

Manufacturer Advantages in Residual Value Estimation

Seeking an Empirical Test in the Automobile Industry

Lamar Pierce

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This paper outlines the background for a proposed empirical study of whether or not manufacturer-owned automobile lessors better estimate residual values than do their independent competitors. The more formal modeling and thorough discussion are being reserved until it is generally agreed upon that I will be able to carry out such a study.

1. A Brief Introduction

The estimation of residual values is one of the most critical determinants of profitability for equipment lessors. In writing an operating lease, lessors must estimate what the equipment will be worth at the end of the lease term. This value is often highly unpredictable, due to uncertainty about future market conditions, more specifically general economic conditions, competition, customer preferences, and innovation and new product development. This paper, along with other projects by the author, is principally concerned with how innovation and new product introductions influence the decisions of manufacturers, independent lessors, and consumers. In order to understand these issues, it is crucial to examine how innovation affects the value of used equipment, and how knowledge about current and future innovations can aid in the prediction of these values.

The ability to accurately predict residual values is largely dependent on knowledge about future innovations and product introductions. Thus in understanding firm performance in this sector, it is important to first examine whether certain firms or types of firms have greater knowledge of these issues, which might allow them profit from efficient lease contracting. It is the premise of this paper that manufacturers, possessing this often highly confidential knowledge, will have an advantage over independent lessors in estimating the residual values for their equipment. Furthermore, this paper asserts that under certain conditions the manufacturer will not be able to credibly sell this knowledge to an independent institution providing leasing services for its customers. The manufacturer's critical interest in selling its products will encourage it to inflate residual value estimations for such a lessor, and where reputation effects are not immediate and strong, a cheap-talk model ensues. The interest of this contracting problem is in its implications for a manufacturer facing a standard make/buy decision for vendor leasing

services. When a critical information asymmetry can not be contracted for, vertical integration may ensue.

2. An Introduction to Vendor Leasing

Equipment leasing is becoming an increasingly attractive financing option for many types of firms. Companies that formerly financed capital equipment through debt are transferring much of their attention to leases, where they do not take ownership of these assets but rather agree to pay for the right to use them. As the use of the leasing option increases, significant differences in leasing rates and methods across firms and industries become apparent. Some industries and firms find leasing more attractive than others, and even among those firms engaging in comparable levels of leasing we can observe a heterogeneity of modes in which this financing is carried out.

Manufacturers provide leasing for their customers in several ways. One method is to allow the customer to locate their own financing source, whether it be for a lease or purchase financing. While this method still exists, it is certainly becoming less common as customers demand that manufacturers facilitate financing for their new equipment. Manufacturers provide leases for their new equipment customers through vendor leasing programs. In order to provide these services, they can choose between two alternatives. The first alternative is to contract with an independent lessor who will provide this service for them. Such a lessor is an independent leasing company engaged in a long-term (multiple transactions) contract with an equipment manufacturer. The manufacturer engages the independent vendor lessor to provide leasing services for its customers, thereby alleviating their need to find independent financing. A second alternative is to create a captive leasing organization, whereby the manufacturer uses a wholly-owned subsidiary to provide financing for its customers. A hybrid between these options also

exists in joint ventures between the equipment manufacturer and an independent leasing organization. A range therefore exists between the manufacturer having no ownership of the leasing organization to having complete control.

The choice between these two alternatives is ultimately one of vertical integration. We can view the choice of the manufacturer as one where they determine whether to make or buy leasing services for its customers. This project is largely aimed at understanding what determines this make/buy decision, and at asking why equipment manufacturers choose to engage in the difficult process of creating subsidiaries in a field in which they may have no previous expertise. Captive leasing organizations have produced some of the most profitable subsidiaries in the business world, yet have been found to be intractable in certain industries. The key to understanding this issue lies in examining what advantages a manufacturer may have over independent financial institutions in providing leasing to its customers.

While there are potentially many such advantages (and disadvantages), one of the most significant of these is the information asymmetry between the manufacturer and the independent lessor. It is commonly suggested within the leasing industry that manufacturers often have an advantage over independent lessors in estimating the residual values on their products and those that are closely related. Such an advantage would be critical for manufacturer-owned lessors, as residual value estimation is one of the most critical determinants in leasing industry success. This project seeks to empirically test the hypothesis that manufacturers are better able to estimate residual value than independent lessors. In order to test it, I propose using data from the automobile industry, which not only has large amounts of available data, but also numerous lessors, customers, and a longitudinal dimension. With these advantages also come several serious hurdles in testing, which I wish to discuss before moving forward with theoretical modeling and data gathering.

3. Why Do Manufacturers Provide Vendor Leasing?

In the interest of time, this synopsis will not deal with the reasons for leasing rather than buying equipment. Readers wishing to review this may request an additional paper from the author. Suffice it to say, there is significant demand for the lease financing of equipment. How this demand is met is of considerably more interest here. Specifically, we are interested in the reasons why an equipment manufacturer might set up a vendor leasing program, either through a wholly-owned subsidiary or through contracting with an independent financial institution.

When the manufacturer decides to institute a vendor program providing leasing for its customers, it may do so for several reasons. The customer may simply demand the ease of arranging the financing concurrently with the equipment acquisition. If customers value ease of acquisition, they may tend to favor manufacturers who can also provide lease financing. The manufacturer may lose the customer if they can not provide this service. Likewise, the manufacturer may find an additional advantage in providing leasing for the customer. The manufacturer does not have to worry about the customer losing interest in the equipment while pursuing outside financing or about the funding source dissuading the customer from leasing the equipment. The manufacturer can finalize the lease before the customer might change their mind and decide against the acquisition.

The equipment manufacturer can gain other advantages through a vendor leasing program as well. As the financing coordinator, the manufacturer maintains constant contact with the customer throughout the life of the equipment. This allows them be constantly aware of the customers future equipment needs. It also maintains a working relationship with the customer, making future sales or leases more probable. Furthermore, when the lessee nears the end of the lease, they are contractually obligated to inform the lessor of their future equipment needs, through their advanced notice of their intent to either purchase, return, or re-lease the equipment. Bundling can also be a lucrative result of a vendor leasing program. There are several ways in

which bundling can aid the manufacturer. Bundling the equipment with complicated lease terms can obfuscate the sales price in negotiations. The manufacturer may be able to avoid the discounting of list price either through this prestidigitation or may achieve further product differentiation from its competitors through the bundle. Additionally, the manufacturer may bundle lucrative services such as maintenance, upgrades, and support in a full-service lease package. Such complicated bundles make determination of actual sales price and lease terms extremely difficult for the customer. The existence of a vendor leasing program may also allow the bundling of multiple types of equipment in a blanket lease. Such a lease may allow more traditional bundling benefits of achieving higher lease payments than would be obtained if the products were sold separately.

A vendor lessor may hold an advantage in the refurbishment and maintenance of the equipment. Such expertise allows a vendor leasing program to more efficiently maintain, refurbish, and reallocate used equipment than an independent lessor could. There may also exist tax advantages from maintaining a vendor leasing program, particularly where the leasing organization is a joint-venture between the manufacturer and an independent lessor. These advantages may accrue either through MACRS deductions or gross profit deferral, and can be realized by either a captive or independent vendor lessor.

A manufacturer may also create a vendor leasing program in order to control the market for used equipment. If the manufacturer produces a durable good (which most equipment qualifies as), it always suffers the risk of products it produced in the past competing with its current offerings. When a manufacturer sells its new durable equipment, it loses control over when and how they will return to the equipment market as used goods. Used equipment reentering the market may be priced very low, thereby making new equipment unattractively expensive. The manufacturer thereby suffers the fate of competing against its own previously sold products, and ultimately loses market power because of this. This case is particularly severe for the durable goods monopolist. Canonized as the Coase conjecture, the durable goods

monopolist loses all market power when the infinitely durable good sold in the one period continues to compete against their new production in future periods. The problem arises in that buyers of the durable good in the first period anticipate the monopolist's future pricing decisions. Recognizing that the monopolist will have to lower prices in future periods in order to compete with goods already on the market, consumers are unwilling to pay monopoly prices in the first period. The monopolist can thus only earn profits through its customers' impatience. When consumers do not discount future periods, the monopolist must charge a competitive price.

Leasing allows a durable goods monopolist to at least partially avoid this problem. By only offering the product through a lease, the manufacturer guarantees that they will have control over the secondary equipment market. At the end of each lease period, the manufacturer can choose at which price it will release the used equipment to its customers. This allows the manufacturer to set a higher price for used equipment, such that it does not compete so aggressively with its new offerings. In short, a vendor leasing program allows the equipment manufacturer to internalize used equipment prices into its profit-maximizing decisions. In the extreme case of the durable goods monopoly, the manufacturer is able to achieve monopoly rents through exclusively leasing its products. This ability naturally declines with market power. Establishing a vendor leasing program can thus ensure that the manufacturer will be able to greatly influence the market price of its own used equipment through its guaranteed stock of lease-returns. The manufacturer is able to internalize the cross-elasticity effects of this used equipment in its calculus through its setting of new equipment price, lease residual value, lease term, and new product introduction.

4. Why Choose a Captive Leasing Organization?

There are obvious disadvantages to providing leasing through a wholly-owned subsidiary. Rarely will manufacturers be able to approach the low cost of capital that large

financial institutions enjoy. Perhaps more importantly (and not independently), they will be unable to diversify risk in the same way that financial institutions can. Success as a leasing organization is largely defined by the ability to predict the residual value of the leased equipment, since overestimations can lead to huge financial losses when the equipment is returned at the end of the initial term. Additionally, lessors must be able to absorb such inevitable losses from overestimation (which often results from unforeseen exogenous shocks) through possessing a diverse portfolio of lease investments. Manufacturers with captive organizations will tend to be heavily vested in their own products, as initially they tend to have a disadvantage in the leasing of other goods. Even if such a captive organization is highly adept at predicting residual value for their own leases, unpredictable exogenous shocks could result in a gross under-realization of residual value. Without a diversified portfolio, the captive organization may not be able to absorb the huge financial loss in the way that a diversified financial institution would. While residual value insurance exists, it is not universally available and has certainly not been historically available during the rise of many of the now ubiquitous captives from earlier eras (GE, John Deere, AT&T).

Recognizing that many of the advantages of the vendor program listed earlier can be captured through contracting, what are the advantages of a captive organization? The principal advantage that a captive organization has is its information about its products, the industry, and future innovations and product introductions. Predicting residual value is extremely difficult because of a number of contributing factors. Perhaps the most important of these factors is the rate of innovation and the introduction of new products. The value of existing used equipment is often drastically deflated by new innovations and product introductions. It is also deflated by weakened market positions by the original manufacturer, as they must often continue to provide maintenance, support, and upgrades on used equipment to keep it functional. Manufacturers have clear advantages not only in knowing the rate at which they will innovate, but also when they will introduce new products. They may also have advantages in understanding industry

trends, the future actions of competitors, and shifts in industry structure. With this knowledge and the help of experienced individuals from the leasing industry, captive leasing organizations may possess a distinct advantage over independent organizations in predicting residual value. Since the prediction of residual value is one of the primary determinants in lessor profitability and survival, such an advantage would be crucial in the decision to form a captive organization rather than use an independent lessor to service its customers.

The obvious question in this make/buy decision is why certain advantages of the manufacturer cannot be contracted for with an independent lessor. Surely, the independent lessor will hold some advantages over the manufacturer, such as diversification of risk, credit evaluation, experience in leasing, and organizational knowledge. Why then can't the manufacturer simply contract with an independent lessor to provide leasing services with its customers? In turn the manufacturer could provide the contracted lessor with residual value estimations such that they could combine their respective advantages. The problem with this arrangement lies in the manufacturer's conflicting incentives with regard to residual value. While the manufacturer may possess an advantage in residual value estimation, it is not always in its best interest to accurately reveal it. The residual value in a lease contract (along with interest rates and other terms) ultimately determines the size of the payment a potential customer must make for new equipment. If the residual value is low, the customer will face higher payments, and thus will be less inclined to lease that manufacturer's product.

A manufacturer thus has a very strong incentive toward setting residual values inaccurately high. High residual values effectively lower the initial price of the equipment and therefore will lead to greater quantities of equipment leased. In industries with numerous competitors, this incentive may be very strong. If a manufacturer owns and operates a captive leasing organization, it has conflicting incentives. While inaccurately high residual values may lead to higher numbers of leases, it will also lead to inevitable losses at the end of the lease terms. When the equipment is returned to the captive lessor at the end of these terms, the manufacturer

will be stuck with equipment that is not worth what it initially estimated. Thus, while it gained customers initially through lower lease payments, it ultimately loses in the final used equipment sale. If you present the sale of the used equipment after the lease as a final lease payment (although from a different source), the present value of overestimating residual value is inevitably less than accurately predicting for the manufacturer. While this may seem obvious, what is less obvious and more important is that the extra sales gained from this tactic are never profit-improving. If the manufacturer wishes to boost sales, the firm is better off reducing the new price of the equipment than in tinkering with residual values. In the words of Bill Lovejoy, chief of sales at GM, “the most expensive way of doing [boosting sales] is leasing programs.” So long as the manufacturer is truly seeking to maximize long-term profits, it should never artificially inflate residual values on leases that it owns.¹

When a manufacturer owns its vendor leasing program as a captive organization, it therefore includes both of these conflicting incentives in its calculus. A serious problem occurs, however, when the vendor leasing program is provided by an independent lessor. The manufacturer faces a strong incentive to overestimate residual values when conveying this information to the lessor. Such an overestimation will boost sales, and the lessor is unable to verify the accuracy of this estimation without extensive access to the manufacturer’s strategic plans and technology. The manufacturer will obviously be wary about giving such access to a financial institution that may also be contracting with its competitors. Even if such access were granted, there is no guarantee that the lessor would be able to interpret and analyze it for residual value accuracy. Obviously, manufacturers will not be able to grossly overestimate residual value, but they will certainly be able to do so within a range. While reputation in the very long run may mitigate some of these risks, the inaccuracy of such estimates will not be known until some time into the lease term, often many years later. Even then, the wide variance of residual

¹ Unfortunately we can observe manufacturers engaging in this type of residual value inflation. This likely has to do with agency problems within the firm.

value realizations will allow manufacturers to attribute overestimations as within the normal residual value estimation margin of error. It may take numerous products and long periods of time to truly establish a pattern of overestimation by the manufacturer. Consequently, accurate reputations may not develop for many years and therefore may have little or no effect on the manufacturer's behavior, due to discounting. Additionally, in industries with many more lessors than manufacturers, lessors may aggressively compete for the right to provide vendor financing for the manufacturers. If most leases happen through such vendor financing, lessors will see the potential benefits of such an alliance as great and will be will to risk the hazard of dealing with manufacturers.

The natural theoretical progression of this argument is toward a formal contracting model between a manufacturer and an independent lessor. Such a "cheap-talk" model would demonstrate that under certain parameters, a manufacturer with an information advantage would be unable to credibly signal an accurate residual value prediction to a 3rd-party vendor lessor. Such a fuzzy signal would leave the manufacturer and lessor not contracting as the only equilibrium solution.

5. Leasing in the Automobile Industry

Leasing is perhaps most visible in its extensive growth in the automobile industry over the past twenty years. While automobile leasing used to be a rare substitute for ownership, its use has dramatically expanded into the general consumer population. Almost all automobile leases are operating leases, such that they involve leasing the vehicle for less than its useful life. There are a number of major players in the automobile leasing industry, including major captives, independent lessors, banks, and even some dealer lessors. The industry is currently in severe financial trouble, due to overaggressive residual value estimation in the mid to late nineties. Lessors clearly overestimated residual values, and have recently been flooded with lease-returns

worth less than anticipated. Even manufacturers were overaggressive in their terms. Consequently, a number of lenders have left the automobile finance industry, with others becoming more conservative in their approach. This problem was particularly large with sport-utility vehicles, with many leases losing \$2,000-\$3,000 on residual value. While these events do not demonstrate the role of innovation in residual value, they do underscore the importance of estimation accuracy. Industry lessors have become distinctly more conservative in recent estimations, leading to decreased leasing activity by consumers. Ford, for instance, has observed leasing as a percentage of retail sales fall from 26% to 19% in the past year.

6. Testing for the Information Advantage in the Automobile Industry

Hypothesis: Captive automobile lessors will more accurately predict residual values on their vehicles than will independent lessors.

There are a number of reasons why the automobile industry is well-suited for testing the existence of a residual-value prediction advantage by captive leasing organizations. First, its customers have used widespread leasing to finance their vehicles, so there is a vast array of customers, models, and timeframe. Second, the automobile leasing industry includes many firms, including both captive organizations and independent financial institutions. Additionally, federal and state law requires automobile lessors to explicitly list residual value in consumer lease contracts, whereas it is often bundled with other costs in some industries.

Perhaps the most important aspect of the automobile industry is the availability of extensive data. Residual value is heavily guarded in most industries, and is therefore very difficult to acquire for testing purposes. The automobile industry, however, has extensive data via government registrations and private data firms. Data on thousands of individual transactions therefore exist, including sales prices and ownership identifiers. In some cases, lease terms have

been recorded such that one can observe the original expected residual value and realized residual value at the end of the lease term.

Even without the lease terms, I have determined a way to measure accuracy of residual value estimation using registration data. As almost all automobile leases give the consumer an option to buy at the end of the contract, one can observe from registration data whether or not the lessee took this option. In aggregate, one should be able to observe the rates at which certain vehicles were purchased at the end of their leases. Those lessors who had higher than normal rates will have underestimated the residual value, while those with lower than normal rates will have overestimated residual value. Through observing lessee behavior at the end of these leases, I will be able to observe how accurately the lessors initially predicted the residual value.

I have located appropriate data at two firms. The first and most significant database is owned by Polk, an automotive data company. Their database is based on individual vehicle records, and appears to include data from 1981 to present. This data includes new and used sales prices, ownership identifiers, type of registration (lease, owned, fleet), geographic info and more. The dataset is a panel, such that one can track certain vehicles throughout their history. It is not clear as to the availability of this data, although Polk is clearly willing to sell subsets of it. All of the data appears to be for sale, although they typically do not market the entire set. I have not contacted them yet about the details or availability yet.

The second source is ALG, or the Automotive Leasing Group. They are the primary provider of residual value data for all software companies. They claim to have the most complete and comprehensive used vehicle database in the leasing industry, encompassing 35 years. It is not clear if this data involves individual automobiles, but this seems unlikely. The value from this data may be an establishment of anticipated residual values (or averages) from which to compare individual firm results. Once again, I will need to contact ALG to find out what they have. ALG last year entered a partnership with JD Power to combine their data services. This

may mean that they have a much richer dataset than before, although the press release is not clear about what partnership entails.

Another source of potential data is the Consumer Banking Association's Automobile Finance survey, which has been conducted by KPMG for several years. This survey has some aggregate data from lessors but could prove valuable in verifying the accuracy of the vehicle registration extrapolations. Once again, I do not yet know whether or not this data is available.

I am also currently in contact with Babcock and Brown, perhaps the largest manager of lease portfolios. They have indicated their willingness to provide some data, although the extent and nature of this data is still unclear. I will likely know more about this data when my contact there gets back from his honeymoon.

Finally, a potentially rich source of data would be residual value insurance companies. They undoubtedly have data on specific banks' residual value estimations and whether or not these were realized. Data from many years ago may be available under some sort of agreement.

There are numerous other empirical tests that will stem from these data. One will directly test how information about new products and innovations will influence residual values in lease contracts. Another will test how this information will influence customer decisions on lease-end options.

7. Empirical Issues to Deal With

There are a number of difficulties with testing residual value advantage that I can already perceive, and doubtlessly endless more that you will tell me about.

A. Lack of variation in residual value estimation: It is possible that all lessors simply benchmark off the captive lessors, thereby eliminating any variation and making this test impossible. My casual observation is that there is variation, although benchmarking does occur. The benchmarking that tends to occur, however, is based on ALG's residual value estimations.

Even with this benchmarking, independent lessors still vary in their estimations. Captives tend to not rely on ALG, and therefore this should not be a big problem.

B. Identification of the Dependent Variable: Ultimately, I want my dependent variable to accurately represent the ability to predict residual value. Unfortunately, it may also incorporate a number of other issues. With such a large sample of vehicle registrations, I would expect consumer behavior on leases with options to accurately represent residual value accuracy, but there are a number of actions that could make this representation difficult. Primarily, lessors may offer sweetened deals to lessees in order to get them to purchase the off-lease vehicle. Thus a high level of option-taking by lessees may indicate these deals rather than an underestimated residual value.

The use of residual values is even more problematic. Despite the danger of overestimating residual values to increase leases, there is extensive evidence that lessors in the nineties were engaged in exactly this practice. Consequently, they are suffering financially from this mistake. Unfortunately, this means that lessor residual values may represent strategic pricing behavior as much as information ability. It is critical that my dependent variable represent actual estimations of residual value, not strategic manipulations of contract terms in order to increase sales. It seems clear that such manipulations occurred, and I will therefore need to find some way to correct for this problem. If the lessors also provided loan financing, I may be able to find equivalent incentives that were offered on purchased vehicles, but any other suggestions would be greatly appreciated.

8. Conclusion

This project seeks to empirically test for an advantage in residual value prediction for captive automobile lessors. It is argued here that such an advantage ultimately stems from

private knowledge of the manufacturer about future innovations and product introductions, and how these will influence used car prices. This advantage is important in that this information cannot be credibly transmitted to independent lessors through a vendor leasing contract, thereby leading to captive leasing organizations. While directly testing for the make/buy decision of manufacturers is of ultimate importance, this will be a much more difficult project due to the number of alternative reasons for such a decision.