Realized Returns and the Default and Prepayment Experience of Financial Leasing Contracts

Ronald C. Lease, John J. McConnell, and James S. Schallheim

Ronald C. Lease is the A.B. Freeman Professor of Finance at Tulane University, New Orleans, LA. John J. McConnell is a Professor of Finance at Purdue University, West Lafayette, IN. James S. Schallheim is an Associate Professor of Finance at the University of Utah, Salt Lake City.

■ The decision to lease or buy equipment continues to be important for financial managers. Nevitt and Fabozzi [15] estimate that 80% of U.S. corporations lease assets each year and that, in aggregate, these firms lease over $100 billion in capital equipment. Because of systematic economic differences between lessees and lessors, financial managers will continue to view leasing as a viable alternative for acquiring the use of an asset.

For the most part, existing research on leasing focuses on the theoretical and analytical aspects of leasing contracts.[1] The few existing empirical studies concentrate on the ex-ante contractual yields of leasing contracts.[2] Contractual yield calculations assume that all lease payments are made as scheduled and that the estimated residual value of the leased asset is realized at the maturity date of the contract. In essence, these ex-ante yield computations assume leasing contracts are default-free.

However, as noted in Schallheim, Johnson, Lease, and McConnell [17] (SJLM), ex-ante yields reflect a

We gratefully acknowledge funding from the SBA.
We acknowledge useful suggestions from James Brickley, Judy Lease, Wayne Marr, Ralph Sanders, Barry Schachter, and four anonymous referees. Lisa Borstadt and Denise Woodbury provided valuable research assistance. Jim Schallheim was visiting at Vanderbilt University during part of this project.

[1]See, for example, Brealey and Young [7], Lewellen, Long, and McConnell [11], McConnell and Schallheim [12], Miller and Upton [13], Myers, Dill, and Bautista [14], Schall [16], and Smith and Wakeman [18].

[2]These papers include Crawford, Harper, and McConnell [8], Schallheim, Johnson, Lease, and McConnell [17], and Sorenson and Johnson [19]. One important exception is Franks and Hodges [10].

premium to compensate the lessor for the default potential inherent in leasing contracts. If leasing contracts are risky, then contractual yields, on average, will overstate the returns lessors expect to earn. However, if expectations are, on average, realized, the ex-post returns of a large and random sample of leases should provide an unbiased estimate of the expected returns on the contracts.

This research extends the SJLM study that examined the determinants of ex-ante contractual yields on equipment leasing contracts. In contrast, the primary focus of this study is an analysis of the ex-post realized returns on the subsample of completed contracts in the SJLM data set. The study also presents data on the frequency of default and prepayment on leasing contracts and evidence on the actual outcomes when default or prepayment occurs. Few contracts pay out exactly as specified in the original leasing agreement. In addition, realized salvage values of the leased assets are compared with the ex-ante estimated residual values as recorded by the lessor.

Finally, the results on leasing contracts are compared with the evidence presented in recent high-yield bond studies. Leasing is often perceived as a substitute for debt for firms that are "too risky" or are unable to access conventional debt markets. Therefore, the results of this study are contrasted to those of Asquith, Mullins, and Wolff [4], Altman [1], Blume and Keim [5], and Blume, Keim, and Patel [6], who have analyzed the realized returns, prepayment, and default experience of "junk" bonds.

I. Lease Yields and Alternative Outcomes

Once signed, lease contracts are subject to a variety of possible outcomes. For example, the lessee may make all payments as promised; the lessee may make a number of lease payments as promised, make a few late payments, and then continue payments as promised; the lessee may make several lease payments as promised, miss a few, and then pay off the lease; or the lessee may make a few payments as promised and then default on the contract. Indeed, the number of permutations and combinations of possible outcomes for leases virtually is unlimited.

Because contractual lease yields are calculated as if the leases are default-free and as if the estimated residual salvage value will be realized, contractual yields of risky leases exceed expected yields. For any individual risky-lease contract, the contractual lease payment will be set such that the expected yield will equal the risk-adjusted capital market required return. The actual realized return is not likely to equal the expected yield for any individual contract. However, if expectations on average are unbiased, for a large sample of leases the average ex-post realized return should equal the expected return. The primary hypothesis is that, for a random sample of leases, the average contractual yield will exceed the average realized return.

For any individual lease, the realized return will depend upon the outcome associated with the lease. For purposes of further analysis, the leases are categorized into three groups: *(i)* "full-term leases," or leases on which periodic rental payments are made, more or less as promised, and the asset is sold by the lessor at the maturity of the contract; *(ii)* "prepaid leases," or leases on which payments are made, more or less as promised, for some period of time and then the lease is paid off prior to maturity; and *(iii)* "default leases," or leases on which the lessee makes some periodic payments and then defaults.

For full-term leases, the realized return will differ from the contractual yield only if the realized residual value of the leased asset differs from the expected salvage value and/or actual payments differ from contractual specifications in timing or amount. If the realized residual value is greater (less) than expected, the realized return will exceed (be less than) the contractual yield. For leases which default, the realized return should fall below the contractual yield. For leases which pay off early, the realized return should exceed the contractual yield. This statement reflects the similarity between lessors and investors in callable bonds. If interest rates fall, lessees can choose to prepay their contracts. As with callable bonds, lessees typically will be required to pay a "call" premium in the form of a prepayment penalty. Accordingly, as with called bonds, the average realized return for prepaid leases should exceed their average contractual yield.[3]

II. The Sample

A. Description of the Data

The leases analyzed here are a subset of the leases described in SJLM [17]. The sample in that study is composed of 363 open (i.e., active) and closed (i.e., completed) financial leasing contracts. The current

[3]Theoretical analyses of lease contracts often assume that leases are perfect substitutes for debt. For empirical evidence on this question, see Ang and Peterson [3].

study analyzes in further detail 137 completed contracts. The data were provided by five nonbank leasing companies who must remain anonymous as one of the conditions of their participation.

The information collected for each lease includes the origination date of the lease, the type and cost of the leased asset, the maturity date of the lease, the date the lessor paid for the asset, the date and amount of any "upfront" payments (i.e., security deposits and/or receipts greater than a single periodic payment), the amount of any broker commissions paid to originate the lease, the estimated residual value (as recorded by the lessor), and the due dates and amounts of the contractually promised rental payments. Additionally for the closed leases, the dates and amounts of the actual rental payments, late payment fees, prepayments, legal and repossession costs (if any), and the realized salvage values of the leased assets were recorded.

Data describing the sample are displayed in Exhibit 1. Panel A is a frequency distribution of the leases according to their contract initiation dates. Panels B, C, and D are frequency distributions of the leases categorized according to the cost of the leased asset, the term-to-maturity of the lease contract, and the general type of the leased asset, respectively.

The earliest lease was originated in 1973 and the latest in 1982. The average cost of the leased assets is $74,829 with a minimum cost of $1,000 and a maximum of $1.5 million. The average contractual term-to-maturity of the leases is 50.7 months with a minimum and maximum term of 12 months and 96 months, respectively. The types of assets are not concentrated in a single category, although leases on trucks and trailers comprise about 15% of the sample.

All of the leases are noncancellable financial leases. The lessees are located in at least 27 different states (the state where the asset is located could not be identified for 30 of the leases). For each contract, the lessee is responsible for selection, acquisition, and maintenance of the asset and payment of associated property taxes and insurance premiums. In the event that periodic rental payments are late, the lease contracts specify the late payment penalty and the conditions under which the lease is considered to be in default. In the event of default, the lessor can repossess the asset, declare the remaining payments due and payable, and make claims for any deficiencies. In some cases, the time period between the declaration of default and repossession or sale of the asset can be substantial.

Exhibit 1. Descriptive Statistics Characterizing the Sample of 137 Completed Financial Lease Contracts Originated Over the Period 1973–1982

Panel A: Frequency Distribution by Origination Date of the Lease

Year of Origination	Number of Leases	Percent of Total
1973	8	5.8
1974	1	0.7
1975	1	0.7
1976	10	7.3
1977	38	27.7
1978	10	7.3
1979	35	25.5
1980	24	17.5
1981	9	6.7
1982	1	0.7

Panel B: Frequency Distribution by Cost of the Leased Asset

Cost of Asset	Number of Leases	Percent of Total
$1,000 to $5,000	27	19.7
$5,001 to $10,000	34	24.8
$10,001 to $20,000	23	16.8
$20,001 to $50,000	22	16.1
$50,001 to $100,000	6	4.4
Over $100,000	25	18.2
Maximum = $1,500,000	Mean = $74,829	
Minimum = 1,000	Median = $14,000	

Panel C: Frequency Distribution by Term-to-Maturity of the Lease

Term-to-Maturity (in months)	Number of Leases	Percent of Total
less than 24	1	0.7
24	9	6.6
36	49	35.8
37 to 59	11	8.0
60	52	38.0
61 to 95	11	8.0
96	4	2.9
Maximum = 96 months	Mean = 50.7 months	
Minimum = 12 months	Median = 48 months	

Panel D: Frequency Distribution by Type of Leased Asset

Type of Asset	Number of Leases	Percent of Total
Aircraft	1	0.9
Computers	12	8.8
Construction	13	9.5
Copiers	6	4.4
Electronics	11	8.0
Farm Equipment	4	2.9
Food and Lodging	5	3.6
Machine Tools	12	8.8
Medical Equipment	7	5.1
Office Equipment	11	8.0
Telephone Systems	7	5.1
Trucks and Trailer	21	15.3
All Other Assets	27	19.7

Exhibit 2. Contractual and Actual Term-To-Maturity of the Full Sample of 137 Leases and Three Subsamples of Leasing Contracts Originated Over the Period 1973–1982 (in months)

Category	Average Contractual	Minimum Contractual	Maximum Contractual	Average Actual	Minimum Actual	Maximum Actual
A. Full Sample (N = 137)	50.7	12.0	96.0	35.6	1.0	96.0
B. Full-Term Leases (N = 68)	49.5	12.0	96.0	50.4	14.5	96.0
C. Prepaid Leases (N = 43)	47.6	24.0	90.0	21.0	1.0	58.5
D. Default Leases (N = 26)	58.8	24.0	84.0	21.3	8.0	52.5

The lessor generally permits the lessee to pay off the lease prior to maturity. In that event, the lease specifies the terms under which early pay-off of the lease can be made. Summary statistics on the contractual and actual terms-to-maturity of the leases are contained in Exhibit 2.

Of the 137 leases in the sample, 68 (49.6%) are classified as full-term leases concluding more or less as specified in the contract. However, even for this subsample, some irregularities usually occur in the actual payments. In many cases, a lease payment is late or omitted—often followed by a double payment plus a late fee during the next period. In a number of cases the lease is renegotiated, sometimes informally, and the final payment on the lease actually is made after the contractually specified maturity date of the contract.

The average contractual term-to-maturity for the full-term leases is 49.5 months. However, because of omitted payments and contract renegotiations, the average actual term-to-final payment is 50.4 months. For example, the minimum contractual term-to-maturity is 12.0 months while the minimum actual time is 14.5 months. The maximum contractual and actual terms-to-maturity are both 96.0 months.

In 43 cases (31.3%), the lease contract is paid-in-full prior to maturity. For contracts in this category, the average contractual term-to-maturity is 47.6 months with a minimum of 24.0 months and a maximum of 90.0 months. In comparison, the average actual term-to-maturity is 21 months with a minimum of 1.0 and a maximum of 58.5 months.

When leases are prepaid, the lessee pays a single "lump sum" terminal prepayment amount that includes acquisition of the asset and the prepayment penalty. Disentangling these two components is not possible, given the database. However, the terminal payment can be compared to the purchase price of the asset and the present value of the remaining lease payments plus the present value of the expected salvage value.

On average, the final payment is 68% of the original cost. To estimate the relative size of the prepayment penalty, divide the final "lump sum" settlement amount by the present value of the remaining lease payments plus the present value of the expected salvage value. The contractual yield, discussed below, is used as the discount rate. The average of this calculation is 1.11 (median = 1.10). Therefore, the approximate prepayment penalty is 10%.

In 26 cases (18.9%), the lessee defaults on the lease contract. In each of these cases, the payment pattern is irregular prior to outright default. For this subsample, the average contractual term-to-maturity is 58.8 months with a minimum of 24.0 months and a maximum of 84.0 months. In contrast, the actual time period between the first and last payment is 21.3 months with a minimum of 8.0 months and a maximum of 52.5 months. The average contractual term-to-maturity for leases that default is longer than that of either of the two subsamples—by 9.3 months for the full-term subsample and by 11.2 months for the prepaid group. Typically, a substantial period also elapses between the last payment and the recovery and sale of the asset by the lessor for the leases which default. This interval averages 11.7 months with a minimum of 1.0 and a maximum of 44.5 months.

When the asset finally is recovered and sold, the resale price is 37.8% of the original cost. However, a more meaningful comparison is the ratio of the resale price to the present value of the remaining lease payments plus the present value of the estimated residual value. The discount rate used is the contractual yield. On this basis, the lessor received 64% (median = 58%) of the remaining value of the lease.

In summary, 49.6% of the sample are classified as full-term leases, 31.4% are prepaid leases, and 19.0%

are defaults. As the discussion indicates, even within each subcategory, the experiences across leases varies widely. The contractual yield and realized return calculations provide an indication of how well (or poorly) the lessors fared in economic terms.

B. Calculation of Contractual Yields and Realized Returns

Two statistics of particular interest to this study are the ex-ante contractual yields and the ex-post realized returns of the lease contracts, both calculated on a before-tax basis.[4] The contractual yields are calculated by solving the following equation iteratively for y:

$$\frac{Cost}{(1+y)^{t_1}} = \frac{P+SD}{(1+y)^{t_2}} - \frac{Com}{(1+y)^{t_3}} + \sum_{x=4}^{np} \frac{L_{t_x}}{(1+y)^{t_x}} + \frac{RV-SD}{(1+y)^{t_n}}, \quad (1)$$

where *Cost* is the original cost of the leased asset; P is the amount of any up-front payments made on the lease; *SD* is any security deposit required on the lease; *Com* is the amount of any broker commission paid on the lease; L is the periodic lease payment; and RV is the residual value of the leased asset as estimated by the lessor. The time components $t_1, ..., t_n$ are the number of days between time zero and the date of the respective cash flow. Time zero is either t_1 or t_2, depending on which cash flow occurs first. The symbol np represents the number of lease payments and t_n is the number of days until the maturity date of the lease.

Realized returns are computed by solving Equation (1) with four exceptions. First, the time subscripts are restated to reflect the times when the actual cash payments took place. Second, the actual rental payments are substituted for the contractual payments. Third, the realized salvage value is substituted for the estimated residual value. Finally, an additional term, LP_t, is included on the right side (appropriately discounted) to capture any late payment penalties collected by the lessor firm, where LP_{t_z} are late payment penalties at time t_z and z is the period of receipt of the late payment penalty.

III. Results

A. Contractual Yields and Realized Returns

Assuming that realized lease returns provide an unbiased estimate of expected lease yields for a portfolio of risky leases, the hypothesis is that realized returns will fall below contractually promised yields. For the full sample of 137 contracts, Panel A of Exhibit 3 summarizes the before-tax contractual yields and realized returns. The average contractual yield is 19.30% and the average realized return is 16.68%. Although the two averages differ in the hypothesized direction by 2.62%, the difference is significant only at the 0.074 level in a one-tailed test. Similarly, the sign test and the Wilcoxon signed-rank test are not significant at the conventional 0.05 level. The greater dispersion of realized returns in comparison to contractual yields is illustrated by the respective standard deviations. The standard deviation of the realized returns is over three times greater than that of the contractual yields.

For full-term leases (Panel B), the average realized return of 20.37% is greater than the contractual yield of 19.16% by 1.20%. This difference is significant at the 0.007 level via the t-test and at the 0.001 level for both the sign and Wilcoxon tests. Since the contractual and actual lease payment patterns are approximately equal for this category of leases, the average realized salvage values must exceed the expected residual value by a sufficient amount to increase the realized return by about 1%.

As anticipated, for the prepaid leases (Panel C) the realized returns significantly exceed the contractual yields—27.38% versus 20.43%. This 6.94% difference is significant at the 0.024, 0.032, and 0.004 levels for the t-test, sign test, and Wilcoxon signed-rank test, respectively. The difference is due, at least in part, to the prepayment penalties embedded in the lease contracts.

[4]Desirably, because of the importance of taxes as a primary consideration in the evaluation of lease contracts, the yields and returns would be calculated on an after-tax basis. However, in order to make reasonable after-tax calculations, we need to know: *(i)* the lessor's marginal tax rate; *(ii)* the lessee's marginal tax rate; *(iii)* the lessor's and lessee's tax status (i.e., tax-loss carry forward/back status); *(iv)* the depreciation schedule employed by the lessor; *(v)* ITC recapture provisions; *(vi)* depreciation recapture provisions; *(vii)* tax consequences of prepayments and defaults; *(viii)* losses/gains on disposal; and *(ix)* differences in state tax codes (leased assets were located in at least 27 different states). None of these data are available to us. Therefore, to make after-tax adjustments, uniform assumptions on all of these tax variables for the entire sample are required. In making these assumptions, we lose cross-sectional variation. We concluded that any results that we dredged from this undertaking were almost totally uninformative with regard to the effect of taxes on ex-post lease returns.

Exhibit 3. Frequency Distribution of Before-Tax Contractual Yields and Before-Tax Realized Returns for the Full Sample of 137 Leases and the Three Subsamples of Leasing Contracts Originated Over the Period 1973–1982

	Mean (in percent)	Median (in percent)	Standard Deviation (in percent)	Minimum (in percent)	Maximum (in percent)
		Panel A: Full Sample (N = 137)			
Contractual Yield	19.30	20.18	7.45	4.41	44.78
Realized Return	16.68	19.87	23.32	-97.63	129.49
Difference[1]	2.62	-0.22			
	t-test (probability) =	1.45	(0.074)		
	sign test (probability) =	58+/79-	(0.088)		
	Wilcoxon (probability) =	-0.706	(0.480)		
		Panel B: Full-Term Leases (N = 68)			
Contractual Yield	19.16	19.70	7.06	6.64	44.78
Realized Return	20.37	20.36	6.92	7.02	45.36
Difference	-1.20	-0.35			
	t-test (probability) =	-2.76	(0.007)		
	sign test (probability) =	20+/48-	(0.001)		
	Wilcoxon (probability) =	-3.293	(0.001)		
		Panel C: Prepaid Leases (N = 43)			
Contractual Yield	20.43	21.30	7.73	5.72	35.03
Realized Return	27.38	24.95	22.68	-3.02	129.49
Difference	-6.94	-4.09			
	t-test (probability) =	-2.34	(0.024)		
	sign test (probability) =	14+/29-	(0.032)		
	Wilcoxon (probability) =	-2.886	(0.004)		
		Panel D: Default Leases (N = 26)			
Contractual Yield	17.78	18.09	7.92	4.41	37.53
Realized Return	-10.66	-3.51	30.91	-97.63	38.45
Difference	28.44	23.41			
	t-test (probability) =	4.92	(0.000)		
	sign test (probability) =	24+/2-	(0.000)		
	Wilcoxon (probability) =	-3.975	(0.000)		

[1]The mean (median) difference is the average (median) of the individual differences between the contractual yields and realized returns.

As discussed in Section II.A, the estimate of this prepayment penalty is 10%.

Finally, for default leases (Panel D), the average realized return of −10.66% is significantly less than the contractual return of 17.78% according to the *t*-test (*p*-level = 0.000). Similarly, the difference is significant for the two nonparametric tests. This result also is in the predicted direction and indicates the substantial loss to lessors when default occurs.[5] As discussed in Section II.A, the recovered amount is 64% of the pres-

[5]In actuality, the net realized returns to the lessor probably are lower that the numbers reported here, due to the incremental administrative costs associated with defaulted leases. Although we do not have data on indirect costs, Ang, Chua, and McConnell [2] report evidence on the administrative costs of corporate bankruptcy.

Exhibit 4. Frequency Distribution of the Estimated and Realized Salvage Values for the 68 Full-Term Leases Originated Over the Period 1973–1982

Residual Values	Mean	Median	Standard Deviation	Minimum	Maximum
Estimated	$3,789	$ 995	$ 9,686	$0	$ 74,154
Actual	7,379	1,075	18,023	0	104,000
Percentage Difference[1]	-53.5%	0.0%			
		t-test (probability) =	-2.76 (0.007)		
		sign test (probability) =	4+/25- (0.000)		
		Wilcoxon (probability) =	-3.795 (0.000)		

[1]*(Estimated Salvage Value - Actual Salvage Value)/Estimated Salvage Value.*

ent value of remaining lease payments and estimated salvage value.

B. Realized Residual Values and Unexpected Inflation

Analysis of the realized returns and contractual yields for full-term leases indicates that realized salvage values, on average, exceed expected residual values. Exhibit 4 summarizes the expected and actual residual values for the full-term leases. The actual average salvage value of $7,379 is almost double the ex-ante estimated salvage value of $3,789. This difference is significant at the 0.007 level in a two-tailed test. The difference also is significant according to both the sign test and the Wilcoxon signed-ranks test at the 0.000 level.

The primary hypothesis is that contractual yields should exceed the expected returns and that, for a large sample of leases, the actual return should be an unbiased estimator of the expected return. For the entire sample, the results presented in Exhibit 3 suggest that, while the differences in means is consistent with this hypothesis, the difference is significant at only the 0.074 level.

One explanation for the insignificant difference between contractual yields and realized returns stems from the higher than expected residual values documented in Exhibit 4. To remove this "windfall" residual value gain from the realized returns, the realized returns are reestimated using the actual lease payments but substituting the expected residual value for the actual residual value. This calculation provides a modified realized return under the assumption that the expected salvage value had, in fact, been realized. The results are displayed in Exhibit 5. The results in Exhibit 5 indicate that the contractual yields and the modified actual returns differ in the expected direction and are significant at the 0.054 level with a t-statistic of 1.96 and at the 0.010 level for both the sign and Wilcoxon tests.

One possible explanation for the difference between actual and expected residual values is that actual inflation rates exceeded expected inflation rates over the period of this study.[6] If unexpected inflation is the only cause of the deviation of realized salvage values from estimated residual values, the following relationship is expected:

$$RRV = (ERV)[(1 + u)^n], \qquad (2)$$

where RRV is the realized residual value, ERV is the estimated residual value, u is the unexpected inflation rate, and n is the time-to-maturity of the lease.

Unexpected inflation is the difference between realized inflation and expected inflation. For a specific lease, expected inflation is difficult to measure. However, one reasonable proxy may be the yield of a treasury bond whose maturity matches that of the lease at the origination date of the contract. The treasury bond yield should include market participants' assessment of expected inflation, as well as an estimate of the real rate of interest. If the real rate of interest is small, as re-

[6]Another possibility, motivated by the present value of the tax savings, is that lessors systematically "over depreciate" the leased assets. If this practice does occur, it suggests that the IRS accounting depreciation guidelines systematically exceed economic depreciation.

Exhibit 5. Frequency Distribution of Before-Tax Contractual Yields and Modified Before-Tax Realized Returns for the Subsample of 68 Full-Term Leasing Contracts Originated Over the Period 1973–1982

Before-Tax Yields	Mean (in percent)	Median (in percent)	Standard Deviation (in percent)	Minimum (in percent)	Maximum (in percent)
Contractual Yield	19.16	19.70	7.06	6.64	44.78
Modified Actual Return	18.16	17.77	7.69	6.08	45.76
Difference	1.01	0.82			
	t-test (probability) =		1.96 (0.054)		
	sign test (probability) =		45+/23- (0.010)		
	Wilcoxon (probability) =		-2.588 (0.010)		

ported in Fama [9], the bias in the treasury bond yield as a proxy for expected inflation should be small as well. The realized rate of inflation is measured, in a general way, by the Consumer Price Index.[7] The unexpected inflation is measured as:

$$u = \textit{realized inflation} - \textit{T-bond yield}. \qquad (3)$$

The unexpected inflation levels are computed on an annual basis, as is the maturity of the lease. Over the time period encompassed by this study, 1973–1982, the actual average unexpected inflation rate was 1.93% per year and the median unexpected inflation rate was 2.90%.

To estimate the relationship hypothesized in Equation (2), the following econometric equation is used:

$$RRV = (e^{a})(ERV)[(1+u)^{n}](e^{\epsilon}), \qquad (4)$$

where a is the constant term, e is the base for natural logarithms, $(1+u)^n$ is the annual unexpected inflation rate compounded over the life of the lease, and ϵ is the independent error term. Taking logs of both sides, Equation (4) becomes:

$$Ln(RRV) = a + Ln(ERV) + (n)[Ln(1+u)] + \epsilon. \qquad (5)$$

Based on Equation (5), the following regression is estimated:

$$Ln(RRV) = b_0 + b_1 Ln(ERV) + b_2\{(n)[Ln(1+u)]\} + \hat{\epsilon}. \qquad (6)$$

The hypotheses, based on Equation (2), predict that b_0 is zero and b_1 and b_2 are equal to one. The results are:

$$Ln(RRV) = -0.33 + 1.05Ln(ERV) + 1.58\{n[Ln(1+u)]\}. \qquad (7)$$
$$R^2 = 0.96$$
$$F = 719.2$$

The t-statistics testing whether the coefficients equal zero are: b_0, -1.57; b_1, 34.55; and b_2, 2.52.

A summary of the tests of the hypotheses are: $b_0 = 0$ (t = -1.57); $b_1 = 1$ (t = 1.71); $b_2 = 1$ (t = 0.93). Based on the 5% level of significance, these hypotheses cannot be rejected.[8] Given the high R^2 and F-statistic, unexpected inflation appears to contribute significantly to the difference between expected and realized residual value.[9]

[7]CPI levels were obtained from *Stocks, Bonds, Bills and Inflation: 1986 Yearbook*, Ibbotson and Associates Capital Management Research Center, Chicago.

[8]We also estimated the "unlogged" version of Equation (2). The results are: $b_0 = 1295.40$ (t = 1.04); $b_1 = 1.36$ (t = 13.12); $R^2 = 0.73$; $F = 174.30$. These results are similar to the "logged" version reported for Equation (6) in the text. However, the slope coefficient in the unlogged version is significantly greater than 1.0. This result indicates that unexpected inflation does not completely explain realized residuals exceeding expected residuals (see footnote 6). The disadvantage of the unlogged version of the equation is that we cannot separate the impact of expected residual value and unexpected inflation in explaining realized residual value.

[9]Our assumption that the real rate is zero is not critical. As long as the real rate is a constant, we will obtain the same results. The nominal rate, n, minus the real rate, r, equals the expected inflation rate. If the actual inflation rate equals ai, then, $u = ai - (n - r)$, where u is the unexpected inflation rate. If we assume r to be any constant other than zero, we just add this number to the u term in Equation (4). The issue is whether the b_2 coefficient in Equation (6) is affected. Adding or subtracting a constant from a random variable will not affect the result.

IV. Lease Comparison with High-Yield Bonds

Although the evidence is not totally convincing, leasing is often perceived as a substitute for borrowing, especially among high-risk firms.[10] If so, the outcomes associated with high-yield bonds can serve as a convenient benchmark for evaluating the outcomes associated with leasing contracts. Altman [1] and Asquith, Mullins, and Wolff [4] conduct comprehensive analyses of default frequencies of low-rated (i.e., "junk") bonds. Both studies report that cumulative default rates for such bonds are about 30% over the life of the bonds. On bond issues that default, the recovery rate is roughly 40% of the face value of the debt. These statistics compare with a default rate of approximately 20% for the sample of leases and a recovery rate of about 38% relative to the original asset cost, or 64% of the present value of remaining lease payments plus estimated salvage value.

As expected, Asquith et al. report that calls depend critically on the interest rate environment. For example, between 26–47% of the bonds issued between 1977–1982 had been called by the end of 1988. This call frequency reflects the sharp interest rate decline which began in 1982. In contrast, for bonds issued between 1983–1986, only 3–14% had been called by the same date. Because of the differences in the time periods between the study (1973–1982) and the Asquith et al. analysis, the "call" (i.e., prepayment) experience of the leasing sample is not directly comparable to the call frequency they note. However, roughly 30% of the leases in the sample were prepaid prior to maturity.

Finally, Blume and Keim [5] report that for lower grade bonds issued during 1977–1978, the annual promised yield of 11.2% exceeded the realized return of 8.5% by 2.61%. For the sample of leases, the contract yield exceeded the realized return by 2.62%. Therefore, while the evidence is far from complete, a number of similarities between the outcomes associated with leases and high-yield debt exist. This comparison is consistent with the conjecture that leases and lower grade debt are comparable sources of funds.

V. Conclusions

Leasing continues to be an important contracting mechanism whereby the lessee acquires the economic but not the legal ownership of an asset. Because of systematic economic differences between potential lessees and lessors, financial managers continue to scrutinize the lease versus borrow/buy alternatives.

The study presents contractual yields and realized returns for a diversified sample of 137 lease contracts written from 1973–1982 by five geographically diverse lessors. The database represents an opportunity to compare contractual and actual outcomes of nonpublicly traded financial contracts. Various descriptive statistics are presented which provide evidence on the deviations of realized returns relative to contractual yields on leasing contracts. Few lease contracts are paid out strictly according to the contractual specifications; 31% of the leases were paid off in advance of the original term-to-maturity and 19% ended in default. The payment irregularities, which cause actual returns to differ from contractual yields, are further compounded by large differences between expected and realized salvage values for the full-term leases. The realized versus contractual returns, prepayment experience, and default rates on the sample of leases are similar to those reported in recent studies of high yield ("junk") bonds.

Actual returns are an unbiased proxy for expected returns for a large sample of risky leases. On average the contractual yields should exceed realized returns. In general, the results support this hypothesis, especially after the misestimation of salvage values is corrected. Prepaid contracts provide lessors with higher than expected returns, due to prepayment penalties, while contracts which default result in large negative returns.

Actual salvage values are significantly higher than expected residual values for the sample of lease contracts. Unexpected inflation over the study period is suggested to contribute to this outcome. The evidence supports this contention.

[10]See Ang and Peterson [3].

References

1. E. Altman, "Measuring Corporate Bond Mortality and Performance," *Journal of Finance* (September 1989), pp. 909–922.
2. J. Ang, J. Chua, and J. McConnell, "The Administrative Costs of Corporate Bankruptcy," *Journal of Finance* (March 1982), pp. 219–226.
3. J. Ang and P. Peterson, "The Leasing Puzzle," *Journal of Finance* (September 1984), pp. 1055–1065.
4. P. Asquith, D. Mullins, and E. Wolff, "Original Issue High Yield Bonds: Aging Analyses of Defaults, Exchanges, and Calls," *Journal of Finance* (September 1989), pp. 923–952.
5. M. Blume and D. Keim, "Realized Returns and Defaults on Lower-Grade Bonds: The Cohort of 1977 and 1978," Wharton Working Paper, August 1989.

6. M. Blume, D. Keim, and S. Patel, "The Components of Lower-Grade Bond Price Variability," Wharton Working Paper, August 1989.
7. R. Brealey and C. Young, "Debt, Taxes and Leasing—A Note," *Journal of Finance* (December 1980), pp. 1245–1250.
8. P. Crawford, C. Harper and J. McConnell, "Further Evidence on the Terms of Financial Leases," *Financial Management* (Autumn 1981), pp. 7–14.
9. E. Fama, "Short-Term Interest Rates as Predictors of Inflation," *American Economic Review* (June 1975), pp. 269–282.
10. J. Franks and S. Hodges, "Lease Valuation When Taxable Earnings are a Scarce Resource," *Journal of Finance* (September 1987), pp. 987–1005.
11. W. Lewellen, M. Long, and J. McConnell, "Asset Leasing in Competitive Capital Markets," *Journal of Finance* (June 1976), pp. 787–798.
12. J. McConnell and J. Schallheim, "Valuation of Asset Leasing Contracts," *Journal of Financial Economics* (August 1983), pp. 237–261.
13. M. Miller and C. Upton, "Leasing, Buying, and the Cost of Capital Services," *Journal of Finance* (June 1976), pp. 761–786.
14. S. Myers, D. Dill, and A. Bautista, "Valuation of Financial Lease Contracts," *Journal of Finance* (June 1976), pp. 799–819.
15. P. Nevitt and F. Fabozzi, *Equipment Leasing*, 3rd ed., Homewood, IL, Dow Jones-Irwin, Inc., 1988.
16. L. Schall, "The Lease-Or-Buy and Asset Acquisition Decision," *Journal of Finance* (September 1974), pp. 1203–1214.
17. J. Schallheim, R. Johnson, R. Lease, and J. McConnell, "The Determinants of Yields on Financial Leasing Contracts," *Journal of Financial Economics* (September 1987), pp. 45–67.
18. C. Smith and L. Wakeman, "Determinants of Corporate Leasing Policy," *Journal of Finance* (July 1985), pp. 895–908.
19. I. Sorenson and R. Johnson, "Equipment Financial Leasing Practices and Costs," *Financial Management* (Spring 1977), pp. 33–40.