Effective Credit Costs in Retail Financial Markets: Leasing Versus Borrowing

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This study examines reported credit cost information in the automobile sales market to determine if vehicle leasing really is cheaper than installment borrowing. In addition, the study evaluates the accuracy of credit cost data furnished to consumers by commercial banks, vehicle leasing firms, and automobile dealers to gauge whether any systematic differences exist in the accuracy of reported credit cost information. Results of the study suggest that the cost of leasing is significantly different from borrowing, yet neither financing alternative is unilaterally cheaper than the other. In addition, suppliers of credit in consumer finance markets routinely and significantly understate effective credit costs reported to consumers.

INTRODUCTION

Vehicle leasing has become an increasingly popular financing alternative for new car buyers, reaching almost $42 billion in mid-1991. According to recent Federal Reserve (1991) data, retail automobile lease contracts accelerated at an average annual rate equal to 19.2 percent between 1985 and 1990, while traditional automobile financing contracts advanced just 13 percent each year during the same period. Vehicle lease contracts, which represented 44 percent of total automobile sales supported by retail credit arrangements in 1985, captured nearly 51 percent of the new automobile credit market in 1990. In addition, industry analysts estimate that 1.3 million new vehicles will be leased in 1991, representing a 20 percent growth in leased vehicles from 1990 and a 100 percent growth in leased vehicles since 1985 (Koretz, 1990).

In years preceding the Tax Reform Act of 1986, the tax deductibility of lease payments was often used to explain the growth in vehicle leasing. Under current tax regulations, however, most consumers classified by the Internal Revenue Service as employees are not permitted a tax deduction for personally leased vehicles, and the

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continued growth in leasing must be explained in other ways. For example, lessors frequently promote the benefits of leasing by arguing that (1) lease financing often requires lower monthly payments than an installment purchase, (2) leasing permits consumers to acquire more costly vehicles for a given monthly payment, and (3) leasing simplifies the disposal of used vehicles at the maturity of the lease.

While these benefits might provide the impression that leasing represents the lower cost financing alternative, this conclusion is not necessarily supported by principles of financial management. Unfortunately, consumers who remain unaccustomed to the application of these principles are not able to make accurate lease versus borrow comparisons. Federal legislation designed to inform consumers about the effective costs of different financing options actually impedes the lease-borrow comparison.

The Truth-In-Lending Act (1969) requires installment lenders to express the effective cost of borrowing in a standardized way (the Annual Percentage Rate of Interest), so that consumers can accurately compare the cost of alternative borrowing contracts. In contrast, the Consumer Leasing Act (1976) does not require lessors to report effective leasing costs in a manner comparable to the APR. Therefore, a simple and direct comparison of leasing versus borrowing costs becomes impossible.

The purpose of this study is to examine reported credit cost information in the automobile market and determine the accuracy of pricing information furnished to consumers by a varied array of credit suppliers. The study examines the behavior of three credit suppliers—commercial banks, vehicle leasing firms, and automobile dealers—and surveys credit costs in different urban markets to gauge whether any systematic differences in the accuracy of reported credit cost information exist. Second, the study investigates credit cost differences between leasing and borrowing, and draws from the extant finance literature to explain observed credit cost differences. Finally, the study provides a simple analytical framework for evaluating the effective cost of leasing that is directly comparable to the effective cost of borrowing.

1. Credit Costs and Consumer Leasing

The typical consumer vehicle lease contract represents an operating lease, or a financing arrangement which is cancelable at the option of the lessee and is not fully amortized over the term of the lease. In addition, most consumer contracts are closed-end, characterized by lease agreements specifying a fixed number of payments for a finite period of time. When the leased asset is returned undamaged and vehicle mileage is within the limits established in the lease contract, the lessee has no further financial obligation to the lessor. As such, leasing contracts transfer some of the ownership risks associated with debt financing to the creditor.

1.1. The Cost of Leasing

The extant finance literature offers a variety of different frameworks to evaluate the lease versus borrow question. Following the work of Myers, Dill, and Bautista (MDB hereafter, 1976) and Weingartner (1987), these valuation models begin by comparing the value of two different financing transactions:

(1) leasing, which involves purchasing the necessary cash to acquire an asset by giving up the asset's depreciation tax shields, salvage value, and investment tax credit, and agreeing to make a fixed series of cash payments to the lessor; and

(2) purchasing, which involves the acquisition of cash by selling an optimal package of financing securities exclusive of the lease contract.

Mathematically, the valuation of financial leases from the lessee's perspective takes the general form

$$V_0 = \text{ITC} + \sum_{j=0}^{n} L_j(1 - t)[1 + k(1 - t)]^{-j} + \sum_{j=1}^{n} tD_j[1 + k(1 - t)]^{-j} + F[1 + k(1 - t)]^{-n} \tag{1}$$

where

ITC = the investment tax credit available to the lessee at time zero;
L_j = the lease payment in period j;
t = the lessee's marginal tax rate;
k = the before-tax cost of debt to the lessee;
D_j = the depreciation expense displaced by the lessee in period j; and
F = the after-tax residual value of the leased asset, which occurs in period n.

The general lease valuation model is remarkably versatile. Brick, Fung, and Subrahmanyam (1987) use it to explain pricing differences between manufacturer lessors and third-party lessors, Copeland and Weston (1982) use it to value cancelable operating leases, and Franks and Hodges (1978) use it to value corporate lease contracts.

Unfortunately, the general model shown in equation (1) is less helpful in evaluating consumer financing transactions, because installment borrowing costs are frequently expressed in percentage terms. Following the work of Beechy (1969 and 1970), Roenfeldt and Osteryoung (1973), and Doenges (1974), however, the MDB lease valuation framework can be easily modified to provide the annual percentage cost of lease financing. In this case, the quantity V_0 in equation (1) is set equal to the value of the leased asset acquired by the lessee, reduced by the after-tax

cash costs required at the inception of the lease, and the equation is solved in terms of the unit-period percentage cost of leasing (k).

Given monthly lease payments, k can be transformed exponentially to yield the annual percentage cost of leasing (APL):

$$APL = (1 + k)^{12} - 1 \qquad (2)$$

Under current tax regulations, which prohibit the deduction of vehicle lease payments from taxable income for most consumers, t is set equal to zero in equation (1). The absence of an investment tax credit in the current tax code also requires that ITC equal zero in equation (1).

Sorenson and Johnson (1977) and Crawford, Harper, and McConnell (1981) offer similar percentage-cost lease valuation frameworks to evaluate the cost of corporate lease agreements. In general, these studies find that the cost of leasing corporate assets far exceeds concomitant borrowing costs. Crawford, Harper, and McConnell establish the before-tax yield on leases as 22.72 percent in 1975, while the average yield on BBB-rated corporate debt in the same period was 10.61 percent. They offer three possible explanations for this difference: (1) there is a greater probability of default among firms which use lease financing, (2) the market for leased assets is relatively inefficient; and (3) lease contracts are functionally different from debt contracts in ways that are not well understood by financial managers.

This empirical research provides only indirect evidence regarding the cost of consumer leasing, because it deals with financial lease contracts negotiated between corporate borrowers and lenders. While such transactions might be considered arms-length agreements between informed buyers and informed sellers of credit claims, Anderson and Martin (1977) show that many large corporate lessees inaccurately value lease contracts.

While the degree of informational asymmetry between buyers and sellers of consumer credit may be even more extreme, the finance literature offers little evidence concerning the valuation of retail lease contracts. Given the recent growth in consumer leasing, it is important to consider an accessible, straightforward methodology allowing consumers to compare directly the costs of borrowing versus leasing durable goods. At present, consumer decisions are frequently governed by differences in out-of-pocket costs. Some consumers believe, and some creditors promote, that leasing is the optimal means of asset acquisition simply because it results in lower monthly payments. This logic runs counter to the principles of financial theory, and more important, it encourages inefficiencies in the market for consumer credit.

1.2. The Cost of Borrowing

According to Regulation Z of the Federal Reserve (Truth-In-Lending Regulations, 1984), annual percentage rate computations for closed-end borrowing trans-

actions take the form of the familiar internal rate of return calculation. In particular, the unit-period cost of credit, k, is determined by solving

$$V_0 = \sum_{t-1}^{n} CF_t / (1 + k)^t \tag{3}$$

iteratively for k. V_0 represents the principal balance advanced to the borrower, and CF_t represents the contractual loan payment required in period t. According to federal regulations, this unit-period cost is transformed to the annual percentage rate of interest by multiplying the unit-period rate by the number of periods in one year.

While the Federal Reserve provides Annual Percentage Rate Tables to facilitate compliance with Regulation Z, lenders are free to use any computational tool in determining APRs, provided these tools conform to the mathematical framework outlined by the Fed. As a general rule, lenders must report percentage financing costs within ±0.125 percent of the actual APR to comply with Regulation Z.

1.3. The Lease Versus Borrow Comparison

Simple comparison of the APR and APL data identifies the less costly financing alternative. Advocates of the installment purchase option might argue, however, that credit costs alone do not adequately capture differences between leasing and borrowing alternatives. Lessees must surrender leased assets at the expiration of the financing contract, while borrowers gain title to assets purchased over time.

For this reason, Nunnally and Plath (1989) provide a second index to compare the wealth position of lessees and installment borrowers at the maturity of these respective financing contracts. This lease hurdle rate (LHR) provides the unit-period rate of return necessary to transform the net cash savings from leasing into the residual value of the leased asset at the maturity of the lease. In the absence of tax-deductible lease payments, financing costs, and the depreciation and investment tax credit tax shields on consumer purchases, the unit-period LHR may be defined by solving

$$R_n = C(1 + k)^t + \sum_{t-1}^{n} M_t (1 + k)^t \qquad \text{for } k. \tag{4}$$

In this expression, R_n represents the net residual value of the leased asset at the expiration of the lease, C represents the difference between initial cash outlays under the lease and installment purchase options, and Mt represents the difference between monthly cash costs associated with leasing and debt financing, respectively.

The unit-period LHR is transformed into an effective annual rate through the use of equation (2). This annualized hurdle rate represents the after-tax return which

lessees must earn to realize cash wealth equal to the leased asset's terminal residual value. Lessees unable to obtain this rate of return will possess smaller total wealth than installment purchasers at the maturity of the respective financing contracts. Accordingly, the annual LHR defines the minimum rate of return that lessees must earn on the investment of residual cash flows from leasing to justify the selection of this financing alternative.

2. DATA AND METHODOLOGY

The study used a random sampling procedure to gather financing cost data from providers of new vehicle credit within major metropolitan markets. Credit suppliers included financial institutions, specialized leasing firms, and franchised automobile dealerships. Restricting the research population to large urban markets insured a high degree of competition in the credit markets examined, and provided a straightforward method to determine the size and composition of the population.

Urban population centers included the 25 most populous metropolitan statistical areas within the U.S., and consumer credit vendors included firms that maintained 1989 telephone directory listings under the "Banks", "Automobile Leasing", or "Automobile Dealers—New Cars" categories in the Yellow Pages. Lessors specializing in short-term vehicle rentals were excluded from the research population.

The study used a disguised written questionnaire to obtain specific credit cost information. Shown in the Appendix, this questionnaire appeared as a request for lease and installment purchase credit information initiated by a typical consumer in the market for personal transportation. The professional identity of the researchers and the purpose of the inquiry were not revealed in the questionnaire, because these disclosures might severely bias the information reported by respondents. While each questionnaire requested information concerning 48-month installment borrowing and leasing contracts to standardize the data set, the vehicles described in individual questionnaires varied according to the manufacturer affiliation of different auto dealerships.

2.1. The Sampling Plan

The study used a two-stage, probability-proportionate-to-size sampling plan in order to generalize the credit cost data reported by respondents to the larger research population. In the first stage of sampling, five urban markets were selected at random from the overall research population. Table 1 shows population data and market composition for each of these five markets.

In the second stage of sampling, 300 individual firms were randomly chosen for inclusion in the sample. In keeping with the sampling methodology, the number of firms selected from each geographic market reflected the population density of that market, and the distribution of banks, lessors, and auto dealers within each

TABLE 1.
Description of Sampling Plan

I. Population Characteristics

Market area	1987 Population (thousands)	Percent of total	Sample size
Philadelphia	5,891	37%	110
Miami	2,954	18	54
Cleveland	2,767	17	52
Atlanta	2,657	16	48
Denver	1,861	12	36
TOTAL	16,130	100%	300

II. Sampling Plan

Market area	Banks No.	Banks Pct.	Lessors No.	Lessors Pct.	Dealers No.	Dealers Pct.	Total No.	Total Pct.
A. Market Composition								
Philadelphia	68	10%	130	20%	459	70%	657	19%
Miami	229	35	35	5	399	60	663	19
Cleveland	51	7	228	33	415	60	694	20
Atlanta	130	17	187	25	431	58	748	21
Denver	160	22	158	22	403	56	721	21
TOTAL	638	18%	738	21%	2,107	60%	3,483	100%
B. Respondent Composition								
Philadelphia	3	7%	8	20%	30	73%	41	41%
Miami	3	27	0	0	8	73	11	11
Cleveland	2	11	7	37	10	53	19	19
Atlanta	7	37	4	21	8	42	19	19
Denver	4	44	1	11	4	44	9	9
TOTAL	19	19%	20	20%	60	61%	99	100%
RESPONSE RATE	19	37%	20	32%	60	32%	99	33%

market paralleled the composition of that market in the research population.

Table 1 also reports useable responses across the five markets and three classes of credit suppliers. In most cases, response rates reflect the composition of the original research population, providing geographic and creditor diversity within the data set. In order to qualify as a useable response, the study required that respondents report the annual percentage cost of both leasing and borrowing, as well as all dollar-cost items shown in equations (1) and (3). While the Consumer Leasing Act does not require lessors to report the annual percentage cost of leasing to consumers, 88 percent of the respondents (99 of 113) provided this information in response to the original survey.

2.2. Statistical Tests

The study examined the accuracy of reported credit cost information in a variety of ways. First, the APR on installment borrowing transactions and the APL associated with vehicle leases were calculated from the reported credit cost data using the methodology described above. In calculating lease cost data, the values of ITC, D_j ($j = 1$ to n), and t in equation (1) were set equal to zero in conformity with current tax regulations for individual taxpayers. Values for F, representing the expected residual value of leased assets in period n, were approximated by the purchase option prices offered to lessees at the conclusion of the lease. In calculating the annual percentage cost of leasing, equation (1) contains an implicit assumption that the riskiness of the expected residual value term is equal to the risk of contractual lease payments. While this clearly oversimplifies the lease valuation problem, the random selection of different vehicle manufacturers and various leased assets in the sample suggests that residual value estimation errors will contain no systematic bias.

Effective annual credit costs for both borrowing and leasing transactions were determined using the exponential transformation shown in equation (2). Next, calculated annual credit costs were compared with reported credit costs to identify the direction and magnitude of individual credit cost reporting errors. Finally, these reporting errors were evaluated using various statistical significance tests, including one-way analysis of variance (ANOVA) procedures.

Given the unbalanced ANOVA designs present in the study, heterogeneity of variance can severely bias the reported statistical results. Bartlett's test (Neter, Wasserman, and Kutner, 1985) for the equality of group variances provides a means of testing this condition. Test results from this procedure are shown in Table 2. In

TABLE 2.
Homogeneity of Variance Hypothesis Testing.
Bartlett's Test Results

Dependent variable	Treatment	ANOVA table	df	Chi-Square values Calculated	Critical
Calc. loan cost	Market area	4-I-A	4	16.7**	13.3
Calc. lease cost	Market area	4-I-B	4	18.9**	13.3
Calc. loan cost	Creditor type	4-II-A	2	10.4**	9.2
Calc. lease cost	Creditor type	4-II-B	1	0.6	6.6
Loan error	Market area	5-II-A	4	49.4**	13.3
Lease error	Market area	5-II-A	3	4.0	11.3
Loan error	Creditor type	5-II-B	2	36.2**	9.2
Lease error	Creditor type	5-II-B	1	10.5**	6.6
Lease risk premia	Market area	6-II-A	4	2.3	13.3
Lease risk premia	Creditor type	6-II-B	1	0.9	6.6

Note: ** — Indicates significance at least at the 1% level.

cases where the homogeneity of variance condition is violated, Welch's (1951) F'' statistic replaces the conventional F statistic in the reported statistical results. Keselman, Games, and Rogan (1979) demonstrate that Welch's procedure provides adequate control of Type I errors in cases where unbalanced designs exhibit unequal variance structures.

3. RESULTS

Table 3 provides a summary of the reported credit costs furnished by respondents, and the calculated credit costs and lease hurdle rates derived from these reported data. In general, reported loan costs exceed reported lease costs, and the variance within reported loan costs exceeds the variance in reported lease costs. In contrast, calculated lease costs frequently exceed calculated loan costs, while the variance within calculated credit costs is greater for lease transactions. These data suggest that larger credit cost reporting errors characterize vehicle lease agreements.

Variance in the derived lease hurdle rates exceeds variance in both reported and calculated credit costs, indicating that in the specific lease and borrow alternatives provided by respondents, it is impossible to declare either financing option as unilaterally optimal. In some cases, the lease hurdle rate is actually negative, which

TABLE 3.
Profiling Consumer Credit Costs

	Mean	Standard deviation	Minimum value	Maximum value
I. Composite Sample				
Reported loan cost	11.02%	1.76%	6.90%	12.95%
Calculated loan cost	12.47	2.26	7.18	18.35
Reported lease cost	10.56	0.95	8.75	12.00
Calculated lease cost	12.65	2.97	0.31	18.29
Lease hurdle rate	9.02	7.90	–23.45	105.86
II. Financing Costs by Market Area				
Philadelphia				
Reported loan cost	10.99%	1.66%	6.90%	12.95%
Calculated loan cost	12.70	2.57	7.18	17.58
Reported lease cost	10.39	0.76	9.00	11.50
Calculated lease cost	12.35	3.19	0.31	16.58
Lease hurdle rate	7.52	8.18	–23.45	20.62
Miami				
Reported loan cost	11.40%	1.81	7.90%	12.50%
Calculated loan cost	13.46	0.71	12.40	14.49
Reported lease cost	NC	NC	NC	NC
Calculated lease cost	NC	NC	NC	NC
Lease hurdle rate	NC	NC	NC	NC

(continued)

TABLE 3. (continued)
Profiling Consumer Credit Costs

	Mean	Standard deviation	Minimum value	Maximum value
Cleveland				
Reported loan cost	10.66%	2.12%	6.90%	12.95%
Calculated loan cost	11.99	2.22	8.11	15.28
Reported lease cost	10.47	0.98	9.00	12.00
Calculated lease cost	12.00	3.21	5.30	18.29
Lease hurdle rate	8.14	73.20	− 8.59	105.86
Atlanta				
Reported loan cost	10.84%	2.09%	6.90%	12.90%
Calculated loan cost	11.99	2.75	8.07	18.35
Reported lease cost	10.20	1.45	8.75	12.00
Calculated lease cost	13.73	1.77	10.60	15.90
Lease hurdle rate	11.73	4.72	6.38	20.14
Denver				
Reported loan cost	11.45%	1.49%	6.90%	12.50%
Calculated loan cost	12.38	1.22	8.79	13.71
Reported lease cost	11.33	0.52	11.00	12.00
Calculated lease cost	13.80	0.76	12.90	14.57
Lease hurdle rate	16.23	3.10	10.99	18.84

III. Financing Costs by Credit Source
Banks

	Mean	Standard deviation	Minimum value	Maximum value
Reported loan cost	11.96%	0.52%	11.00%	12.50%
Calculated loan cost	12.70	0.63	11.47	13.44
Reported lease cost	NC	NC	NC	NC
Calculated lease cost	NC	NC	NC	NC
Lease hurdle rate	NC	NC	NC	NC
Lessors				
Reported loan cost	10.68%	2.17%	6.90%	12.95%
Calculated loan cost	12.59	2.72	8.20	18.35
Reported lease cost	10.15	1.00	8.75	11.25
Calculated lease cost	12.23	2.63	6.20	15.90
Lease hurdle rate	9.96	5.97	1.17	20.62
Dealers				
Reported loan cost	10.86%	1.81%	6.90%	12.90%
Calculated loan cost	12.38	2.42	7.18	17.58
Reported lease cost	10.68	0.94	9.00	12.00
Calculated lease cost	12.77	3.08	0.31	18.29
Lease hurdle rate	8.78	8.35	−23.45	21.95

Note: NC—Insufficient responses for calculation.

TABLE 4.
Calculated Loan and Lease Credit Costs.
Analysis of Variance

I. Calculated Credit Costs by Market Area

A. Loan Data: Omnibus Test (Welch's F'')

SV	df	SS	MS	F''	p > F
Treatment	4	15.2	3.8	3.0	> 0.05
Error	79	409.4	5.2		
Total	83	424.6			

B. Lease Data: Omnibus Test (Welch's F'')

SV	df	SS	MS	F''	p > F
Treatment	4	32.0	8.0	3.8	> 0.10
Error	69	614.1	8.9		
Total	73	646.1			

II. Calculated Credit Costs by Creditor Type

A. Loan Data: Omnibus Test (Welch's F'')

SV	df	SS	MS	F''	p > F
Treatment	2	1.4	0.7	0.1	> 0.25
Error	81	423.2	5.2		
Total	83	424.6			

B. Lease Data: Omnibus Test (Traditional F)

SV	df	SS	MS	F''	p > F
Treatment	1	3.8	3.8	0.4	> 0.51
Error	72	642.3	8.9		
Total	73	646.1			

implies that the undiscounted periodic cash savings provided by leasing generates cumulative cash flows in excess of the vehicle's residual value at the maturity of the financing contracts. In other cases, the LHR exceeds 100 percent, indicating that the small difference between periodic lease and installment purchase costs makes it virtually impossible for consumers to invest these cash flows to provide terminal wealth equal to the vehicle's residual value.

While these data may be dismissed as erroneously reported information, they are not treated as statistical outliers and removed from the data set. Rather, reported credit costs are shown in unadulterated form to illustrate the nature of credit information routinely provided to consumers. The results contain substantial variance, and they may provide grossly inaccurate and misleading information.

Table 4 provides summary ANOVA results examining whether calculated credit costs differ according to market area or creditor type. These categorical variables are not significant in explaining variance in calculated credit costs. Given the depth, breadth, and communications linkages within the market for consumer credit, this market can be described as national in scope. Regional credit cost differences explain very little of the variance in either calculated lease or calculated borrowing costs.

Similar results emerge from ANOVA testing of the creditor type variable. Competition within the metropolitan credit markets examined would suggest that credit costs remain stable across different suppliers of credit. The data support this hypothesis, as calculated credit costs do not vary significantly across banks, lessors, or auto dealers.

3.1. Credit Cost Reporting Errors

Credit cost reporting errors, representing the difference between calculated and reported credit costs, are significantly different from zero for both lease and

TABLE 5.
Analysis of Credit Cost Reporting Errors
(Reporting Error = Calculated Credit Cost – Reported Credit Cost)

I. Tests of Significance (Unequal Population Variance)

| | Absolute value of Reporting error | | Proportion of sample where | |
	Mean	Std. error	Reported cost > Calculated cost	Reported cost < Calculated cost
A. Aggregate Sample				
1. Loan Data	1.39%**	0.19%	1%	99%
2. Lease Data	3.22 **	0.33	9	91
B. Errors by Market Area				
1. Loan Data				
Phila.	1.71%**	0.31%	0%	100%
Miami	2.16 *	0.75	0	100
Cleveland	1.43	0.71	9	91
Atlanta	0.74 **	0.08	0	100
Denver	0.71	0.12	0	100
2. Lease Data				
Phila.	3.54%**	0.59%	25%	75%
Miami	NC	NC	—	—
Cleveland	2.78 *	0.76	0	100
Atlanta	3.56 **	0.52	0	100
Denver	2.09 **	0.38	0	100
C. Errors by Creditor Type				
1. Loan Data				
Banks	0.83%**	0.07%	0%	100%
Lessors	1.35	0.71	9	91
Dealers	1.55	0.23	0	100
2. Lease Data				
Banks	NC	NC	—	—
Lessors	1.80%**	0.17%	14%	86%
Dealers	3.62 **	0.39	8	92

Notes: NC — Insufficient responses for calculation.
** — Indicates significance at least at the 1% level.
* — Indicates significance at least at the 5% level.

installment borrowing results. Table 5 reports the significance test statistics for these data. The absolute value of reporting errors are used in statistical tests to evaluate the magnitude and dispersion of these errors independent of their direction. Table 5 also reports directional characteristics of reporting errors. In virtually all cases, calculated credit costs exceed reported costs. In other words, creditors systematically understate the effective cost of consumer credit.

On average, loan reporting errors are smaller and more narrowly concentrated about their mean than lease errors. This may occur because the Truth-In-Lending Act establishes explicit guidelines for creditors reporting borrowing cost data to consumers, while similar standards do not apply to lease transactions. The reporting errors shown for loan transactions occur because the Truth-In-Lending Act permits creditors to use an arithmetic transformation of unit-period credit costs provided in equation (3) to obtain annualized credit costs. In keeping with financial theory, this study generates calculated credit costs using the exponential transformation of unit-period returns shown in equation (2).

Commercial banks understate effective borrowing costs by an average 0.83 percent. The significance of this error represents a statistical artifact, which is

II. Analysis of Variance

A. Reporting Errors by Market Area

1. Loan Data: Omnibus Test (Welch's F'')

SV	df	SS	MS	F''	$p > F$
Treatment	4	17.8	4.5	4.8	> 0.05
Error	71	194.8	2.7		
Total	75	212.7			

2. Lease Data: Omnibus Test (Conventional F)

SV	df	SS	MS	F	$p > F$
Treatment	4	41.6	10.4	1.4	> 0.27
Error	27	203.2	7.5		
Total	31	244.8			

B. Reporting Errors by Creditor Type (Omnibus Test (Welch's F'')

1. Loan Data: Omnibus Test (Welch's F'')

SV	df	SS	MS	F''	$p > F$
Treatment	2	5.8	2.9	1.3	> 0.25
Error	73	206.8	2.8		
Total	75	212.7			

2. Lease Data: Omnibus Test (Welch's F'')

SV	df	SS	MS	F''	$p > F$
Treatment	1	12.3	12.3	2.6	> 0.10
Error	30	232.4	7.5		
Total	31	244.8			

explained by the different compounding methods used to produce calculated and reported borrowing costs in the study. The modest variance associated with reporting errors for banks suggests that these financial institutions use a consistent methodology to calculate effective borrowing costs. While this methodology conforms to federal regulations, it modestly understates effective borrowing costs.

In addition, reporting errors provided by lessors and auto dealers are not statistically significant, due to the relatively large variance in these data. While the Truth-In-Lending Act applies to all lenders who regularly extend consumer credit, lessors and auto dealers do not appear to follow a common methodology in determining and reporting effective credit costs.

The statistical significance associated with credit cost reporting errors is not attributable to market area or creditor type. Table 5 shows that ANOVA tests performed on the data do not yield significant results. Credit cost reporting errors occur systematically throughout the consumer credit industry; they are not isolated within a particular geographic area or unique to a particular type of credit supplier.

3.2. Explaining Credit Cost Differences: Leasing Versus Borrowing

The finance literature demonstrates that long-term lease contracts are similar to secured debt in many respects, but as Smith and Wakeman (1985) and Ang and Peterson (1984) illustrate, these financing alternatives are clearly different from one another. In spite of their differences, MDB explain that both leasing and borrowing represent a means for lessees/borrowers to acquire the necessary cash to support asset acquisition plans. As such, Miller and Upton (1976) point out that in efficient and competitive capital markets, the financial costs of leasing and borrowing must be equal. Informed lessees/borrowers seek out the lowest-cost source of credit, while competition among different credit providers drives economic rents toward zero.

Table 6 reveals, however, that under the current tax treatment of personal borrowing and leasing transactions, the effective annual percentage costs of these alternative financing arrangements are not the same. In addition, the effective cost of leasing is neither unilaterally higher, nor lower, than the corresponding borrowing cost. In roughly one-half of the sample cases, borrowing costs exceeded leasing costs, while the remaining cases exhibit the opposite cost preference.

This result counters many previous empirical studies in the finance literature examining leasing costs. For example, Sorensen and Johnson (1977), McGugan and Caves (1974), Gudikunst and Roberts (1978), and Crawford, Harper and McConnell (1981) estimate the internal rates of return associated with a variety of different corporate financial lease contracts. In general, these studies report that lease yields unilaterally exceed equivalent debt financing costs. In contrast to this evidence, the finance literature offers a number of reasons to explain why in some cases, the cost of leasing should exceed that of borrowing, while in other cases, the reverse is true. This literature is useful for interpreting the results shown in Table 6.

TABLE 6.
Credit Cost Differences: Leasing Versus Borrowing
(Difference = Calculated Lease Cost − Calculated Loan Cost)

I. Tests of Significance (Unequal Population Variances)

	Absolute value of Credit cost difference		Proportion of sample where	
	Mean	Std. error	Difference > 0	Difference < 0
A. Aggregate Sample	2.92%**	0.27%	52%	48%
B. Credit Cost Difference by Market Area				
Philadelphia	2.72%**	0.41%	45%	55%
Miami	3.63 *	0.95	33	67
Cleveland	3.58 **	0.65	38	62
Atlanta	3.25 **	0.89	87	13
Denver	2.08 **	0.50	78	22
C. Credit Cost Difference by Creditor Type				
Banks	NC	NC	—	—
Lessors	2.53%**	0.51%	36%	64%
Dealers	3.01 **	0.32	56	44

II. Analysis of Variance

A. Absolute value of credit cost difference by market area: Omnibus Test (Conventional F)

SV	df	SS	MS	F''	$p > F$
Treatment	4	15.3	3.8	0.7	0.58
Error	65	344.1	5.3		
Total	70	359.4			

B. Absolute value of credit cost difference by creditor type: Omnibus Test (Conventional F)

SV	df	SS	MS	F	$p > F$
Treatment	1	2.6	2.6	0.5	0.49
Error	68	356.8	5.2		
Total	69	359.4			

Notes: NC — Insufficient responses for calculation.
   ** — Indicates significance at least at the 1% level.
    * — Indicates significance at least at the 5% level.

First, the credit cost estimation framework provided by equations (1) and (3) may not capture all of the relevant financial costs associated with leasing. The lease-borrow comparisons in Table 6 assume that equivalent risk premia apply to lessees and installment borrowers. This assumption may be invalid. If lessees, as a group, exhibit higher rates of expected delinquency or nonperformance, then the financial cost of leasing should exceed borrowing costs to compensate lessors for the additional default risk of leasing.

This argument seems unlikely, however, because suppliers of credit generally offer the lease-borrow choice to consumers on the basis of similar credit standards. Individuals classified as creditworthy for borrowing are also offered the lease

alternative, and consumers who fail to qualify for installment credit are also rejected as lessees. While credit quality undoubtedly varies across different debtors, it seems unlikely that it differs across the entire class of lessees versus borrowers.

A second financial cost affecting lease yields, the non-diversifiable residual value risk premium, is not considered in equation (1). Miller and Upton (1976), McConnell and Schallheim (1983), and Schallheim, Johnson, Lease, and McConnell (1987) demonstrate that financial lease yields are negatively related to the non-diversifiable residual value risk of leased assets. Assets exhibiting higher rates of systematic depreciation, measured by the time-series covariance between market returns and asset depreciation rates, are priced by lessors to provide higher returns. If this residual value risk differs substantially across the leased vehicles represented in Table 6, then these results may represent equilibrium financing costs in a competitive market. Lease yields for vehicles containing relatively high residual value risk will exceed equivalent borrowing costs, while leases supporting vehicles that exhibit lower residual value risk will be priced below the corresponding borrowing cost.

Another explanation for differences between observed leasing and borrowing costs concerns the presence of imperfections in the market for consumer credit. These imperfections include differential tax rates between lessors and lessees, transactions costs, information costs, and contract monitoring costs. In some cases, particular imperfections imply that leasing costs will exceed borrowing costs, while in other cases a different set of imperfections offers reasons why leasing is less costly than installment borrowing.

Several imperfections suggest that lease yields will exceed borrowing costs. In cases where information is not costlessly available to all participants in consumer finance markets, lessors may be able to exploit lessees' inability to determine the true cost of leasing. Anderson and Martin (1977) report that even among Fortune 200 firms, many analytical and methodological errors occur in the valuation of financial leases. This problem is perhaps even more acute in consumer finance transactions, where many individuals unfamiliar with the principles of financial analysis make financing choices.

Residual value uncertainty provides another imperfection explaining why lease yields exceed borrowing costs. In cases where lessors and lessees do not share a similar view of a given asset's residual value distribution, lessees may be willing to pay lessors a premium to avoid residual value uncertainty. Given that lessors are more familiar with secondary markets for leased assets, paying this premium allows lessees to avoid the search, information, and transactions costs associated with the disposal of owned assets.

Monitoring costs can also explain the higher cost of leasing. Smith and Wakeman (1985) point out that an asset's value is affected by its history of use and maintenance. Since lessees do not acquire disposal rights in connection with lease transactions, they have less incentive to maintain the asset to maximize its resale value. If the lease contract cannot effectively bind the lessee to provide mainte-

nance, or if it is relatively expensive for lessors to detect asset abuse caused by undermaintenance, then lease yields will reflect a premium for the added monitoring costs and adverse selection problems created by leasing.

Finally, differences in marginal tax rates between lessors and lessees can explain differences between leasing and borrowing yields. In cases where lessees are unable to use the tax shields provided by lease payments, but lessors must treat lease payments as taxable income, then the cost of leasing may exceed borrowing costs to compensate lessors for the disproportionate tax burden they bear. Current tax regulations attenuate this cost, because most consumers are unable to use lease payments to shield income from taxes.

On the other hand, differences in lessor and lessee tax rates provide one explanation why the cost of leasing can fall below borrowing costs. Franks and Hodges (1978) and Miller and Upton (1976) show that when lessees maintain lower marginal tax rates than lessors, depreciation tax shields are more valuable to lessors. In this circumstance, firms seeking to acquire depreciable assets can exchange depreciation tax shields for reduced financing costs through the use of leasing. In consumer markets, a similar exchange of tax shields for reduced financing costs might be expected, because most personal assets cannot be depreciated against taxable income. Through leasing, consumers can pass these tax shields to lessors who can realize their value, and in return, lessors may offer reduced financing costs of consumers.

Finally, transaction cost advantages can explain why borrowing costs exceed leasing costs. In cases where lessors have a comparative advantage in the disposal of used assets, Lewellen, Long, and McConnell (1976) note that lessors can promote the lease alternative in competitive markets by offering reduced financing costs of lessees. In consumer markets, this reduction in lease yields is made possible by lessors' comparatively lower search, information, and transaction costs in providing centralized locations for second-hand asset sales.

Given the offsetting nature of various imperfections, and the absence of a single market imperfection which dominates the determination of lease yields, different lease-borrow comparisons produce significantly different results. This leads Lewellen, Long, and McConnell to note that corporate lease-borrow comparisons must be evaluated on a case-by-case basis to determine the lower cost financing method.

The same general conclusion applies to consumer credit transactions. Identification of the less costly retail financing method is difficult, however, because reported lease cost data tends to confuse, rather than clarify, true financing costs, and federal credit cost disclosure requirements are not structured to permit the direct comparison of leasing and borrowing costs. Moreover, the need for case-by-case credit cost comparison is not limited to particular geographic areas or specific credit suppliers. As Table 6 indicates, the market area and creditor type variables are not significant in explaining the variance in calculated credit cost differences. While leasing and borrowing costs differ across a variety of geographic markets and credit

suppliers, the cost of leasing is neither generally higher, nor generally lower, than associated borrowing costs in specific metropolitan areas. Similarly, vehicle leasing firms do not generally provide superior leasing terms, and commercial banks do not necessarily provide borrowing rates that favor installment purchase.

4. CONCLUSIONS

This article surveys reported consumer credit costs associated with new vehicle lease and installment borrowing transactions to measure the credit cost advantages associated with lease financing, and assess the accuracy of credit cost data provided to consumers. In general, the study finds that major suppliers of credit in consumer markets—including banks, leasing firms, and auto dealers—consistently and significantly understate effective annual credit costs. The magnitude of these reporting errors is larger for leasing transactions, which may occur because federal consumer credit regulations do not require lessors to report the effective cost of leasing to consumers in a uniform manner. These credit cost reporting errors are not unique to specific geographic areas, and they are not confined to particular types of credit suppliers.

The study also finds that neither leasing nor installment borrowing provides a unilaterally cheaper consumer financing alternative. While leasing and borrowing costs are significantly different from one another in every credit market examined, in approximately one-half of the sample cases, borrowing costs exceeded leasing costs, and the remaining cases exhibited the opposite cost preference. This result counters previous empirical research concerning the effective cost of leasing, which concludes that leasing is generally more expensive than borrowing. The results of the present study, however, are compatible with a wide body of basic research in the finance literature that explains why the cost of different lease agreements may fall above and below the associated cost of borrowing.

Finally, the study concludes that comparative analysis of consumer leasing and borrowing costs must be handled on a case-by-case basis to make appropriate financial choices. Unfortunately, a variety of impediments in the market for consumer credit—including participants who are unskilled in the application of modern financial theory, inaccurate credit cost information reported by credit suppliers, and federal reporting standards which make direct comparisons between leasing and borrowing costs difficult—can lead to inappropriate financing decisions. In addition, these impediments encourage allocational inefficiency in the market for consumer credit.

APPENDIX

Research Questionnaire

Residential Street Address
City, State Zip
Date

Creditor Name
Creditor Address
City, State Zip

Sales Manager:

I will be relocating to the area in September, and I plan to acquire a new car upon my arrival there. In order to research local financing costs before my arrival, I would appreciate some information from your firm regarding:

(1)   the cost of a 48-month, closed-end lease with zero capital cost reduction provided at the beginning of the lease; and

(2)   the cost of a 48-month installment loan contract with a 20 percent down payment.

I would like to acquire for personal use a new, 1989 sedan containing air conditioning, AM/FM stereo cassette, and the custom appearance package.

Please provide a summary of the initial costs, lease payments, and final costs your firm would charge to lease this car. In addition, I would like to know the totl price of the car used to determine the lease payments, the estimated residual value of the vehicle at the termination of the lease, and the effective annual percentage cost of the lease contract.

In order to compare leasing with installment purchase, I would also like to know the total cost necessary to purchase the vehicle, the monthly payments necessary to amortize an installment loan over a 48-month period, and the Annual Percentage Rate of interest for this transaction. I am planning to make a 20 percent down payment on this purchse.

I have enclosed a postage-paid envelope for your convenience. Thank you for your time, and I look forward to discussing the details of this transaction with you in September.

Sincerely,
D. Anthony Plath

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