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CONFORMANCE-TO-STANDARD FOR ON-TIME LTL TRANSPORTATION: HOW MUCH IS IT WORTH?

by

JOHN E. TYWORTH
HAW-JAN WU

DEPARMENT OF BUSINESS LOGISTICS
THE SMEAL COLLEGE OF BUSINESS ADMINISTRATION
THE PENNSYLVANIA STATE UNIVERSITY
UNIVERSITY PARK, PA 16802

PH: (814) 863-0620
FAX: (814) 863-7067

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INTRODUCTION

A recurrent theme in the field of transportation is that a carrier with the capability to offer on-time delivery can charge a premium rate for this service and still save the shipper money. This proposition rests on the fundamental principle of logistics systems that consistent lead times reduce the amount of inventory needed to sustain a predetermined customer service target. The attention currently given to quality management and inventory reduction by the business community, however, has intensified interest in this proposition along with the derivative notion that carriers should pursue competitive strategies based on service, rather than on price.

Quality management, of course, embraces efforts to eliminate or reduce rework, service defects, and other inefficiencies in operations. These outcomes improve service levels and reduce costs with existing or fewer resources. To achieve 100 percent conformance to lane standards, however, carriers generally will have to commit new resources to upgrade transit-time capabilities. This condition raises a fundamental question: how much is on-time delivery worth to shippers? This issue arises, for example, in a variety of familiar settings such as follows:

1. A carrier negotiates a premium rate for a commitment to 100 percent conformance to a standard transit time.
2. A carrier holds the line on rate discounts, while upgrading transit performance.
3. A railway company offers 20 percent off any truck rates for shippers willing to switch from truck to rail.

The problem is that the actual worth of on-time delivery remains largely a matter of conjecture. This state is a manifestation of two research obstacles. First, accurately quantifying the value of consistent transit times is difficult, for this task encompasses many variables and some complex relationships. Second, the values assigned to key variables are idiosyncratic. For example, transportation attributes such as speed and consistency, as well as product attributes such as weight, value, and demand rate, are distinctive to individual lanes and companies. Consequently, what is known about the size of premiums that carriers can charge for 100 percent conformance to standard transit time remains fuzzy. Yet such knowledge is critical to the success of a service-based strategy that requires carriers to invest in additional resources.

This paper presents a study of the logistics cost savings gained from complete conformance to less-than-truckload (LTL) transit-time standards. The objectives of the study are to (1) examine the magnitude of the savings from perfect on-time performance for a broad range of potential products, (2) translate the savings into the rate premiums that carriers could charge for conformance to standard or, equivalently, the rate discounts needed to compensate for inferior service, (3) establish reasonably accurate upper bounds on rate premiums, as well as probable values for the premiums, and (4) investigate the magnitude of specific cost components under various circumstances to gain some insights about the relative importance of logistics elements.

TRANSPORTATION SERVICE QUALITY

The systems approach to logistics management has influenced the price-quality mix of transportation supply for decades. This approach declares that transportation service quality affects the cost of non-transportation logistical elements in the firm, as well as the value of the firm's product-service offering. Although shippers often consider inventory to be the most important non-transportation cost element, other significant elements include production costs, ordering costs, inspection costs, loss and damage costs, and customer service flexibility (Morash and Calantone 1991, 206; Tyworth, Cavinato, and Langley 1987, 43-46). Thus, for decades, researchers and practitioners have recognized the need for the carrier to mold its price-quality mix in a way that will favorably affect the shipper's total logistics costs (see, for example, Meyer et al. 1959, Roberts 1961, Plowman 1963, Heskett 1973). Likewise, the corollary notion that rational shippers will pay more for quality transportation service to reduce total logistics costs has circulated for a long time (Stenger and Beier 1976, Stenger and Cunningham 1978, Sheffi 1987, Davis, Ozment, and Cunningham 1989, Morash 1990). This notion, however, is more prominent now than in the past primarily for two interrelated reasons. First, the logistics community has become increasingly sensitive to the importance of quality--a trend that has induced many companies to launch transportation quality programs in which 100 percent conformance to standard transit times is a prime goal (see, for example, Gordon 1989, Automotive Industry Action Group 1989, Mayeske 1989). Second, logisticians generally view inventory reduction as the greatest area for productivity improvement today (Tersine and Tersine 1990). This viewpoint matches the current interest in the concept of time-based (development-, manufacturing-, and order-cycle) competition and in related programs, such as just-in-time, quick-response, and direct-store-delivery.

METHODOLOGY

The research methodology involved three steps. The first step was to compute the logistics cost savings from perfect on-time deliveries. The savings were determined by computing the optimal expected total annual logistics costs for two levels of on-time performance (perfect service and less-than-perfect service) and then finding the difference in total costs. The second step was to estimate the premiums that directly corresponded to the savings. A premium was defined as the percentage change in the freight rate needed to offset the cost savings from perfect service. Thus the rate adjusted by the premium would make both regular and perfect levels of on-time service equivalent in terms of total logistics costs and service (order-fill target). The third step was to examine the savings and premiums for (1) multiple levels of key product attributes, (2) different measures of on-time performance, and (3) selected What if? questions. Additionally, the third step included an analysis of the individual cost components for selected scenarios.

As noted in the previous section of the paper, researchers face two difficulties when trying to assess the value of on-time performance: (1) accurately modeling the complex set of logistics cost and service trade-offs and (2) initializing the model's idiosyncratic parameters. The specific methods used to surmount these difficulties are as follows.

Modeling Trade-Offs

The inventory theoretic approach provided the platform for assessing the value of on-time delivery from a logistics cost-service perspective. Table 1 lists the model's assumptions. This particular set of assumptions is consistent with the model introduced by Tyworth, Rao, and Stenger (1991). Their model uses a robust solution procedure that produces accurate estimates of the impact of transit-time performance on inventory holding costs without making restrictive assumptions about the shape of the lead time demand distribution (Tyworth 1992). In addition, Figure 1 identifies the relationships among the logistic cost and service elements included in the model. The elements are presented from the perspective of the two drivers of interest in the carrier's price-service mix: rate premiums and changes in on-time performance levels. A rate premium influences the order quantity (shipment size) Q, which affects both cycle and safety stocks. Meanwhile, a change in on-time delivery performance affects the amount of safety stock needed to sustain a pre-specified order fill target. Reliable deliveries, however, can impart other benefits to a receiver, such as less shipment tracing activity and improved warehouse labor productivity. To address this limitation, the study purposely biased the initial values toward maximum savings from perfect service.

Figure 1 also indicates that shipping costs can affect the monetary value assigned to a stock unit. Generally speaking, the unit shipping cost is part of the unit value of an item--either directly as an add-on cost as shown in Figure 1 or indirectly as a cost element embedded in the purchase price. Nonetheless, the study excluded unit shipping costs from unit value for two reasons. First, this restriction had a negligible effect on the accuracy of estimates. Second, it enabled a direct mathematical procedure for calculating the rate adjustments needed to equate the total logistics costs of the two on-time performance levels.

Initialization of Model Parameters

The general approach to the task of initializing the model parameters embraced two techniques. The first technique was to examine multiple levels of key parameters to broaden the scope of the study. The second was to assign input values that would inflate the maximum savings and premiums for on-time delivery. This bias makes the results of the analysis very conservative in the sense that the true values are not very likely to exceed the estimated values. Table 2 shows the initial values of model parameters. The specific methodology for selecting these values is as follows.

On-Time Performance. A critical task was to establish a baseline peformance against which perfect on-time delivery could be measured. The baseline performance was developed from transit-time data provided by a LTL carrier. The transit times characterized two lanes, which had caught management's attention for service irregularities. Each lane encompassed a pair of hub terminals and a set of satellite terminals serving each hub. Given this arrangement, the baseline performance was specifically determined as follows. First, origin and destination (O-D) satellite pairs were grouped by lane standards, which ranged from three to six days. Second, the coefficient of variation (CV) was computed for each O-D pair having at least 25 movements. This step yielded 45 pairs. Third, the list of 45 pairs was pruned by keeping only the pair from each group with the highest CV. Fourth, among the remaining pairs, the one with the greatest potential for improvement was selected as the baseline. This approach acknowledges that transit time distributions with different probability loadings can produce the same mean and standard deviation, and thus the same CVs. Yet the different loadings can produce different safety stock requirements (Allen 1973, Allen, Mahmoud, and McNeil 1985).

In addition, the lane having the median CV in the same group as the baseline lane was also selected for analysis. While the baseline lane helps establish the upper bounds on savings, the median CV lane gives an indication of likely savings and premiums. Further, since the choice of either week-days or total days to measure transit time can alter the probability loadings (Tyworth, Lemons, and Ferrin, 1989), the analysis included both measures.

Transportation Cost. The same LTL carrier supplied its current class rates applicable to the two (high and median CV) lanes. The study used class 70 rates to represent the baseline shipping costs for products valued at one dollar per pound or higher.

Product Attributes. The study included multiple levels of two key product attributes: the value/lb and the period demand. The value/lb levels, which ranged from $1/lb to $21/lb, encompass a broad array of products (see Table 3). Similarly, the values for period demand, which extend from 25 to 200 units per day, are representative of many firms. Two other product attributes in the study are the unit weight and the standard deviation of period demand forecast errors (variability of demand). The unit weight was set at 25 lb, while the forecast error measure was set at 10 percent of average period demand.

Inventory and Procurement Elements. As shown in Table 2, the study used separate holding cost factors for stationary and in-transit inventories. The high initial values for these two factors (.30 and .18) reflect an attempt to (1) capture the implicit, as well as explicit, costs arising from unreliable deliveries and (2) inflate the savings from perfect delivery service. Likewise, the high order fill level (99.9 percent) gives an upward bias to the savings realized from perfect service.

ANALYSIS OF RESULTS

Upper Bounds for Savings and Premiums

Table 4 indicates the maximum expected savings obtained by switching from less-than-perfect service to complete conformance to lane transit-time standards (perfect service). The savings are shown for both week-day and total-day measures of transit time and for different levels of period demand and item value/lb. Figure 2a represents a three dimensional surface plot of the values in Table 4 for a more intuitive examination of the same results. Figure 2a reveals an interesting growth pattern for the savings. When either the period demand of a product or the value/lb remains fixed at the low end of the scale, savings increase in relatively small increments. By contrast, the simultaneous increase of both product attributes creates increasingly steeper slopes moving from left to right along the horizontal (value/lb) axis. Thus, while the amount of savings at the low end of the scales (25 demands and $1/lb) is merely $396 for the total days measure, it grows progressively to $99,847 at the upper end of the scales. Likewise, Table 2 shows the that same pattern applies to the effect that the measure of transit time has on the savings. The week-days measure generally produces less variability than the total days measure and, therefore, lower savings. The rising levels of the two product attributes amplify that measurement effect. As shown in Table 4, for example, the difference between the amount of savings for the two measures is $223 ($396-$173) at the low end of the product attribute scales and $36,686 ($99,874-$63,161) at the high end.

Table 5 and Figure 3a show the maximum premiums that carriers can charge. These premiums shadow the growth pattern for savings as they rise from 2 percent to slightly more than 50. The week-day measure of transit time, however, reduces the size of the premiums by approximately 10 to 50 percent.

Most Likely Savings and Premiums.

The analysis of savings and premiums was repeated for the median CV lane (see Tables 6 and 7). As expected, the patterns previously discussed still hold, but the magnitude of the savings is substantially less. Figures 2a and 2b juxtapose the savings of high and median CV lanes, while Figures 3a and 3b contrast the percent premiums of high and median CV lanes. The savings decreased by about a third when the median CV lane performance replaced the high CV lane and the measure of performance was total days. The week days measure, however, cuts the median CV savings about in half.

The savings for the high CV lane ranged from $400 to nearly $100,000, while the savings for the median CV lane went from $300 to about $70,000. The premiums declined in a similar fashion. As illustrated in Figures 2b and 3b, the median CV lane savings are about two-thirds of the high CV lane savings. The kinky lines and ridges in these two figures appear because the base price on which the rate premium is constructed has changed in response to a new optimal order quantity (Q) and reorder point (s) solution.

Change of Input Variables

Two "What if...?" scenarios were evaluated to get a sense of how other initial values affected the results. The scenarios focused on the general magnitude of the changes in savings and premiums in response to new input values. In the first scenario, the class of freight was increased. The effect on the baseline savings was negligible when the model included either class 100 or 125 rates, a value/lb of $3.00, a period demand rate of 50 units, and the total days measure of performance. The use of higher class rates simply shifted the total costs of the two service alternatives without altering the spread between the optimal total costs. Further, adding the unit shipping costs to the unit value affected the results only slightly. For example, the baseline savings increased by only $250 (worth a .27 percent rate premium) for high value ($19/lb), medium demand (50 units/period) merchandise such as apparel and accessories. With a total logistics cost of $8.7 million, such effects seem trivial. Likewise, the combined effects of using higher class rates and adding unit shipping costs to the unit value on savings were negligible. In the previous example, the change in baseline savings was less than $2000, while the directly corresponding change in premiums was less than two percentage points.

The second scenario focused on the order fill target. In principle, the premiums will mimic changes (up or down) in the order fill target. As already indicated, the baseline case assumes a 99.9 percent order fill level. Thus a decrease in that target, say to the 98 percent level that is standard in many industries (LaLonde 1988), should also diminish the premiums the carrier might charge. As shown in Table 5, for example, a demand rate of 100 units per day (total-days measure) permits the carrier to charge premiums ranging from 2 to 43 percent for products having a value density of $1/lb to $21/lb. By contrast, a 98 percent target cuts the premiums nearly in half. Further, the analysis indicated that the increases in savings and premiums accelerated as the product values and order fill rates rise.

Total Cost Components

Figure 4 depicts the relative importance of the elements that constitute total logistics costs in this study. The acquisition cost, which comprises nearly 95 percent of the total cost, clearly dominates all of the other cost elements. By contrast, the transportation cost represents 3 percent of the total cost, while the inventory holding cost generates only 2 percent. More winnowing shows that safety stock comprises only 11 percent of the total inventory cost, compared to 14 percent for in-transit stock and 76 percent for cycle stock. Cycle stock, in effect, dominated the transportation-inventory cost trade-offs in this study. The most important source of leverage, however, resides in the purchase price. Even small percentage discounts, say .5 percent, off the unit price overwhelmed the savings earned by reducing safety stock.

CONCLUSIONS AND MANAGERIAL IMPLICATIONS

Two difficulities limit research that tries to quantify the value of on-time delivery. The first difficulty is that transportation-inventory trade-offs encompass complex relationships that are hard to model--a problem that makes certain simplifying assumptions necessary. In this study, the setting encompassed a single echelon, an independent demand lot size (s,Q) inventory system for items with relatively high demand rates and dollar densities, and LTL transportation services. Although the model used in this study relied on the classic inventory theoretic framework, it included a new procedure for determining the impact of on-time performance on inventory that is more accurate and robust than the current approaches. The second difficulty is that many cost and service elements are idiosyncratic. The study addressed this problem by purposely biasing the results in favor of the savings from on-time performance. This approach instills confidence that the results represent the upper bounds on the estimates.

Strictly speaking, the conclusions that follow are applicable to the specific conditions evaluated. Nonetheless, one might cautiously use them as guidelines for developing a better sense of the potential value of complete conformance to delivery standards in related settings.

1. The method of measuring lead time has a significant effect on the estimated value of on-time delivery. Increases in an inventory item's value/lb and demand rate amplify that effect.

2. The expected savings and premiums from on-time delivery are sensitive to the value/lb and demand rate of an item. Thus these product attributes are useful for defining a "region of opportunity" where shippers realize considerable savings. In the best case for a high service strategy, this region included articles valued at $9/lb or more and having at least 25 demands per day. Here, the shipper's savings were worth premiums ranging from 12 percent to 51 percent. The most likely region of opportunity, however, included articles valued at $13/lb or more and having a demand rate of at least 100 units per day. With weekdays as the measure of transit time, this region produced premiums in the 12 to 20 percent range.

3. The value of on-time delivery is not very sensitive to changes in the class of freight (rate levels) or to making the unit value of an article include the shipping cost per unit. By contrast, the value of perfect conformance to lane standards is sensitive to the shipper's order fill policy. The relaxation of the baseline rate of 99.9 percent will diminish the size of the premiums that carriers might charge, as well as limit the kinds of products suitable for a premium price-service strategy.

4. Although the absolute amount of savings from perfect delivery service may appear substantial, it comprises a minute fraction of the total logistics costs. The greatest potential payoff for the buyer comes from a discount in the purchase price. For relatively high-demand and high-value items, a small quantity discount, say as little as .5 percent, has a far greater impact on total costs than complete conformance to on-time delivery standards. This relationship implies that a discount from a supplier served by carriers with even a mediocre delivery performance can be a very good deal. The buyer simply carries more safety stock to offer the same level of customer service and pockets the savings.

5. Safety stock is productive stock. The firm can achieve the same level of product availability with different mixes of transportation performance and safety stock levels.

6. Cycle stocks, which are unaffected by consistent lead times, can dominate transportation-inventory trade-offs among high-demand, high-value articles. This outcome prevailed for the articles embraced by this study, which had demands ranging from 25 to 200 units per day and values ranging from $1 to $21 per lb.

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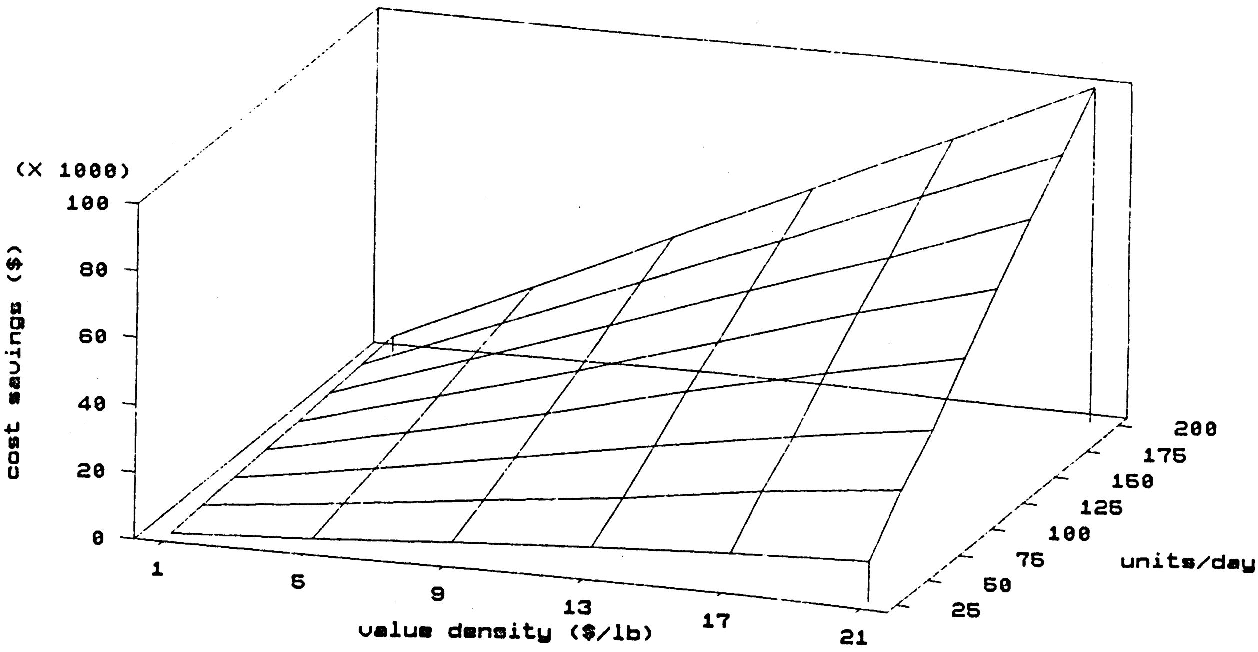
FIGURE 2(a)

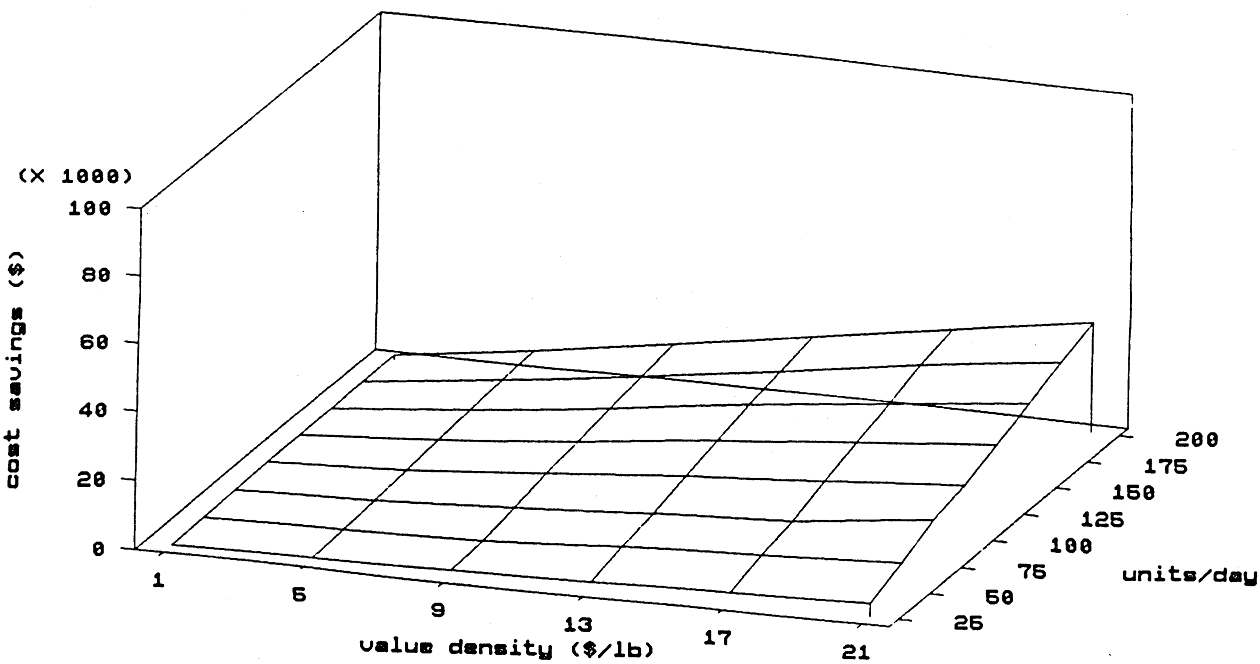
Upper Bounds on Logistics Cost Savings for Conformance to Standard--High CV Baseline*



*99.9% order fill, total days

FIGURE 2(b)

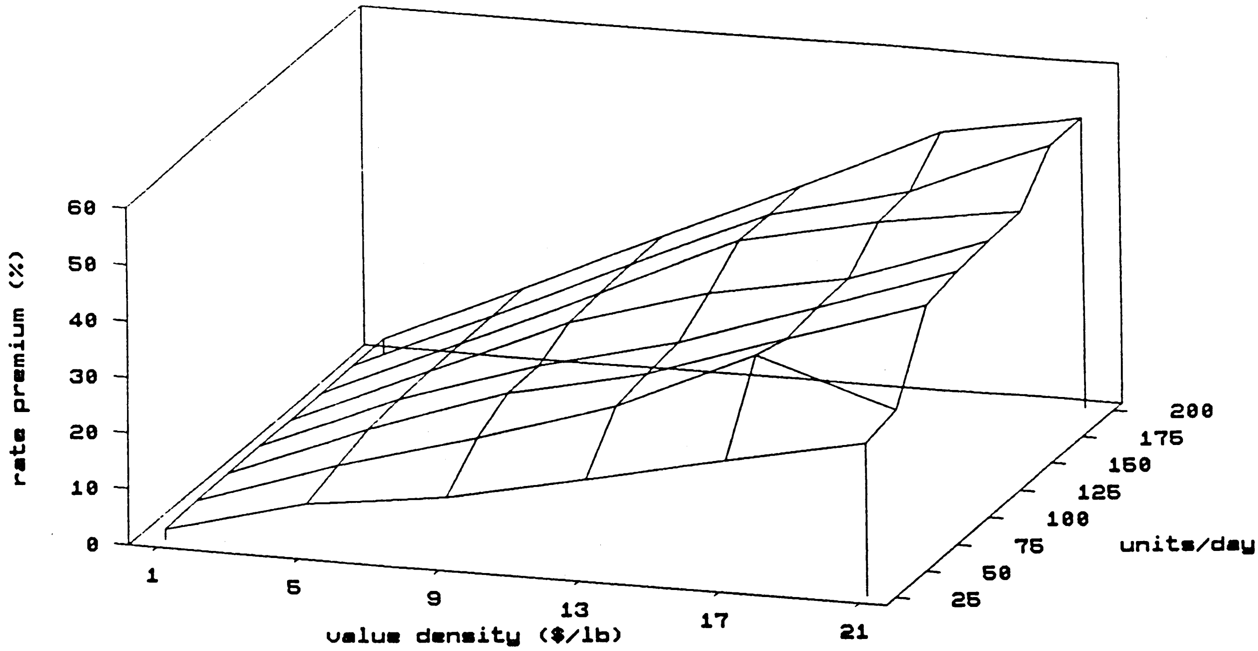
Logistics Cost Savings for Conformance to Standard--Median CV Lane*



*99.9% order fill, weekdays

FIGURE 3(a)

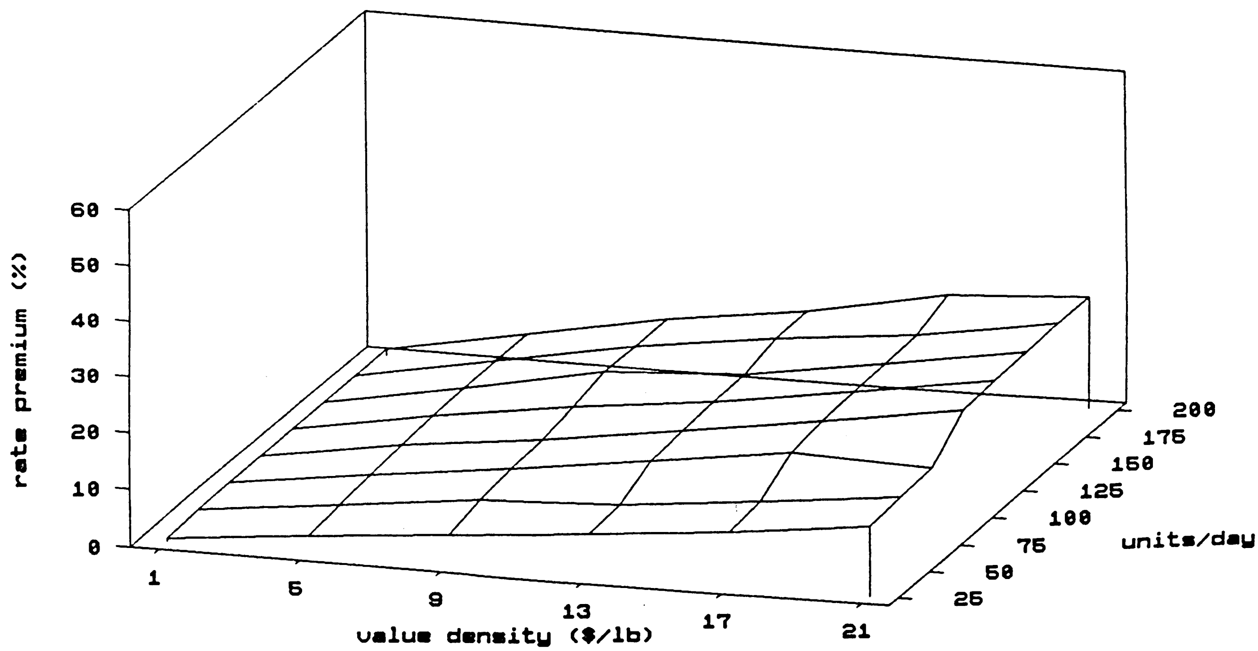
Upper Bounds on Percent Rate Premiums for Conformance to Standard--High CV Baseline*



*99.9% order fill, total days

FIGURE 3(b)

Percent Rate Premiums for Conformance to Standard--Median CV Lane*



*99.9% order fill, weekdays

FIGURE 1

Elements and Relationships of Total Logistics Costs Model

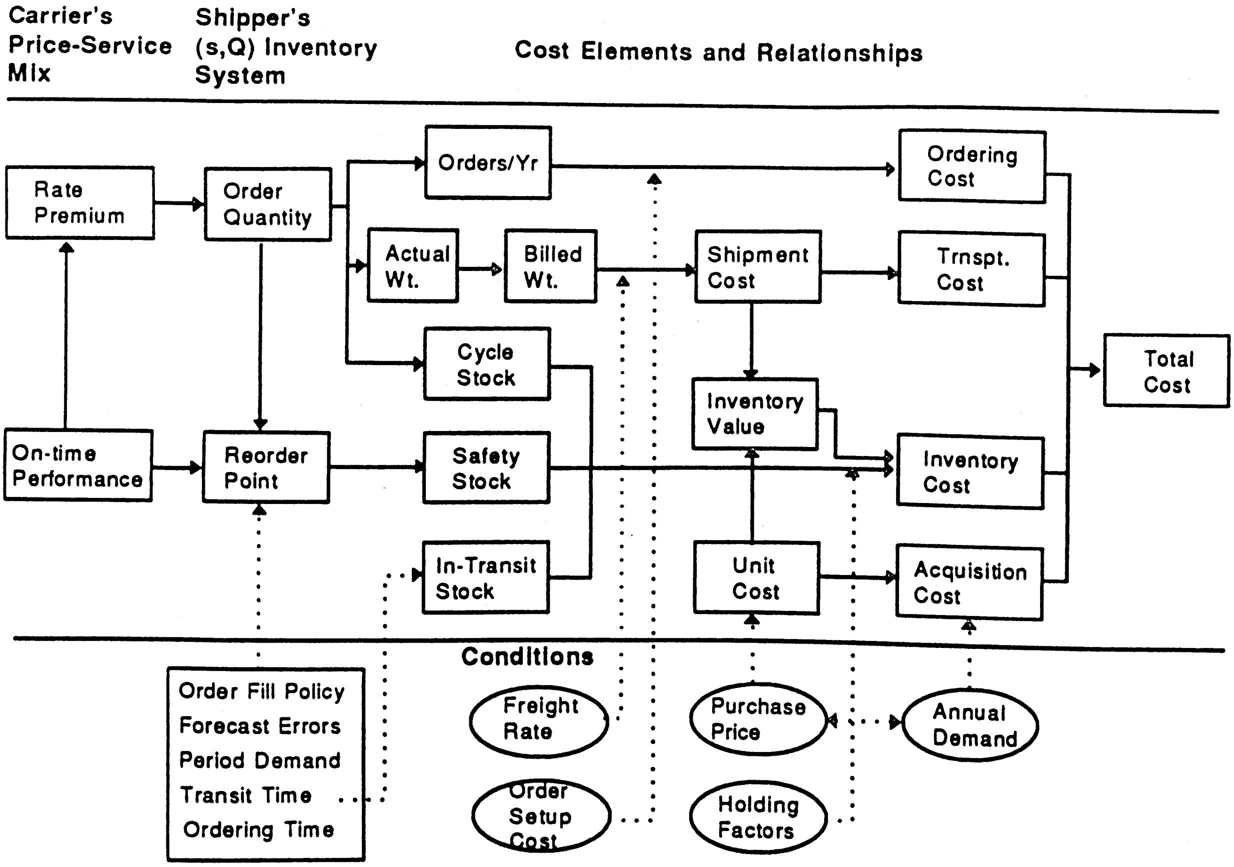
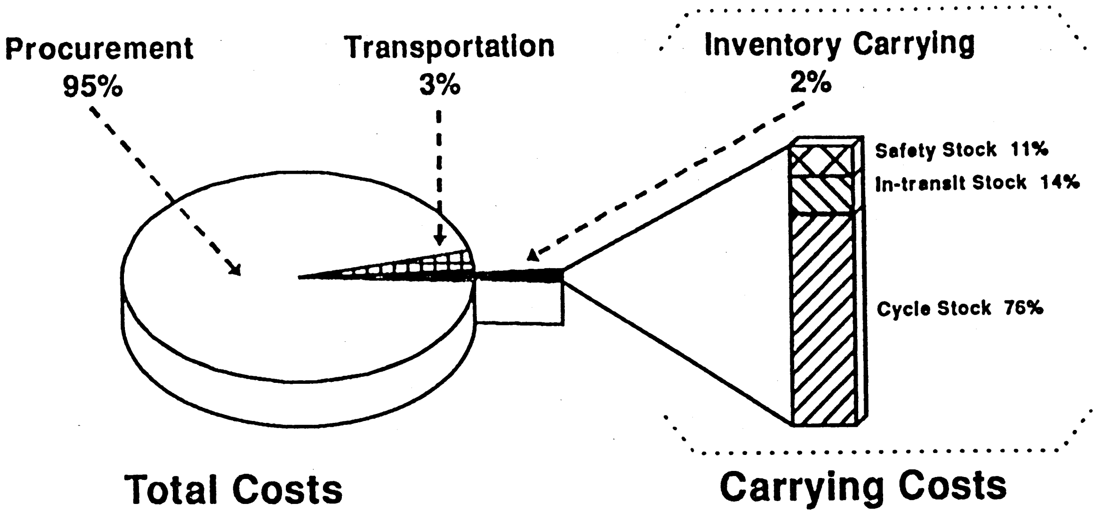


FIGURE 4

Total Costs Breakdown



Product value = $3.0/lb
Order fill rate = 99.9%

TABLE 1
Model Assumptions

- Independent demand item from a single source
- Continuous review inventory system
- Stationary, independent, and normally distributed period demand
- Stationary, independent transit-time having any discrete probability distribution
- Constant ordering time of 2 periods
- No crossover orders
- Complete lost sales (no backorders)

TABLE 2
Model Parameter Values

On-time performance: imperfect service

	Lead Time							
	3	4	5	6	7	8	9	10
High CV* baseline								
Total days			0.125	0.344	0.250	0.219	0.031	0.031
Business days		0.125	0.375	0.438	0.031	0.031		
Median CV* baseline								
Total days			0.128	0.213	0.298	0.319	0.043	
Business days	0.043	0.170	0.383	0.362	0.043			

Transportation cost: class 70

	Weight Groups									
	Min Chg	L5C	5C	1M	2M	5M	10M	20M	30M	40M
Rates per cwt	79.25	40.24	39.95	28.29	25.09	20.16	18.50	12.65	10.79	9.46

Product Attributes

Periods per year	
Total days	360
Business days	250
Period demand	25 to 200
Unit value/lb	$1 to $21
Unit weight (lb)	25

Inventory and Procurement Elements

Holding Cost Factors	
Stationary stock	30.0%
In-transit stock	18.0%
Order fill target	99.9%
Ordering cost/order	$30
Order processing	2 periods

*coefficient of variation

TABLE 3
Selected Commodity Groups and Corresponding Values

Commodity Group	1975 Value* $/kg	1989 Value** $/lb
1-4 $/lb		
Toiletries	1.61	1.43
Paper End Products	1.72	1.52
Dairy Products	1.89	1.67
Paper for Printing	2.27	2.01
Fresh Meat	3.09	2.74
Plastic End Products	3.88	3.44
Stationery	3.92	3.47
Rubber Tires	4.17	3.69
Agricultural Chemicals	4.48	3.97
5-8 $/lb		
Printed Matter	5.85	5.18
Furniture & Fixtures	5.89	5.21
Coffee	5.95	5.27
Tobacco Products	6.79	6.01
Fresh Fish	7.74	6.85
Electrial Applicances	8.4	7.44
9-12 $/lb		
Lighting & Dist	9.41	8.33
Air Conditioning & Refrigeration Equip.	9.46	8.38
Other Equipment	10.23	9.06
Engines & Turbines	11.84	10.48
Compresssors & Pumps	12.08	10.70
13-17 $/lb		
Apparel & Accessories	18.45	16.34
17-21 $/lb		
Generators & Motors	19.64	0.00

* Samuelson, R. and Roberts, P. O. 1975. A Commodity Attribute Data File for Use in Freight Transportation Studies. Center for Transportation Studies, Massachusets Institute of Technology.

** Converted values adjusted by Producer Price Index in U.S. Bureau of Census, Statistical Abstracts of the U.S.: 1991 (111 ed.). Washington, D.C., p. 481.

TABLE 4
Upper Bounds on Logistics Costs Savings ($) for Conformance to Standard--High CV* Baseline

Period Demand	Period Measure**	Product Value ($/lb)					
		1	5	9	13	17	21
25	TD	396	2,428	5,248	7,580	9,912	12,245
	WD	173	1,313	3,240	4,680	6,120	7,663
50	TD	971	5,156	9,888	14,282	20,425	25,592
	WD	510	3,188	5,738	9,848	12,878	15,908
75	TD	1,569	7,846	15,124	22,252	29,099	35,946
	WD	885	4,801	9,248	13,358	17,468	24,413
100	TD	2,197	10,987	20,383	30,515	39,904	49,293
	WD	1,283	6,413	12,825	18,525	24,225	29,925
125	TD	2,810	14,052	25,293	37,412	50,454	62,326
	WD	1,673	8,363	15,660	23,595	30,855	38,115
150	TD	3,431	17,155	30,879	45,281	59,601	75,515
	WD	2,063	10,313	18,993	28,679	37,613	46,463
175	TD	4,052	20,258	36,464	52,670	70,279	87,103
	WD	2,453	12,263	22,073	32,858	44,494	54,964
200	TD	4,672	23,361	42,049	60,737	79,718	99,847
	WD	2,843	14,213	25,583	38,025	50,311	63,161

* CV = coefficient of variation for transit time
** TD = total days
** WD = weekdays

TABLE 5
Upper Bounds on Percent Rate Premiums for Conformance to Standard--High CV* Baseline

Period Demand	Period Measure**	Product Value ($/lb)					
		1	5	9	13	17	21
25	TD	1.9	8.5	11.6	16.7	21.9	27.0
	WD	1.2	6.6	10.3	14.9	19.4	24.3
50	TD	2.3	10.6	17.4	25.1	35.9	28.2
	WD	1.7	8.1	14.5	15.6	20.4	25.3
75	TD	2.5	12.3	20.8	26.1	34.1	42.1
	WD	2.0	9.5	15.6	22.5	29.5	25.8
100	TD	2.6	12.9	21.0	26.8	35.0	43.3
	WD	2.2	10.8	16.2	23.4	30.6	37.8
125	TD	2.6	13.2	23.8	30.8	35.5	43.8
	WD	2.3	11.3	18.6	23.9	31.2	38.6
150	TD	2.7	13.4	24.2	35.5	40.9	44.2
	WD	2.3	11.6	21.4	28.4	31.7	39.2
175	TD	2.7	13.6	24.5	35.4	41.4	51.3
	WD	2.4	11.9	21.3	27.8	32.2	39.7
200	TD	2.7	13.7	24.7	35.7	46.8	51.4
	WD	2.4	12.0	21.6	28.2	37.3	39.9

* CV = coefficient of variation for transit time
** TD = total days
** WD = weekdays

TABLE 6
Logistics Costs Savings ($) for Conformance to Standard--Median CV* Lane

Period Demand	Period Measure**	Product Value ($/lb)					
		1	5	9	13	17	21
25	TD	308	1,727	3,705	5,356	7,008	8,660
	WD	86	619	1,654	2,389	3,124	3,961
50	TD	676	3,547	6,757	9,760	14,293	17,656
	WD	225	1,500	2,700	5,070	6,630	8,190
75	TD	1,081	5,406	10,529	15,323	20,037	24,752
	WD	409	2,269	4,556	6,581	8,606	12,679
100	TD	1,502	7,508	13,987	20,983	27,439	33,895
	WD	608	3,038	6,413	9,263	12,113	14,963
125	TD	1,929	9,647	17,365	25,765	34,713	42,881
	WD	806	4,031	7,729	11,846	15,491	19,136
150	TD	2,357	11,787	21,216	31,324	40,967	52,024
	WD	1,005	5,025	9,476	14,528	18,998	23,468
175	TD	2,785	13,926	25,067	36,208	48,369	60,039
	WD	1,211	6,056	10,901	16,429	22,631	27,956
200	TD	3,221	16,103	28,986	41,868	55,043	68,893
	WD	1,410	7,050	12,690	19,013	25,448	32,134

*CV = coefficient of variation for transit time
**TD = total days
**WD = weekdays

TABLE 7
Percent Rate Premiums for Conformance to Standard--Median CV* Lane

Period Demand	Period Measure**	Product Value ($/lb)					
		1	5	9	13	17	21
25	TD	1.4	6.1	8.2	11.8	15.4	19.1
	WD	0.6	3.1	5.3	7.6	9.9	12.6
50	TD	1.6	7.3	11.9	17.1	15.8	19.5
	WD	0.8	3.8	6.8	8.0	10.5	13.0
75	TD	1.7	8.5	14.5	17.9	23.5	29.0
	WD	0.9	4.5	7.7	11.1	14.5	13.4
100	TD	1.8	8.8	14.4	18.4	24.1	29.8
	WD	1.0	5.1	8.1	11.7	15.3	18.9
125	TD	1.8	9.1	16.3	21.2	24.4	30.1
	WD	1.1	5.5	9.2	12.0	15.7	19.4
150	TD	1.8	9.2	16.6	24.5	28.1	30.5
	WD	1.1	5.7	10.7	12.2	16.0	19.8
175	TD	1.9	9.3	16.8	24.3	28.5	35.3
	WD	1.2	5.9	10.5	13.9	16.4	20.2
200	TD	1.9	9.5	17.0	24.6	32.3	35.5
	WD	1.2	6.0	10.7	14.1	18.9	20.3

*CV = coefficient of variation for transit time
**TD = total days
**WD = weekdays