably the result of supply and demand interaction.

Exhibit 7 contains the models and results of two stepwise multiple regression runs using as dependent variables the observed before-tax and after-tax (50 percent) cost rates. Independent variables in the equation shown in Exhibit 7 are:

Exhibit 7. Regression on 520 Financial Leases

Cost Rate, % (Dependent Variable)	D.F.	Constant	Regression Coefficients (a) X_1	X_2	X_3	X_4	X_5	Regression Std. Error	F	R^2
Before-Tax	5/514	22.12	−.00004 (2.00) *	−.17885 (9.789) ***	−1.48906 (2.46) **	1.03888 (13.958) ***	2.54484 (4.866) ***	5.42	84.05 ***	.45
After-Tax (50% tax rate)	5/514	24.84	−.00002 (2.00) *	−.25166 (18.823) ***	−2.5491 (5.756) ***	.55771 (10.239) ***	.83492 (2.181) *	3.96	133.29 ***	.57

(a) t-values in parentheses.
* Significant at less than .05, one-tailed test.
** Significant at less than .01, one-tailed test.
*** Significant at less than .001, one-tailed test.

X_1 = Outlay cost of assets; dollars
X_2 = Length of lease period; months
X_3 = Collateral; 0 = no collateral; 1 = Collateralized lease.
X_4 = Prepayments; percent of original asset value.
X_5 = Investment Tax Credit; 0 = Passed on to lessee; 1 = Retained by lessor.

Both equations indicated that collateralized leases carry were inversely related to cost rates. However, the correlation coefficient between outlay cost and maturity was .325 (shown in the correlation matrix, Exhibit 8), so it was impossible to determine the independent impact of outlay cost or maturity on cost rates. On a univariate basis, both outlay cost and maturity had strong negative correlations with cost rates.

Both equations indicated collateralized leases to carry significantly lower cost rates than those not secured by collateral or guarantees. Thus, one must conclude that collateral, when acquired, was considered to be of sufficient quality and quantity to justify a reduction in lease cost rates. However, some of the rate-reducing impact of collateral may have originated with the outlay cost variable. A correlation coefficient of .356 between asset cost and collateral indicated that larger leases were collateralized more frequently than were smaller ones. Recalling the significant rate-reducing impact of increases in outlay cost this possible joint effect should not be disregarded.

Prepayments, as a percentage of outlay cost, had a strong rate-increasing impact. Prepayment requirements were largely negotiable and may be a mechanism for adjusting for the risk class of the lessee.

The investment tax credit variable also provided some explanatory power. The treatment of investment tax credits did significantly influence cost rates on this sample of financial leases. The direction of influence was positive; implicit rates were higher when credits were retained by the lessor than when they were passed on to the lessee.

Exhibit 8. Correlation Matrix on 520 Financial Leases

	Outlay Cost	Contract Period	Collateral	Prepayments	Investment Tax Credit
Cost Rate (before tax)	−.326	−.396	−.223	.507	.167
Cost Rate (after tax, 50%)	−.366	−.642	−.327	.349	.052
Outlay Cost	1.000	.325	.356	−.166	−.029
Contract Period		1.000	.177	−.040	.075
Collateral			1.000	−.054	−.086
Prepayments				1.000	.047
Investment Tax Credit					1.000

Exhibit 9. Regressions on Financial Leases by Lessor.
Dependent Variable: Cost Rate (after-tax at 50 percent)

Lessor Firm	N	D.F.	Mean Cost Rate (%)	Regression Coefficients (a) Constant	X_1	X_2	X_3	X_4	X_5	Regression Std. Error	F	R^2
1	125	4/120	17.80	19.178	−.00003 (2.47) **	−.16153 (5.28) ***	−1.83144 (2.18) *	1.07812 (8.24) ***		3.83	65.61 ***	.69
2	278	5/272	17.66	3.41	−.00002 (1.12)	−.32746 (21.19) ***	−.20718 (.55)	2.36547 (15.83) ***	3.00271 (8.36) ***	2.48	126.25 ***	.70
3	104	4/99	23.25	26.15	.00004 (.60)	−.30264 (10.77) ***		.98764 (10.24) ***	1.33904 (2.49) **	2.63	137.10 ***	.85
4	13	3/9	11.94	9.48	.00001 (.44)	−.08650 (3.45) ***		1.19800 (6.42) ***		1.03	22.23 ***	.88

(a) t-values in parentheses.
* Significant at less than .05, one-tailed test.
** Significant at less than .01, one-tailed test.
*** Significant at less than .001, one-tailed test.

X_1 = Outlay cost of assets; dollars
X_2 = Length of lease period; months
X_3 = Collateral; 0 = no collateral; 1 = collateralized lease
X_4 = Prepayments; percent of original asset cost.
X_5 = Investment tax credit; 0 = passed on to lessee; 1 = retained by lessor

Among the reasons for this outcome could be that the model had missing variables (i.e. credit risk of lessee) or that some lessees were unaware of their options. The investment tax credit variable showed a low, but negative, correlation with outlay cost, indicating that as the size of the contract increased, the more likely was it that the ITC would be passed on to the lessee.

Independent variables were significantly related to lease cost rates on the overall basis, as evidenced by F-statistics (of 84.048 and 133.287, respectively), and all regression coefficients were significant at better than the .05 level. For the first equation, the proportion of variance explained was approximately 45 percent, while on an after-tax interest basis the explained portion of the sum-of-squares reached 56.5 percent. While these were respectable, they were undoubtedly held down by exclusion of variables for which data were not available. There was no way to secure variables which would measure credit risk of lessees.

There was some multicollinearity among independent variables. However, since correlation coefficients were of relatively small magnitudes (from .040 to .356), multicollinearity did not appear to pose a serious problem. The correlation matrix is shown in Exhibit 8.

Stepwise multiple regressions were performed on contracts written by each of the four lessors. The after-tax (50 percent) results appear in Exhibit 9. All four equations had higher R^2 values than the aggregate version, presumably because of greater contract homogeneity within the groupings.

Lessors 1 and 2 wrote leases with cost rates decreasing with outlay cost. Although the opposite appeared true for Lessors 3 and 4, the coefficients were not significant. Further, recall the correlation between outlay cost and maturity, and cost rates were inversely and significantly related to the lease maturity for contracts written by each of the four firms. The existence of collateral beyond the asset leased had a rate reducing impact for leases written by Firm 1 and a small, insignificant effect for those written by Firm 2. Firm 3 did not require extra collateral on any sample contract, while Firm 4 required extra collateral on every sample contract. Prepayments as a percentage of outlay cost had a rate increasing impact on lease costs for contracts written by each of the four firms.

Exhibit 10. Regression on Financial Leases by Asset Category.
Dependent Variable: Cost Rate (after-tax at 50 percent)

Asset Category	N	D.F.	Mean Cost Rate (%)	Regression Coefficients (a) Constant	X_1	X_2	X_3	X_4	X_5	Regression Std. Error	F	R^2
Autos, Trucks	86	4/81	17.20	23.33		−.24028 (6.62) ***	−3.52488 (3.47) ***	.54261 (4.21) ***	1.61949 (1.44)	4.09	28.18 ***	.58
Hospital, Medical	59	5/53	18.58	22.33	.00005 (.71)	−.30328 (6.45) ***	.59856 (.36)	.71019 (3.05) **	3.14800 (2.50) **	3.91	15.02 ***	.59
Office	160	5/154	19.68	26.49	−.00003 (1.23)	−.25939 (9.39) ***	−2.26339 (2.26) *	.55440 (4.94) ***	−.13280 (.18)	4.03	39.73 ***	.56
Manufacturing	77	5/71	18.76	23.18	−.00002 (.49)	−.22804 (7.05) ***	−1.54120 (1.55)	.47308 (2.96) **	2.19047 (2.20) *	3.56	18.85 ***	.57
Construction	30	5/24	17.78	19.62	.00002 (.41)	−.26481 (4.59) ***	.65336 (.51)	.76382 (2.25) *	1.31954 (.93)	3.05	7.49 ***	.61
Misc.	107	5/101	18.74	26.14	−.00003 (.99)	−.26842 (8.42) ***	−3.64208 (3.46) ***	.59732 (5.13) ***	.41135 (.50)	4.04	35.23 ***	.64

(a) t-values in parentheses.
* Significant at less than .05, one-tailed test.
** Significant at less than .01, one-tailed test.
*** Significant at less than .001, one-tailed test.

X_1 = Outlay cost of assets; dollars
X_2 = Length of lease period; months
X_3 = Collateral; 0 = no collateral; 1 = collateralized lease
X_4 = Prepayments; percent of original asset cost.
X_5 = Investment tax credit; 0 = passed on to lessee; 1 = retained by lessor

The impact, however, was much greater for Firm 2 than for the others. The investment tax credit variable did not appear in the regression for Firm 1. This firm did retain the ITC in most cases, but designed contracts to yield the same rate of return regardless of which party used the credit. Firms 2 and 3 secured significantly higher returns when the investment tax credit was retained than when passed to lessees. Firm 4 passed the ITC to the lessee in every contract, so the variable disappeared from that firm's regression. Mean cost rates ranged from 11.92 percent for Firm 4 to 23.25 percent for Firm 3. Firm 4, however, wrote larger contracts than Firm 3, so this outcome could be as much size as firm related.

The contracts were grouped by asset category, and the regressions were run again. These results are shown in Exhibit 10. As before, the maturity variable was very important. While the outlay cost coefficient did not have consistent signs or significant coefficients, correlation between outlay cost and maturity should again be recalled; maturity may be getting all the credit for a joint relationship. Where the collateral coefficient was significant it showed a substantial rate-reducing impact. The most consistent variable (other than maturity) was the prepayment. In each case the coefficients were positive and significant. The ITC variable was significant for the hospital and manufacturing groups only. Mean cost rates were much more uniform for the asset than for the lessor groupings.

The regressions run by asset grouping were not as strong as those produced by lessor groupings. R^2 and F values were much higher for the latter. The equations were more consistent for the asset than the lessor groupings in that each variable was more uniformly represented in the asset groupings. Average cost rates were also more uniform for asset than lessor groupings. If we assume that these are predominantly supply phenomena, we would assert that the asset user would find greater divergence

of terms and conditions from one lessor to another than from one asset category to another.

Summary and Conclusions

This paper has presented descriptive and analytical material from a regional sample of 520 financial lease contracts for six different equipment categories. The sample contracts substantially appeared as debt. Leases were noncancellable, had severe remedies in the event of default, and they required down payments and collateral in varying degrees. Lessors provided no services beyond financing.

Implied cost rates were quite high, averaging 24.98 and 18.69 percent on before- and after-tax (50 percent) basis respectively. Whereas one could not, with available data, perform a lease versus purchase analysis on any sample contract, it appears reasonable to speculate that most leases studied would have been rejected under commonly accepted analytic procedures. Results were, therefore, not inconsistent with those of McGugan and Caves [8] and Gudikunst and Roberts [4] which were discussed earlier.

In addition to the generally high costs of leasing implied by contracts in the sample, an important finding was that terms and practices differed substantially from one lessor to another. This means that asset users should be able to secure better leasing terms by being well informed of their options and shopping around. In general, the high costs of leasing, the differences in contract features and terms between lessors, and the treatment of the ITC (higher cost rates when retained by lessors) were suggestive of an imperfect market.

Results cannot necessarily be generalized beyond the region in which the sample was generated. Further, the sample included no contracts larger than $200,000, and results may not extend to larger contracts. The extent to which lease cost rates changed as lessors provide services beyond financing only is unknown. The major limitation of the study was that data on lessees were not available. This meant that the multiple regression models probably should have contained additional explanatory variables, and it also precluded any direct comparison of the cost of leasing with the cost of owning. One must conclude that this study merely broke some new ground in an area deserving of more attention.

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