An Analysis of Covered Hopper Car Use by Merchandising Firms in North Dakota and a Methodology for Analyzing the Lease/Purchase Alternative

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AN ANALYSIS OF PRIVATE COVERED HOPPER CAR USE BY MERCHANDISING FIRMS IN NORTH DAKOTA AND A METHODOLOGY FOR ANALYZING THE LEASE/PURCHASE ALTERNATIVE

BY Dennis R. Ming*

Private cars comprise a significant portion of all Class I rolling stock. Almost one-third of all freight cars used by Class I railroads are privately owned. Covered hopper car and jumbo covered hopper car numbers are even more significant as 44 and 48 percent, respectively, are nonrailroad owned.

Schools of thought may vary on why private car ownership has increased so dramatically in recent years. However, with respect to covered hopper cars, it is evident that chronic equipment shortages in the seventies prompted grain merchandising firms to seek alternatives to alleviate the problem. As a result shippers began to purchase and lease cars in order to assure equipment availability.

The purpose of this paper is to profile jumbo covered hopper car leasing by country grain merchandising firms in North Dakota. Costs and utilization of leasing hopper cars are detailed. In addition, a model is developed for comparing the lease/purchase decision.

Rail Grain Fleet

Railroads, like many other industries, have been making technological advances to enhance their operational efficiency. The transition from general to special purpose freight cars has increased the railroad's ability to transport commodities efficiently.

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Car Types

Railroads have been increasing the utilization of specialized equipment that facilitates the loading, movement and unloading of various types of commodities in recent years. Current rail movements of grain have principally been in covered hopper cars (Table 1). Covered hopper cars accounted for 38 percent of the loads and 51 percent of the volume in 1970. Boxcars, on the other hand, accounted for 62 percent of the loads and 49 percent of the volume. By 1980, covered hopper cars carried 84 percent of the loads and 90 percent of the grain volume shipped by rail. This shift towards increased utilization of covered hopper cars underscores the preference of railroads and shippers to use specific freight car designs in moving commodities.

TABLE 1. MOVEMENT OF GRAIN BY BOXCARS AND COVERED HOPPER CARS, 1970-80.

Year	Total Rail Volume	Covered Hopper Cars			Box Cars		
		Number of Loads	Percent of Loads	Percent of Volume	Number of Loads	Percent of Loads	Percent of Volume
	(000,000 bu)	(000 loads)			(000 loads)		
1970	3,702	1,463	38	51	908	62	49
1971	3,390	1,288	45	58	707	55	42
1972	3,697	1,356	52	65	653	48	35
1973	4,501	1,678	49	62	852	51	38
1974	4,201	1,463	63	74	546	37	26
1975	4,065	1,342	74	83	355	26	17
1976	4,100	1,322	79	86	282	21	14
1977	3,911	1,249	81	88	239	19	12
1978	4,125	1,340	77	85	309	23	15
1979	4,410	1,425	78	86	311	22	14
1980	5,004	1,575	84	90	252	16	10

Source: Association of American Railroads, The Grain Book, Office of Information and Public Affairs, Washington, D.C., 1981.

Car Numbers and Fleet Capacity

There has been an inverse relationship between the number of boxcars and covered hopper cars since 1970 (Table _). Number of boxcars used for transporting grain declined from over 200,000 in 1971 to less than 16,000 in 1983. It is difficult to make the same comparison with respect to covered hopper cars because of computer separation of small and jumbo covered hopper cars in 1978. Nonetheless, an increasing trend in covered hopper car numbers can be identified in both the 1970-77 and 1978-83 periods. Covered hopper car numbers increased from 161,100 in 1970 to 230,100 in 1977. Jumbo covered hopper car numbers increased from 148,700 in 1978 to 232,700 in 1983.

Private Car Ownership

Private ownership of jumbo covered hopper cars has increased dramatically in recent years (Table 3). In 1978 36 percent of all jumbo covered hopper cars were privately owned. By 1983 this figure had increased to 48 percent. These figures compare with 16 percent private ownership in 1973.[1]

A significant factor contributing to expansion of the private jumbo covered hopper car (JCHC) fleet can be traced to the inherent seasonality of grain marketings. Wilson and Crabtree studied monthly grain movements from North Dakota origins to various destinations for crop years 1967-68 to 1978-79.[2] Seasonal indexes indicated that monthly grain movements from North Dakota were as low as 65 percent and as high as 142 percent of the monthly average movements during crop year 1978-79 in January and October, respectively. Other crop years exhibited similar seasonal patterns. The presence of seasonal grain marketings makes it extremely difficult for

TABLE 2. GRAIN FLEET CAPACITY, 40-FOOT NARROW DOOR BOXCARS AND COVERED HOPPER CARS, UNITED STATES, 1970-83.

Year	Boxcars			Hopper Cars			Total Boxcar And Hopper Car Capacity
		Capacity			Capacity		
	Number	Average	Total	Number	Average	Total	
	(000)	(tons/car)	(million bu)	(000)	(tons/car)	(million bu)	
1970	180.0	54.6	327.6	161.1	86.8	466.1	793.7
1971	207.6[a]	54.9	379.9	170.7	88.2	501.8	881.7
1972	190.0	56.6	358.4	179.9	88.6	531.3	889.7
1973	178.5	57.5	342.1	186.2	88.2	547.4	889.5
1974	164.7	59.0	323.9	204.9	89.9	614.0	937.9
1975	149.5	59.0	294.0	219.4	91.3	667.6	961.6
1976	131.6	60.9	267.1	228.3	91.3	694.7	961.8
1977	107.8	62.4	224.2	230.1	92.3	707.9	932.1
1978[b]	86.5	62.8	181.1	148.7	98.0[c]	485.7	666.8
1979[b]	66.2	62.4	137.7	161.8	98.0[c]	528.5	666.2
1980[b]	58.5	62.5[d]	121.9	186.0	98.0[c]	607.5	729.4
1981[b]	43.8	62.5[d]	91.2	218.1	98.0[c]	712.4	803.6
1982[b]	18.4	62.5[d]	38.3	232.8	98.0[c]	760.4	798.7
1983[b]	15.4	62.5[d]	32.1	232.7	98.0[c]	760.1	792.2

[a] Increase due to reclassification of several cars from wide door to narrow door.

[b] Figures from 1978-83 are not comparable to previous years due to computer separation of small and jumbo covered hopper cars.

[c] Approximate jumbo covered hopper car capacities.

[d] Estimated.

Source: Association of American Railroads, Statistics of Railroads of Class I, November, 1980, and USDA, Office of Transportation, Grain Transportation Situation, Various Issues.

railroads to assess an optimum size grain fleet. If railroads size their fleets based on peak movements overcapacity exists during off-peak periods. Conversely, if fleets are sized based on trough periods shortages will occur during times of peak movements. The apparent undersizing of the grain fleet by railroads in the seventies provided incentives to shippers to acquire privately owned equipment.

TABLE 3. NUMBER OF RAILROAD OWNED AND PRIVATELY OWNED COVERED HOPPER CARS, 1972-83.

Year	Total	Ownership			
		Railroads	Pct.	Private	Pct.
	(thousand cars)			(thousand cars)	
1972	179.7	138.8	77	41.1	23
1973	186.2	142.3	76	43.9	24
1974	205.0	151.2	74	53.8	26
1975	219.4	155.3	71	64.1	29
1976	228.3	158.2	69	70.1	31
1977	230.2	160.0	70	70.2	30
1978[a]	148.8	94.6	64	54.2	36
1979[a]	162.4	99.9	62	62.5	38
1980[a]	188.1	107.2	57	80.9	43
1981[a]	218.1	117.1	54	101.0	46
1982[a]	230.7	122.2	53	108.5	47
1983[a]	232.7	120.2	52	112.5	48

[a] Figures from 1978-83 are for jumbo covered hopper cars.

Source: USDA, AMS, Future Railcar Needs for U.S. Grain Movements, AMS-576, November, 1978 and USDA, Office of Transportation, Grain Transportation Situation, Various Issues.

Decisions concerning fleet size are further complicated as railroads and shippers increase use of specialized equipment. JCHCs cannot be used effectively to transport commodities that do not have like characteristics of grain. Thus, excess capacity in the grain fleet cannot be readily shifted to alternative commodity movements. Likewise, rail cars used to transport other commodities are not readily diverted to grain traffic during peak demand periods because of their specialized nature.

Persistent shortages of covered hopper cars in the seventies burdened the ability of merchandising firms to market grain in a timely fashion. Figure 1 depicts historical supply/demand balances for covered hopper cars from 1972 through 1980. Merchandising firms were faced with little relief

throughout the period with respect to shortages--a likely incentive leading to substantial private investment in JCHCs.

OT-5

Essentially "OT-5" is a misnomer which refers to the process of placing private rail cars into use on railroad lines. Shippers must direct written applications for OT-5 authority through the Association of American Railroads (AAR). AAR approves or disapproves applications based on the direction of the applicable carrier(s) that serve the shippers. Upon approval shippers may place and use privately owned equipment for transporting products.

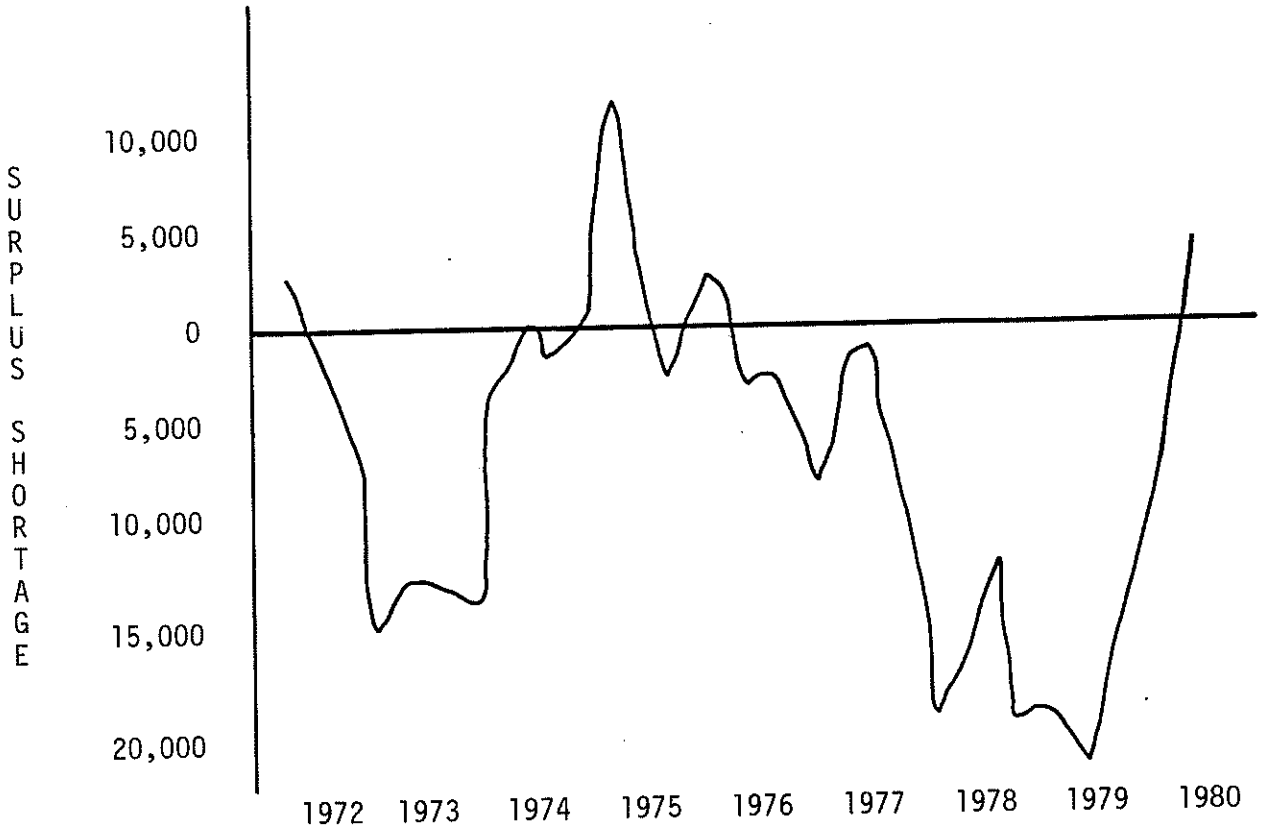

Figure 1. Approximate Supply/Demand Balances of Covered Hopper Cars, 1972-80.

Source: Association of American Railroads.

Private Car Compensation

Shippers receive compensation from railroads for using nonrailroad owned equipment. In the case of grain, most shippers using privately owned JCHCs receive mileage credits. Credits are based on market value and loaded mileage of the car. Table 4 contains selected mileage credits for type "LO" cars (LO designates covered hopper cars) that were being paid as of February 1, 1983. A shipper using a privately owned JCHC having an original fair market value of $44,500 would earn a credit of 47.0 cents per loaded mile. If the shipper sent the car to a market destination 500 miles from point of origin, $235 in mileage credits would be earned (500 loaded miles times $0.47 per loaded mile).

TABLE 4. SELECTED MILEAGE RATE ALLOWANCES FOR TYPE "LO" CARS.

Original Fair Market Value[a] ($)	Mileage Credit, Age of Car	
	1-29	30 and Over
	----------¢/loaded mile----------	
1,001 - 2,000	10.9	9.8
10,001 - 11,000	18.5	10.5
20,001 - 21,000	26.9	11.2
30,001 - 31,000	35.3	12.0
40,001 - 41,000	43.6	12.8
44,001 - 45,000	47.0	13.2
50,001 - 51,000	52.0	13.6
51,001 - 52,000	52.9	13.6
52,001 - 53,000	53.7	13.7
53,001 and over	54.6	13.8

[a] Mileage credits are paid based on $1,000 incremental changes in market value. This table contains only selected mileage credits.

Source: Interstate Commerce Commission, The Handling and Payment of Mileage, ICC PHJ 6007-H, Supplement 24, Effective February 1, 1983.

Value groups for privately owned cars are determined by car values recorded in Universal Machine Language Equipment Register (UMLER) data files. Car owners not reporting proper car valuation data to AAR are assigned to the lowest applicable mileage allowance rate group. Mileage credits do not accrue to shippers if their respective cars are not registered.

Some railroads have recently restricted mileage allowances on shipper owned or leased covered hopper cars to lower levels than were prescribed in Tarriff PHJ 6007-H. In the past, it was common for railroads to restrict mileage allowances on multiple car movements. However, recent restrictions have been exclusive of type of movement (i.e., single car, multiple car, etc.).

Not all railroads compensate private car owners/lessees with mileage payments. An alternative used by several railroads is to publish two separate rates, one which applies when carrier furnished cars are used by the shipper and the other which applies when private cars are used. Normally, rates published for private car useage are lower than rates published for railroad owned car useage.

Another alternative in private car compensation is a combination reduced rate and mileage allowance. Table 5 contains hypothetical examples of three forms of private car compensation methods discussed above. In Example A, the shipper receives the full mileage credit. Example B depicts a reduced mileage credit and rate, and Example C represents a reduced rate, but no mileage allowance.

TABLE 5. HYPOTHETICAL EXAMPLES OF PRIVATE COVERED HOPPER CAR COMPENSATION.

Example	Mileage Credit (¢/loaded mile)	Rate: Private Car (¢/cwt.)	Rate: Carrier Car (¢/cwt.)
A	32	100	100
B	24	90	100
C	0	75	100

Lease Costs and Equipment Utilization

A survey was conducted by the Upper Great Plains Transportation Institute (UGPTI) in September, 1981, to collect data from covered hopper car lessees in North Dakota. Surveys were mailed to 175 grain elevators previously identified as lessees. Fifty elevators returned questionnaires for a 29 percent response rate. Data collected pertained to number of cars, lease cost, age of cars, term of lease, grain shipped, market destination, equipment utilization and future leasing intentions.

Statistics on Covered Hopper Car Lessees

Respondents to the mail survey leased an average of seven covered hopper cars per elevator (Table 6). Fewest cars leased by the responding firms was two while the most was 23. Of 348 hopper cars leased by 50 firms, 302 were 4,750 cubic feet capacity cars. Ten cars classified as "small" covered hopper cars had capacities of 3,750 cubic feet while five had capacities of 3,500 cubic feet. The remaining 31 covered hopper cars had capacities that ranged from 4,500 cubic feet to 4,650 cubic feet.

Lessees made an average monthly lease payment of $430 per car. The lease payment ranged from a low of $195 to a high of $550 per month. North

American Car Corporation and Grain Terminal Association (GTA) were the most prominent lessors. The two firms leased cars to 29 of the 50 responding elevators. Both firms reported leasing most of their cars to country elevators in North Dakota under terms of "full-service operating" leases. Under terms of full-service operating leases, lessees are responsible only for lease payments. Lessors are responsible for maintenance and ownership costs (taxes, insurance, administration, etc.).

TABLE 6. STATISTICS ON COVERED HOPPER CAR LESSEES.

Variable	Number of Observations	Minimum Value	Maximum Value	Mean Value
Number of Cars	50	2	23	7
Lease Payment ($/mo.)	49	195	550	430
Car Ages (yrs.)	46	1	15	4
Lease Term (yrs.)	47	1	15	5

Car Utilization

As was mentioned in a previous section, shippers who use privately owned rail cars receive compensation, usually in the form of mileage credits. Higher degrees of utilization tend to lower costs of owning or leasing equipment while lower degrees of utilization tend to increase costs. Therefore, shippers should strive to maximize utilization of their privately owned freight car fleet.

Privately owned equipment is normally shipped loaded to a given market destination and returned to the shipper empty. Car cycles are a measure of utilization for equipment shipped loaded and returned empty. Respondents

to the mail survey reported car cycles of 15.1 days to Duluth/Superior destinations, 16.1 days to Minneapolis/St. Paul destinations, 19.2 days to "Other" destinations and 24.1 days to Pacific Northwest destinations (Table 7).

Economic-engineering estimates of car cycles were developed using analytical data compiled by United States Railway Association (Table 8). Estimates were developed so comparisons could be made with car cycles reported by lessees. These data indicate expected car cycle times of 8.5 to 14.8 days for eastbound (Duluth/Superior and Minneapolis/St. Paul) movements and 13.5 to 23.8 days for westbound (Pacific Northwest) movements. Simple averages were 11.7 days eastbound and 18.7 days westbound. Car cycle times reported by lessees compared with the highest economic-engineering estimates developed. This indicates that, while actual car cycles were high compared to the economic-engineering estimates, utilization of privately owned covered hopper cars during the survey period approached expected utilization levels within reasonable limits. For example, average car cycle times for eastbound movements were 33 percent higher compared to economic-engineering simple averages [(15.1 + 16.1) ÷ 11.7]. Car cycle times for westbound movements were 28 percent higher (24.1 ÷ 18.7).

TABLE 7. CAR CYCLE TIMES FROM COUNTRY ELEVATOR POINTS TO VARIOUS DESTINATIONS FOR LEASED HOPPER CARS, NORTH DAKOTA, 1981.

Destination	Sample Size	Minimum Value	Maximum Value	Mean Value
		------number of car-days------		
Duluth/Superior	48	9	25	15.1
Minneapolis/St. Paul	20	11	30	16.1
Pacific Northwest	25	14	42	24.1
Other	10	8	42	19.2

TABLE 8. CAR CYCLE TIMES BASED ON MAIN AND BRANCH LINE MOVEMENTS, ECONOMIC-ENGINEERING ESTIMATES, 1981.

Type of Movement	Direction of Movement		
	East[b]	West[a]	
		Priority	Slow
	number of car days		
Main Line[c]	8.5	13.5	17.5
Branch Line[d]	10.5	15.5	19.5
Branch Line[e]	12.9	17.9	21.9
Branch Line[f]	14.8	19.8	23.8
Simple Average	11.7	18.7	

[a] Based on 1500 mile (one-way) movement to Pacific Northwest destination.

[b] Based on 400 mile (one-way) movement to Minnesota destinations.

[c] Calculated by adding two days for loading to the number of car-days spent off branch for combination branch/main line movements.

[d] Service on demand.

[e] Service three times per week.

[f] Service twice per week.

Lease/Purchase Decision

Once shippers make a decision to use privately owned hopper cars they must determine whether to lease or purchase the equipment. If shippers perceive a long-term need for equipment, ownership may be preferable. However, if a short-term need is perceived, leasing may better suit the shipper's needs. While each option has advantages and disadvantages, an important consideration is net cost. The analysis that follows compares applicable discounted cash outlays and inflows of various covered hopper car lease/purchase scenarios.

Net Present Value Analysis

Cash outlays and inflows of various purchase and lease scenarios were discounted using a net present value (NPV) approach. Net present value of one dollar in the future was computed as:

$$NPV = \frac{\$1}{(1 + i)^n}$$

where: NPV = net present value

i = discount rate

n = number of years or time periods

For example, NPV of one dollar five years from today discounted at 12 percent would be:

$$NPV = \frac{\$1}{(1 + .12)^5} = \frac{\$1}{1.76} = \$0.57$$

Cash Flow Versus Profitability

Net present values of lease arrangements were analyzed on the basis of profitability. Lease options involved one source of funds (mileage credits) and one use of funds (lease payments). Purchase options were analyzed using both cash flow and profitability frameworks. The profitability analyses accounted for capital replacement while the cash flow analyses did not.

Tax Considerations

Covered hopper cars are classified by the Internal Revenue Service (IRS) as 5-year section 1245 class property. As such, three methods may be used to recover capital costs. First, straight line depreciation may

be used over a 12 year period. An investment tax credit of 10 percent of purchase price may also be taken. Second, Accelerated Cost Recovery System (ACRS) may be used. Under ACRS the covered hopper car is depreciated over a five year period using the following depreciation schedule:

Year	Percentage
1	15%
2	22%
3 - 5	21%

Again, a 10 percent investment credit is allowed.

A third method involves "Expensing" and ACRS. Expensing allows an additional $5,000 in depreciation in the first year. The purchase price minus $5,000 is then depreciated according to the ACRS depreciation schedule. Investment tax credit is calculated by subtracting the additional depreciation from purchase price.

Base Case Model

A base case model was constructed for analyzing net present values of purchasing and leasing jumbo covered hopper cars. Inputs used in the model were obtained from the survey process and secondary data sources.

Purchase Price

Purchase price used in the base case model was $43,000. Personnel at Burlington Northern, Inc., estimated this to be the cost of installing jumbo covered hopper cars used for originating grain in North Dakota.

Utilization

Tables 9 and 10 contain estimated annual utilization figures for covered hopper cars based on: (1) active car-days freight cars are available

for service; (2) average turnaround times (car cycles) reported by lessees; (3) proportion of grain shipped to various markets; and (4) average distances to the respective markets. Based on these data, the "average" covered hopper car will travel about 10,500 loaded miles per year (Table 9), make 18.5 trips per year (Table 10) and carry about 61,050 bushels of grain per year (18.5 trips times 3,300 bushels per trip).

TABLE 9. ESTIMATED ANNUAL UTILIZATION OF LEASED HOPPER CARS BY COUNTRY ELEVATORS.

Destination	Active Car-Days Available for Service		Average Turn-around Times		Proportion of Grain Shipments		Average Distance to Market		Expected Utilization (loaded mileage)*
	---number of days--				---pct.---		-------- miles --------		
Duluth/ Superior	305	÷	15	*	48	*	450	=	4,400
Minneapolis/ St. Paul	305	÷	16	*	22	*	450	=	1,900
Pacific Northwest	305	÷	24	*	9	*	1,500	=	1,700
Other	305	÷	19	*	21	*	700	=	2,400
Estimated Utilization									10,500**

* Figures are rounded to the nearest hundred miles.
**Rounded to nearest five hundred miles.

Mileage Allowance

Mileage allowance used in the base case model was 24 cents per loaded mile. While ICC tariffs prescribe higher allowances, most private cars were

being paid a restricted mileage credit. For example, during the winter of 1982-83 Burlington Northern restricted all private covered hopper car movements to 24 cents per loaded mile. Soo Line restricted westbound shipments to 24 cents per loaded mile, but paid higher allowances on eastbound single car movements.

TABLE 10. ESTIMATED NUMBER OF GRAIN SHIPMENTS.

Destination	Active Car-Days Available For Service		Average Reported Turnaround		Proportion of Grain Shipments		Number of Shipments
	-------number of days-------				-----pct.------		
Duluth/ Superior	305	÷	15	*	48	=	9.8
Minneapolis/ St. Paul	305	÷	16	*	22	=	4.2
Pacific Northwest	305	÷	24	*	9	=	1.1
Other	305	÷	19	*	21	=	3.4
Total Number of Shipments							18.5

Economic Life of Hopper Car

Economic life of hopper car refers to the term of the analysis. The term used in the base case was five years since this was the average lease term reported by lessees (Table 6).

Salvage Value

It is difficult to estimate a salvage value of a covered hopper car. A figure of $25,000 was used in the base case model.

Maintenance Cost

Maintenance costs referred only to purchase scenarios. A figure of $1,000 per year was used.

Lease Payment

The lease payment used in the analyses was $430 per month. This figure was the average payment reported by lessees (Table 6).

Discount Rate

Cash flows and profits were discounted at an annual rate of 14 percent.

Type of Depreciation and ITC

Expensing and ACRS were used as the depreciation method in the base case model. Investment tax credit (ITC) was taken in the first year.

Compound Interest Rate

Revenues (utilization times mileage allowance) were compounded during the investment period to take into account inflationary increases in mileage credits. Revenues were compounded at a rate of five percent per year.

Tax Bracket

Most grain elevators operating in North Dakota are organized as cooperatives. As such, their tax liability is zero. Nonetheless, in order to account for "private" and "line" elevators, a tax rate of 30 percent was used in the base case model.

Discounted Returns

Discounted cash flows and profit after taxes (PAT) for the base case model are presented in Table 11. NPVs indicate that leasing versus purchasing results in lower costs. NPV of leasing is $-5,791 compared to

TABLE 11. BASE CASE

COMPARISION OF NPV OF PURCHASING AND LEASING HOPPER CARS

INPUTS:	HOPPER PURCHASE PRICE	$ 43000.00
4	UTILIZATION (IN LOADED MILES PER YEAR)	10500.00
5	MILEAGE ALLOWANCE (IN DOLLARS PER LOADED MILE	0.2400
6	ECONOMIC LIFE OF HOPPER CAR (IN YEARS)	5
7	SALVAGE VALUE (IN DOLLARS)	25000.00
8	MAINTENANCE COST (PER YEAR)	1000.00
9	LEASE PAYMENT (PER YEAR)	5160.00
10	DISCOUNT RATE (PERCENT)	0.14
11	TYPE OF DEPRECIATION	EXPENSING+ACRS
12	YEAR IN WHICH INVESTMENT TAX CREDIT IS TAKEN	1.00
13	COMPOUND INTEREST RATE	0.05
14	TAX BRACKET	0.30

	LEASE				PURCHASE				
YEAR	REVENUE	TAXABLE INCOME	PROFIT AFTER TAXES	NET PRESENT VALUE	REVENUE	DEPR	TAXABLE INCOME	NET CASH FLOW AFTER TAXES	NET PRESENT VALUE
	IN DOLLARS								
1	2520	-2640	-1848	-1621	2520	10700	-9180	8074	7081
2	2646	-2514	-1760	-1353	2646	8360	-6714	3660	2815
3	2778	-2382	-1667	-1125	2778	7980	-6202	3639	2456
4	2917	-2243	-1570	-929	2917	7980	-6063	3736	2212
5	3063	-2097	-1468	-762	28063	7980	19083	21338	11075
SUM	13925	-11875	-8313	-5791	38925	43000	-9075	40447	25638

NET PRESENT VALUE OF LEASING A HOPPER CAR	$	-5791
NET PRESENT VALUE OF PURCHASING A HOPPER CAR	$	-17362

NET PRESENT VALUE OF GAIN (LOSS) FROM THE PURCHASE OF A HOPPER CAR

YEAR	REVENUE	DEPR	TAXABLE INCOME	PROFIT AFTER TAXES	NET PRESENT VALUE
	IN DOLLARS				
1	2520	10700	-9180	-2626	-2303
2	2646	8360	-6714	-4700	-3614
3	2778	7980	-6202	-4341	-2930
4	2917	7980	-6063	-4244	-2512
5	28063	7980	19083	13358	6933
SUM	38925	43000	-9075	-2553	-4427

NET PRESENT VALUE OF GAIN (LOSS) FROM THE PURCHASE OF A HOPPER CAR $ -47427

$-17,362 for purchasing (discounted cash flow). Discounted PAT for the purchase option was $-47,427.

Net present values derived in the sensitivity analysis are larger (smaller negative values) for lease scenarios compared to purchase options (Table 12). Generally, increasing mileage allowances (cents per loaded mile) and utilization (loaded miles per year) had the most impact on net present values. For example, increasing the mileage allowance to 30 cents per loaded mile resulted in a NPV of $-4,139 for the lease scenario (an increase of $1,652). Mileage allowances of 40 cents and 54 cents resulted in NPVs of $-1,387 and $458, respectively. Discounted cash flows of the purchase scenario were $-15,711, $-12,958 and $-9,105, respectively, for mileage allowances of 30 cents, 40 cents and 54 cents. Increasing utilization to 15,000 loaded miles per year increased NPVs to $-2,959 for the lease option and $-14,531 for the cash flow purchase scenario.

Leasing covered hopper cars is generally favorable, cost-wise, compared to purchasing until utilization and mileage allowances reach relatively high levels. Increasing utilization and mileage allowance to 18,000 loaded miles per year and 50 cents per loaded mile, respectively, while holding the remaining base case inputs constant, yields NPVs of $1,689 for the lease option and $-1,376 for the purchase scenario. NPVs of $2,067 and $4,343 are obtained for lease and purchase alternatives, respectively, if the mileage allowance is increased to 54 cents per loaded mile and utilization to 20,000 loaded miles annually.

Bushel Costs

Since country elevators operate on margin it is imperative that additional enterprises do not increase costs significantly. Merchandising

TABLE 12. EFFECTS OF SELECTED INPUT CHANGES ON NET PRESENT VALUES

Input/Alternative Level	Lease	Purchase[a]	Purchase[b]
	dollars		
Base Case	-5,791	-17,361	-47,427
Purchase Price:			
$38,000	-5,791 (0)[c]	-13,814 (+20.4)	-40,500 (+14.6)
$48,000	-5,791 (0)	-20,910 (-20.4)	-54,354 (-14.6)
Mileage Allowance:			
30¢	-4,139 (+28.5)	-15,711 (+9.5)	-45,776 (+3.5)
40¢	-1,387 (+76.0)	-12,958 (+25.4)	-43,023 (+9.3)
54¢	458 (+107.9)	- 9,105 (+47.6)	-39,170 (+17.4)
Utilization:			
7,500 Miles	-7,678 (-32.6)	-19,249 (-10.9)	-49,314 (-4.0)
15,000 Miles	-2,959 (+48.9)	-14,531 (+16.3)	-44,596 (+6.0)
Economic Life:			
10 Years	-7,853 (-35.6)	-18,584 (-7.0)	-48,649 (-2.6)
15 Years	-8,295 (-43.2)	-18,602 (-7.1)	-48,667 (-2.6)
Salvage Value:			
$15,000	-5,791 (0)	-20,995 (-20.9)	-51,060 (-7.7)
$35,000	-5,791 (0)	-13,729 (+20.9)	-43,794 (+7.7)
Lease Payment:			
$300	-2,043 (+64.7)	-17,361 (0)	-47,427 (0)
$550	-9,250 (-40.3)	-17,361 (0)	-47,427 (0)
Discount Rate:			
10 Percent	-6,372 (-10.0)	-14,094 (+18.8)	-47,141 (+0.6)
18 Percent	-5,296 (+8.5)	-20,065 (-15.6)	-47,595 (-0.4)
Depreciation:			
Straight Line	-5,791 (0)	-22,254 (-28.2)	-34,552 (+27.1)
ACRS	-5,791 (0)	-17,225 (+0.8)	-46,284 (+2.4)
Compound Interest:			
0 Percent	-6,342 (-9.5)	-17,914 (-3.2)	-47,979 (-1.2)
10 Percent	-5,186 (+10.4)	-16,757 (+3.5)	-46,823 (+1.3)
Tax Bracket:			
0 Percent	-8,272 (-42.8)	-20,688 (-19.2)	-50,753 (-7.0)
46 Percent	-4,467 (+22.9)	-15,588 (+10.2)	-45,653 (+3.7)

[a] Discounted cash flows.

[b] Includes depreciation for capital replacement.

[c] Figures in parentheses are percentage changes from base case.

firms operating in North Dakota typically incur grain handling costs of about 13 cents per bushel.[7] If grain margins are above that figure, elevators will realize profits, otherwise losses will result. On average, a country elevator operating in North Dakota handles about 760,000 bushels of grain annually. Assuming base case NPVs, cost of leasing a jumbo covered hopper car is about .15 cents per bushel. Cost of purchase is .46 cents per bushel.

Costs based on hopper car volume, as opposed to elevator volume are significantly higher. A covered hopper car will make about 18.5 trips per year (Table 10). Thus, expected annual volume is about 61,050 bushels (18.5 trips x 3,300 bushels per car). Based on these figures, costs attributable directly to hopper car acquisition are 1.90 cents per bushel per car for leasing and 5.69 cents per bushel per car for purchasing.

Conclusions

The existing rail equipment surplus is having significant impacts on railroads and managers of private covered hopper car fleets. Grain merchandising firms, already faced with declining equipment utilization because of depressed grain prices, have seen restricted mileage credits as well. Low utilization and reduced mileage allowances have increased costs of leasing covered hopper cars significantly. A substantial decline in the private rail car fleet in North Dakota may be the result. In September, 1981, almost one-half of the survey respondents indicated they would not renew lease agreements in the future. Since then ever increasing equipment surpluses and further depressed grain prices indicate a somewhat bleaker outlook with respect to private covered hopper car investment.

Railroads face a similar dilemma and find it difficult to pull private cars when carrier cars are setting idle. Most railroad officials recognize the need for private cars in the system, but feel the private fleet has been overbuilt. Thus, it is apparent that the marketplace is seeking an equilibrium position with respect to carrier owned and privately owned jumbo covered hopper cars. Given the volatility of the grain industry this market-clearing position may be difficult to obtain.

FOOTNOTES

1 Goldstein, Andrew P., Petition for the Institution of a Rulemaking Proceeding, Docket No. 38692 Before the Interstate Commerce Commission, August 21, 1981.

2 Wilson, W. W. and John Crabtree, Seasonal Behavior of Marketing Patterns for Grain from North Dakota, Ag. Econ. Rpt. No. 143 and UGPTI Rpt. No. 38, North Dakota State University, Fargo, North Dakota, March, 1981.

3 Griffin, Gene C., and Ken Casavant, Structure and Operating Characteristics of the North Dakota Grain Elevator Industry, Upper Great Plains Transportation Institute, North Dakota State University, Fargo, North Dakota, forthcoming.

4 United States Railway Association, Viability of Light-Density Rail Lines, March, 1976.

5 Proportion of grain moved from North Dakota origins to various market destinations was based on average movements from 1979-80 to 1981-82. See Ming, Dennis R., North Dakota Grain and Oilseed Transportation Statistics 1981-82, UGPTI Rpt. No. 48, Upper Great Plains Transportation Institute, NDSU, Fargo, North Dakota, January, 1983.

6 Personal conversations with Burlington Northern and Soo Line Railroads, January, 1983.

7 Chase, Craig A., Delmer L. Helgeson and Terry L. Shaffer, Statistical Cost Analysis of Existing North Dakota Country Elevator Industry, Ag. Econ. Rpt. No. 155 and UGPTI Rpt. No. 43, North Dakota State University, Fargo, North Dakota, 1983.