CASE STUDY USING QUANTITATIVE METHODS FOR DECISION MAKING: TOM LEHRER MOTORS F&I PROFITABILITY

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ABSTRACT

Selling Finance and Insurance (F&I) products are essential to the profitability of an automotive dealership. It offers customers additional protection for a major investment and provides the dealership with products to mitigate the risk of selling these vehicles. This paper presents a simulation model designed to help in forecasting the financial results of the F&I department. It also details the practical applications the model was used for in the dealership, post study.

Keywords: Simulation, Automotive Dealership, Decision Making, Case Study

INTRODUCTION

Tom Lehrer Motors is the fictitious name of an actual automotive dealership located in the Eugene/Springfield, Oregon area. It is in the business of selling vehicles, service, and parts. The dealership represents the Volvo, Volkswagen, and Hyundai brands. In addition, the company possesses a robust used vehicle business. Within vehicle sales, the company also sells additional items known as Finance and Insurance (F&I) products. There are 5 F&I products and each comes with a specific profit contribution.

The company has analyzed their F&I product and specific contributions per product.
The current 2011 profit contributions per product are:

- Guaranteed Auto Protection (GAP) $190
- Extended Service Contract (ESC) $840
- Safeguard Insurance (SI) $241
- Interior and Exterior Sealants (IES) $556
- Splash Guard (SG) $374

Vehicles are sold in one of two methods. Vehicles can be financed or purchased for cash. The company believes that financing increases the odds of selling F&I products. For the purposes of this study, any method of payment other than a contract generated by Tom Lehrer Motors is considered a cash deal. The effects of cash-deals on F&I products will be collected for this study.

The first two products, GAP and ESC, are cancellable items. They are cancellable on a pro-rata share based on the number of years the product has been in effect. The remaining three products are not cancellable and once sold are protected against customer remorse. However, lending

institutions prefer cancellable items versus non-cancellable items. This results in what is known in the industry as a Line 5 call. A Line 5 call, for the purposes of this study, will eliminate all F&I products except for GAP and ESC. Analysis will be conducted to determine the average cash-deal to financed deal ratio per month. Only 1 of each product can be sold with a vehicle with the exception of GAP. GAP is only sellable on a financed car-deal.

Tom Lehrer Motors has several product penetration goals. The company has the following goals for each specific type of F&I product:

- The company wants 60% of vehicles sold to be financed through their F&I department.
- The company wants 40% product penetration for ESC on all vehicles sold.
- The company wants 40% of financed deals to include GAP.
- The company wants 50% product penetration for the three non-cancellable items.

Finally, because ESC and GAP products are cancellable, the company is currently experiencing a set-amount of charge-backs each month. As such, an average amount per month has been determined as being an adjustment to gross-profit. GAP cancellations have reduced the total F&I profit by $543 per month. ESC cancellations have reduced the total F&I profit by $5,931 per month. These trends are expected to continue.

Albritton & McMullen (2006) suggest that the use of statistics and quantitative methods are a valuable tool set for the Master of Business Administration (MBA) student. They assert that the teaching of these methods in the classroom can easily help a student go beyond theory to practical application. Given their assertion, this study proposes to create a spread sheet model that can be used for forecasting F&I income, on a per unit basis, over the course of a year. Additionally, this model will be used to answer several questions for Tom Lehrer Motors, given specific gross profit (GP) contributions per product, types of vehicle sales, bank restrictions, current company policies, and average reductions in gross-profit due to charge-backs. These questions are:

- What should Tom Lehrer Motors expect as the average F&I profit-per-vehicle retailed?
- Is the company's goal of $1000 per vehicle retailed achievable if all goals are hit?
- How often will the company lose money in the F&I department?
- How do these averages compare to the goals of the company?
- How does this model compare to the year to date information of the company?

The next section provides a literature review related to the use of quantitative models in this environment. The third section presents the development of the simulation model while the fourth section discusses the results. The fifth section addresses specific applications of the results to make decisions relative to results. The sixth section discusses the outcomes of those decisions. The last section summarizes the paper.

LITERATURE REVIEW

At the outset of the study, a review of the literature was conducted to answer two research questions. First, what quantitative methods have been used in auto dealerships? Second, what quantitative method would best serve the purposes of this study? The review resulted in no articles illustrating the use of a quantitative method in an auto dealership. However some

general advice was gleaned from the review. For example, Albritton & McMullen (2006) suggested that the focus of quantitative methods in the class room setting was shifting from the pure mathematics of the science and more to the application of the models in the business setting. Thus, a quantitative model could be an appropriate approach to answering Tom Lehrer Motors questions.

Joaquin (2007) illustrated a spreadsheet simulation model detailing risk and loss analysis from a practical approach. That author's assertion was that practitioners of quantitative methods at one point were limited to "…'quants' who had some computer programming expertise." However, with the advent of simulation software provided in spreadsheets, creating simulations could be accomplished by the collaborative efforts of both quants and non-quants. In other words, a person without a deep background in quantitative methods could be guided in their use.

Grossman (1999) illustrated the use of spreadsheet modeling as an application vehicle for applying queuing theory. Although queuing is not an applicable model for this case study, the article illustrated the ease at which spreadsheets could be used vs. complicated and expensive software. In his conclusion, the author asserted that spreadsheet modeling encouraged and allowed students to experiment with the model in order to arrive at their own conclusions and gain new insights. Given his assertion, it would not be out of line to extend this belief to also encompass the use of spreadsheet modeling in the business setting. By using spreadsheet modeling, the business person could have the ability to experiment with the model in order to arrive at conclusions and insights unique to their business.

Harrison, Linn, Carroll, and Carly (2007) discussed the history of simulation modeling and the possible misunderstanding the business community may have about it. Their assertion was that although simulation modeling is a very powerful tool, it might not be fully understood. Within their work, they discussed that simulation modeling was based, in part, on formal modeling. To that end, there were several key components they asserted were part of a good formal model. Formal models provide clarity, ease of comparability, logical power, and transparency.

Anderson, Sweeney, Williams, Camm, and Martin (2011) discussed numerous quantitative methods for decision making. Their discussion began with modeling and logic and then illustrated numerous quantitative models and their application in the business community. Some of these models included linear programming (LP), integer LP, queuing, multi-criteria decision making, and simulation modeling. The following is a discussion of two quantitative methods that seemed likely to fit the purposes of this paper.

Linear Programming (LP)

A LP model helps the decision maker in a situation where the decision needs to result in the maximization or minimization of a quantity (Anderson, et. al., 2011). It is comprised of two parts. The first is the objective function, or what problem needs to be maximized or minimized. The second part includes all of the constraints that have an effect on the solution. They demonstrated a number of LP models that illustrate this. A review of their work suggests that although a LP model might be adaptable to a business problem such as Tom Lehrer's F&I department, it also showed the difficulty in accomplishing it. For example, a LP model might be

usable by setting up the objective function for the problem. Given the GP margins provided, and setting the following variable to, X1 = Gap, X2 = ESC, X3 = SI, X4 = IES, X5 = SG, the following objective function could be created:

$$MAX \quad 190X1 + 840X2 + 241X3 + 556X4 + 374X5$$

Although the objective function was fairly straight forward in setting up, the constraints seemed to be a little more problematic. In theory, the constraints would need to include the penetration goals for each of the products, and potentially a value for chargebacks. Additionally, a constraint would need to be created to set the minimum amount of profit per car deal to $1000. If these constraints were created, then what would this LP model actually result in? Potentially, the model would result in a value for each of the variables to get to a maximized profit. In other words, it should suggest how many of each type of product should be sold to achieve a minimum of $1000 per vehicle retailed.

Simulation Modeling

Anderson, et. al. (2011) asserted that simulation modeling was a widely used approach to business decision making. Their definition of the simulation model stated that it was a way for someone to understand a system by creating a model that was representative of the system. Some business decisions that had successfully been accomplished through the use of simulation modeling included airline overbooking, inventory policy, traffic flow, and waiting lines.

As a general rule, the authors illustrated that a simulation model begins with a flow chart that conveys the inputs of the model, shows a process for the simulations model, and defines the number of trials to be conducted. The authors also illustrated the use of spreadsheet models as the vehicle for creating the simulation model. One example they used was with regards to a waiting line problem for an ATM. The decision to be made was if the bank should expand and install a second ATM for customer use. The power of this example illustrated how a binary solution, expand or do not expand, was reached using simulation modeling.

In considering the information revealed from the literature review either the use of a LP model or a simulation approach seemed the most appropriate. In general, the advice that could be gleaned from the review demonstrated the key components necessary for creating a good model for this study. Additionally, the review illustrated the applicability and confirmed the appropriateness of using a spreadsheet as the means to accomplish the purpose of this paper.

MODEL DEVELOPMENT

The data was collected from historical documentation from the company based on month-by-month records. All product penetration amounts were collected using this same method and were averaged for a thirteen month period prior to the current reporting period. This method helped to include both some of the prior year's averages combined with current year trends.

There were a total of three possible models considered for this project. The first was a LP model. After consideration of what an LP model is used for, and its constraint component, it was determined that this project did not easily lend itself to an LP approach.

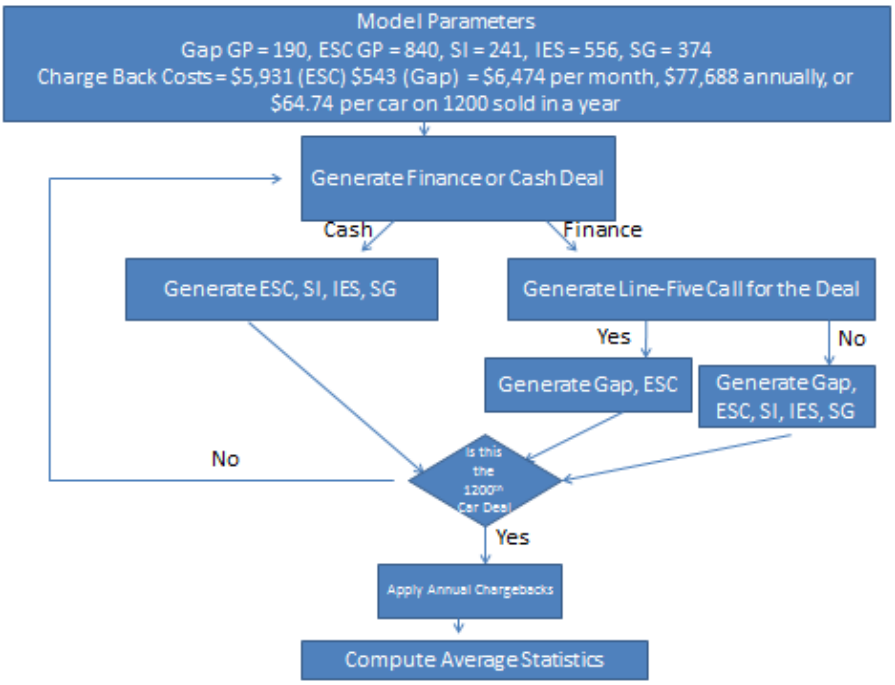
This project seemed more likely to be solved best with a probability or simulation model. There were two models that were looked at. Initially, the use of a normal distribution was constructed by using the mean and standard deviation for each product's current penetration statistics. This approach did not work. The model typically returned duplicate product sales within the same car-deal. Additionally, using a normal distribution approach only resulted in what actual penetration statistic occurred in each simulation. It did not have a decision making capability built into it. This fact brought up the first issue in creating a model for this project. It appeared that probabilities would be a useful way of approaching this project, but the model needed to have the ability to return a binary answer. For example, based on the probability of selling an ESC on a financed deal, an ESC was either sold or not sold.

A uniform distribution approach was next selected as the most likely candidate to fit this particular problem. In order to accommodate the binary solution for each product, probability tables would be constructed on a product by product basis. Additionally, this approach would lend itself to addressing the probability of a cash-deal versus a finance-deal occurring in each simulation.

Flow Chart

In producing this model, it was important to create a flow chart to show the relationships of the inputs and the variables being considered. Figure 1 shows the flow chart developed for the purposes of this model. As previously discussed, the model parameters were gathered from looking at historical financial records. The company often based their annual sales on the idea of 100 car sales per month. This indicated an annual car-deal amount of 1200 for the year. Therefore it was decided that the simulation would be ran 1200 times to simulate a year of sales.

Figure 1. Flow Chart.



Model Parameters

The GP contributions per product were determined by analyzing Tom Lehrer Motor's sale price and cost of sale for each product. The company sells on a fixed gross profit model. Each product may have variations to price and coverage, but each one is designed to sell at a price to achieve the specific gross profit set by the company. For example, an ESC sold on a new vehicle would have different coverage options than that of a used car and may come with a different selling price to the customer. However, the gross profit would be $840 in either situation. One of the challenges to creating this model was determining how to handle the chargebacks from cancellable items sold in prior years. One method would be to calculate all 1200 car deals and then subtract the annual amount from the total. However, to get an accurate average per-car-deal from the scenario a prorated amount was deducted from each car deal. Since this scenario was to be done 1200 times, to represent the 100 cars per month goal of the company, a prorated amount of $64.74 per car was to be deducted from the total amount of F&I gross each time.

Generating a Cash or Finance Car Deal

Each time a vehicle is sold, the F&I manager is required to present financing options to the customer. Although many customers have the ability to purchase for cash or can get their own financing, the company believes that there is an argument to be made in presenting additional options to the customer. For example, a $20,000 vehicle purchase represents $20,000 cash at one time to be given for the purchase. By financing the car, the customer could retain their $20,000 and invest that money in some interest bearing instrument.

In the example of a customer already having a financing source, the company often tries to show other possibilities that may be more advantageous to the customer. For example, Tom Lehrer Motors might be able to get the customer more favorable rates, terms, or both. Most customers finance a car with the need for the payment to be affordable. By being able to offer a lower rate, a greater number of terms, or both, the payment per month could be lower than the one the customer already has. This combined with building value in the F&I product allows the customer to purchase the same vehicle, buy the added protection, and still remain within a favorable payment. It was not possible, however, to determine how often this was successful for the company, as these scenarios are not tracked by the company. For the purposes of this study, the actual results were looked at on a per month basis to determine the level of finance penetration. The level of penetration for the F&I department showed 63.88% finance deals out of the total vehicles sold. Therefore, in a scenario of 100 car deals per month, approximately 64 would be the average number of vehicles financed and 36 would be the number of cash deals.

Cash Deals

A cash-deal requires an F&I managers to sell their additional products to the customers for more money or having to secure permission from the customer's source. Often the customer's bank or lending institutions would not allow additional products, limit them severely, or would offer similar products at substantially reduced prices to the customer. The average product penetration

of each product sold in a cash-deal scenario is as follows: GAP - 0%, ESC - 25%, SI - 3%, IES - 12%, and SG - 1%.

Line 5 Call for a Financed Deal

This probability was difficult to determine as it was not recorded by any of the reporting systems used at Tom Lehrer Motors. The effects of a Line 5 call were fairly easy to determine, in that the lending institution would decrease the amount of F&I products allowable to selling one GAP and one ESC only. To determine how often this happened, each F&I manager was asked how often they faced this problem. The results of this inquiry for each of the three managers were: 1 - 10% to 20% of the time, 2 - 15% of the time, and 3 - no more than 20% of the time. Therefore, the probability of a Line 5 call was treated as having a probability of 16.25%. This was the mean average of the responses. Although this was a heuristic, it was important to determine if Line 5 calls could have an effect on F&I GP.

Generating F&I Products

In terms of financed car-deals, the data that was collected on the product penetration is: Gap - 24%, ESC - 35.77%, SI - 21%, IES - 16.85%, and SG - 3%. These statistics helped to complete the picture and helped to support the company's assertion that financing a car had an effect on the results of selling F&I products. Now that cash- to finance-deal ratios, cash and finance product penetration statistics, and Line 5 call probabilities were determined, the simulation model could be built.

Simulation Model

The simulation model for this project is shown in Figure 2.

Each of the inputs was placed at the top of the model with their associated probabilities and decision criteria. Each of the simulation criteria used a variation of the following formula:

=VLOOKUP(RAND(),$D$13:$F$14,3)

By using the random number generator within Microsoft Excel and the VLOOKUP function, each car deal calculated either a cash or finance deal, sale of a product or a non-sale of a product, and a Line 5 call.

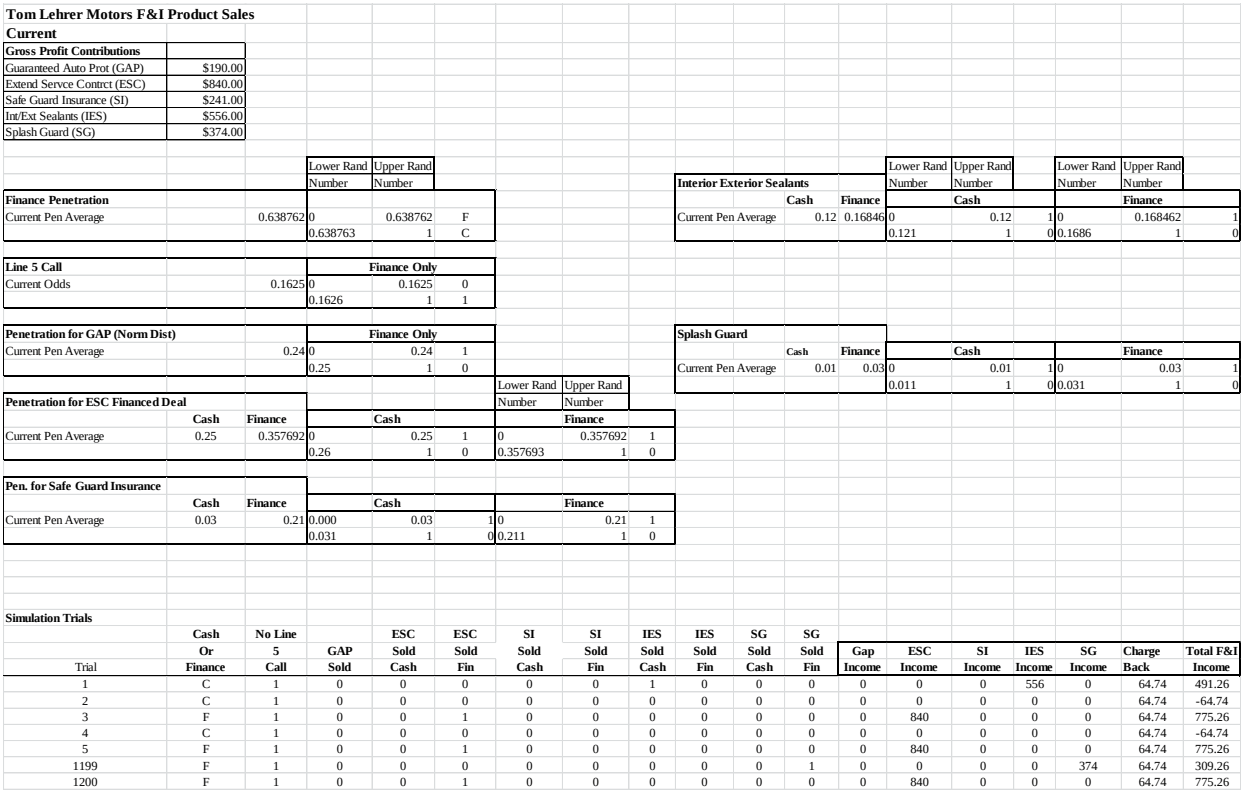
Of special interest was how to handle the Line 5 calls in the spreadsheet model. The basic concept was to demonstrate the effects of a Line 5 call as removing all non-cancellable products from the sale. To accomplish this, a Line 5 call was expressed as a "No Line 5 Call." Therefore, if no Line 5 call was generated, it produced a 1. Notice that on the model, where most probability tables list a 1 before the 0, the 0 comes first. Therefore if the formula returned an actual Line 5 call, a 0 would be expressed in the simulation table. This became important when calculating the gross profit per car sale. A 0 would eliminate any gross profit produced by the estimated sale of an SI, IES, or SG sold, based on the following formula:

+(I58+J58)*$B$7*C58

Cell C58 represented the cell for that line which contained the results of a Line 5 call. Cells I58 and J58 represented the specific product, either cash or finance respectively, and$B$7 was the

fixed cell for the gross amount for this particular product. Therefore, this model very closely simulated what actually happens in a car-deal. The customer may be willing to purchase these products, but the bank might eliminate them at the end during the approval process.

Figure 2. Simulation Model.



Tom Lehrer Motors F&I Product Sales	
Current	
Gross Profit Contributions	
Guaranteed Auto Prot (GAP)	$190.00
Extend Servce Contrct (ESC)	$840.00
Safe Guard Insurance (SI)	$241.00
Int/Ext Sealants (IES)	$556.00
Splash Guard (SG)	$374.00

Finance Penetration		Lower Rand Number	Upper Rand Number	
Current Pen Average	0.638762	0	0.638762	F
		0.638763	1	C

Line 5 Call		**Finance Only**		
Current Odds	0.1625	0	0.1625	0
		0.1626	1	1

Penetration for GAP (Norm Dist)		**Finance Only**		
Current Pen Average	0.24	0	0.24	1
		0.25	1	0

Penetration for ESC Financed Deal			Lower Rand Number	Upper Rand Number	
	Cash	**Finance**	**Cash**		**Finance**
Current Pen Average	0.25	0.357692	0	0.25	1
			0.26	1	0

Pen. for Safe Guard Insurance					
	Cash	**Finance**	**Cash**		**Finance**
Current Pen Average	0.03	0.21	0.000	0.03	1
			0.031	1	0

Interior Exterior Sealants			Lower Rand Number	Upper Rand Number		Lower Rand Number	Upper Rand Number	
	Cash	**Finance**	**Cash**			**Finance**		
Current Pen Average	0.12	0.16846	0	0.12	1	0	0.168462	1
			0.121	1	0	0.1686	1	0

Splash Guard								
	Cash	**Finance**	**Cash**			**Finance**		
Current Pen Average	0.01	0.03	0	0.01	1	0	0.03	1
			0.011	1	0	0.031	1	0

Simulation Trials

Trial	Cash Or Finance	No Line 5 Call	GAP Sold	ESC Sold Cash	ESC Sold Fin	SI Sold Cash	SI Sold Fin	IES Sold Cash	IES Sold Fin	SG Sold Cash	SG Sold Fin	Gap Income	ESC Income	SI Income	IES Income	SG Income	Charge Back	Total F&I Income
1	C	1	0	0	0	0	0	1	0	0	0	0	0	0	556	0	64.74	491.26
2	C	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	64.74	-64.74
3	F	1	0	0	1	0	0	0	0	0	0	0	840	0	0	0	64.74	775.26
4	C	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	64.74	-64.74
5	F	1	0	0	1	0	0	0	0	0	0	0	840	0	0	0	64.74	775.26
1199	F	1	0	0	0	0	0	0	0	0	1	0	0	0	0	374	64.74	309.26
1200	F	1	0	0	1	0	0	0	0	0	0	0	840	0	0	0	64.74	775.26

RESULTS

This study had the expressed purpose of creating a model that could closely represent the profitability of the F&I department at Tom Lehrer Motors. It also was created to help answer several questions for the company. Given the results of the model, all questions were answered through the use of average statistics. Table 1 shows the statistics calculated from the 1200 scenarios. In addition, Figure 3 and Table 2 help to answer questions related to the company's goals. It should also be noted that by comparing the outputs of the company goals and the inputs of those goals, this helped to validate the model. For example, the company goal was 60% finance penetration, and the average amount of financed deals was around 60%. In each case, the penetration amount set up in the input side was validated by the output side.

The Initial Five Questions

Is the company's goal of $1000 per-vehicle-retailed achievable if all goals are hit? The results suggest that even by achieving and, in some instances, exceeding the company's goals, the average gross profit per vehicle sold did not reach the $1000 per copy goal. This may have been

attributable to the Line 5 call. Table 2 shows the average per copy to be just $935 before chargebacks. After chargebacks, the average dropped to around $870 per car deal.

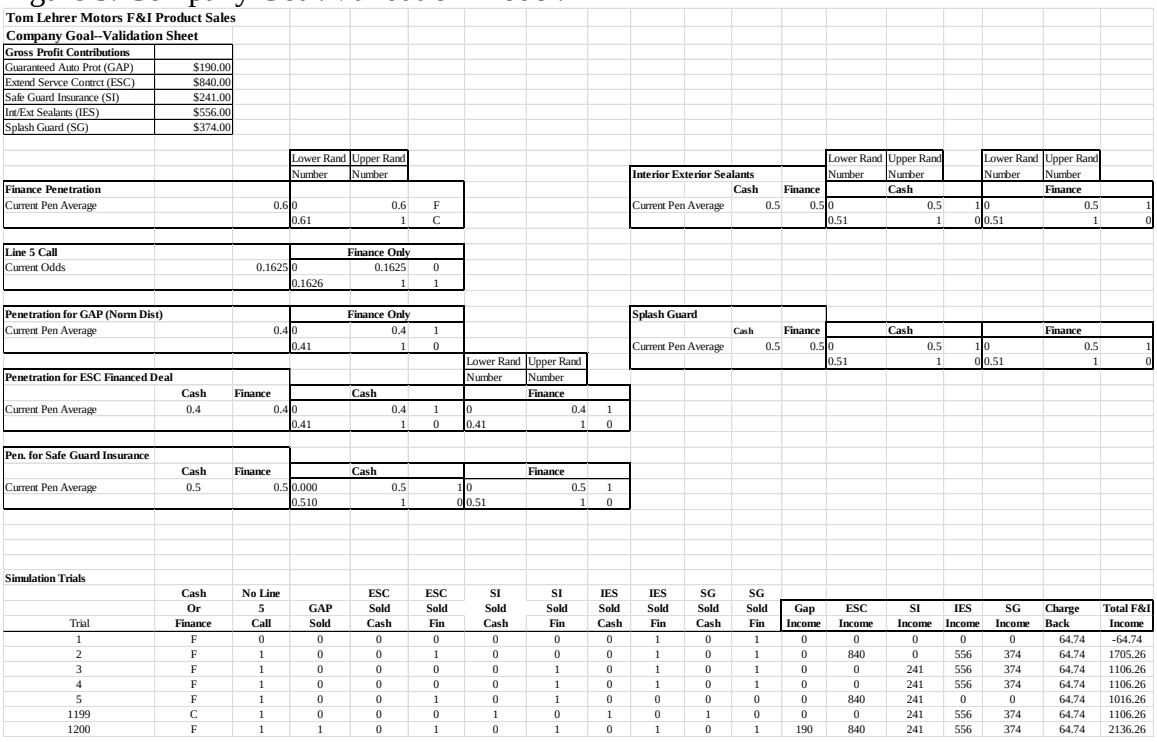
What should Tom Lehrer Motors expect as the average profit-per-vehicle retailed? Table 1 showed that the average profit-per-vehicle retailed calculated to be around $415 before chargebacks. After chargebacks this number dropped to an average of $350.

How often will the company lose money in the F&I department? The scenarios demonstrated that the F&I department lost money 43% of the time. This suggests that the chargeback amounts facing the company have a considerable effect with the penetration levels being lower than the goals set. Further analysis indicated that the company lost money only in instances where no F&I products were sold. Therefore, the model suggests that if the company were to sell 1 F&I product per car sold, the chargeback amount would be fully absorbed.

Table 1. Model Output Current Penetration Statistics.

	Total #	**Percentage**	**Goal**
Number of Cash Deals	423	35%	
Number of Finance Deals	777	65%	60%
	Total #	**Percentage**	**Goal**
# of Times a Line 5 Call Occurs	132	11%	
# of Gap Sold/Fin Deal	203	26%	40%
# of ESC Sold/Veh Retail	393	33%	40%
# of SI Sold/Veh Retail	171	14%	50%
# of IES Sold/Veh Retail	175	15%	50%
# of SG Sold/Veh Retail	29	2%	50%
Gap Income	$38,570	9%	
ESC Income	$330,120	79%	
SI Income	$34,463	8%	
IES Income	$82,844	20%	
SG Income	$9,350	2%	
Total F&I Inc. Before Chg Bck	$495,347		
Averag Per Unit (No Chg Bck)	$413		
Total F&I Gross	$417,659.00		
Avg Per Vehicle Sold	$348.05		
# of Times F&I Loses Money	519	43%	
Amount	-$33,600.06		

Figure 3. Company Goal/Validation Model.



Tom Lehrer Motors F&I Product Sales

Company Goal--Validation Sheet

Gross Profit Contributions	
Guaranteed Auto Prot (GAP)	$190.00
Extend Servce Contrct (ESC)	$840.00
Safe Guard Insurance (SI)	$241.00
Int/Ext Sealants (IES)	$556.00
Splash Guard (SG)	$374.00

Finance Penetration			Lower Rand Number	Upper Rand Number	
Current Pen Average		0.6	0	0.6	F
			0.61	1	C

Line 5 Call			Finance Only		
Current Odds		0.1625	0	0.1625	0
			0.1626	1	1

Penetration for GAP (Norm Dist)			Finance Only		
Current Pen Average		0.4	0	0.4	1
			0.41	1	0

Penetration for ESC Financed Deal	Cash	Finance	Cash			Lower Rand Number	Finance	Upper Rand Number
Current Pen Average	0.4	0.4	0	0.4	1	0	0.4	1
			0.41	1	0	0.41	1	0

Pen. for Safe Guard Insurance	Cash	Finance	Cash			Finance		
Current Pen Average	0.5	0.5	0.000	0.5	1	0	0.5	1
			0.510	1	0	0.51	1	0

Interior Exterior Sealants	Cash	Finance	Lower Rand Number	Cash	Upper Rand Number	Lower Rand Number	Finance	Upper Rand Number
Current Pen Average	0.5	0.5	0	0.5	1	0	0.5	1
			0.51	1	0	0.51	1	0

Splash Guard	Cash	Finance	Lower Rand Number	Cash	Upper Rand Number	Lower Rand Number	Finance	Upper Rand Number
Current Pen Average	0.5	0.5	0	0.5	1	0	0.5	1
			0.51	1	0	0.51	1	0

Simulation Trials

Trial	Cash Or Finance	No Line 5 Call	GAP Sold	ESC Sold Cash	ESC Sold Fin	SI Sold Cash	SI Sold Fin	IES Sold Cash	IES Sold Fin	SG Sold Cash	SG Sold Fin	Gap Income	ESC Income	SI Income	IES Income	SG Income	Charge Back	Total F&I Income
1	F	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	64.74	-64.74
2	F	1	0	0	1	0	0	0	1	0	1	0	840	0	556	374	64.74	1705.26
3	F	1	0	0	0	0	1	0	1	0	1	0	0	241	556	374	64.74	1106.26
4	F	1	0	0	0	0	1	0	1	0	1	0	0	241	556	374	64.74	1106.26
5	F	1	0	0	1	0	1	0	0	0	0	0	840	241	0	0	64.74	1016.26
1199	C	1	0	0	0	1	0	1	0	1	0	0	0	241	556	374	64.74	1106.26
1200	F	1	1	0	1	0	1	0	1	0	1	190	840	241	556	374	64.74	2136.26

Table 2. Model Output Company Goals.

	Total #	Percentage	Goal
Number of Cash Deals	469	39%	
Number of Finance Deals	731	61%	60%
	Total #	**Percentage**	**Goal**
# of Times a Line 5 Call Occurs	108	9%	
# of Gap Sold/Fin Deal	299	41%	40%
# of ESC Sold/Veh Retail	495	41%	40%
# of SI Sold/Veh Retail	610	51%	50%
# of IES Sold/Veh Retail	601	50%	50%
# of SG Sold/Veh Retail	617	51%	50%
Gap Income	$56,810	5%	
ESC Income	$415,800	40%	
SI Income	$133,273	13%	
IES Income	$304,132	29%	
SG Income	$211,684	20%	
Total F&I Inc. Before Chg Bck	$1,121,699		
Avg Per Unit (No Chg Bck)	$935		
Total F&I Gross	$1,044,011.00		
Avg Per Vehicle Sold	$870.01		
# of Times F&I Loses Money	113	9%	
Amount	-$7,315.62		

How do these averages compare to the goals of the company? The data showed that the penetration amounts were less than the goal in all categories, except for percentage of finance-car-deals. In that instance, the average was somewhat higher than the company's goal. However, profitability was remarkably increased in the Company Goal model. If the company had met their goals, they would have made over $1 million dollars before chargebacks.

How does this model compare to the year to date information of the company? The year to date information of the company showed the average per-vehicle-retailed at around $540 before chargebacks. The model developed calculated around $400 per copy without chargebacks being factored in. This difference could be related to several different causes. First, the chargebacks were averaged based on an estimated year to date amount. Second, there were assumptions about how often a Line 5 call actually occurred based on heuristics and not quantifiable data. Third, the current year to date information only accounts for January to September of this year. It would take until the end of the current year to determine how close this model is to forecasting profitability for the F&I department.

PRACTICAL APPLICATIONS

Initial Points for Application

Based on the variations of results from goals, the company wanted to examine three areas that could assist in growing their F&I department. The first area pertains to the chargeback amounts that the company was experiencing. Determining the root cause of these cancellations may help the company to retain more of its original gross profit. Areas to consider may be how well these products were sold to begin with, the number of cancellations due to trade-in of the vehicle, and cancellations designed to lower the outstanding principle balance of the customer. In each of these areas, the company may be able to determine what, if any, affect they can have on them.

The second area of consideration for the company is examining, more closely, the effects each F&I manager has on the overall results of the department. This study, other than asking for Line 5 calls, examined the aggregate value produced by the F&I department. A further study of each F&I manager might reveal areas for improvement in order to increase the overall effectiveness of the department.

Finally, the third area to look at is the actual number of times a Line 5 call occurs for the F&I department. Tom Lehrer Motors should track this data for a period of at least 1 year to determine the probability of a Line 5 call. Once this is determined, the model can be updated and new averages can be produced for decision and analysis purposes.

Model Applicability

In summary, this model closely resembled the profitability of the F&I department. The formulas within the model have been validated and show a contrasting picture of actual performance to expected performance. This model could now be used to simulate and forecast F&I profitability on an annual basis. It would be relatively simple to take each year's average statistics and reprogram the model. Further, this model could be used to track and compare each individual

F&I manager's performance to the goal. This could help both from a profitability standpoint and from a human resources standpoint. By using this model, F&I managers' could be shown how their pay plans would calculate if improvement was made in their individual penetration statistics.

At the conclusion of the study, the first author decided to follow up on several of the initial points for application. This would be in keeping with Grossman's (1999) assertion that simulation modeling encouraged experimentation and application to result into new insights. The starting point for this search was to first review the practical business implications of the study. In other words, what did this study really show Tom Lehrer Motors in terms of their current business-model? From this review the model was used several times to help in the decision making process with the F&I department.

Implications of the Study

The most important implication of the study was the demonstration of around $500,000 lost opportunity cost. At the time of the study, the company was headed into their 4th quarter of 2011. The company was on pace to have a net profit of around $1 million for all operations within the dealership. The study indicated, however, that the net profit for the end of the year could have been around $1.5 million had the F&I department achieved their penetration goals. This information was shared with the General Manager and the President of the company. This information was reviewed by comparing it to industry benchmarks and a comparison of 20 other Hyundai dealers in non-competing markets. The number indicated by this group showed that the dealership had $500,000 in lost opportunity cost, but categorized $400,000 of it from the F&I department. The other $100,000 was attributable to the service department.

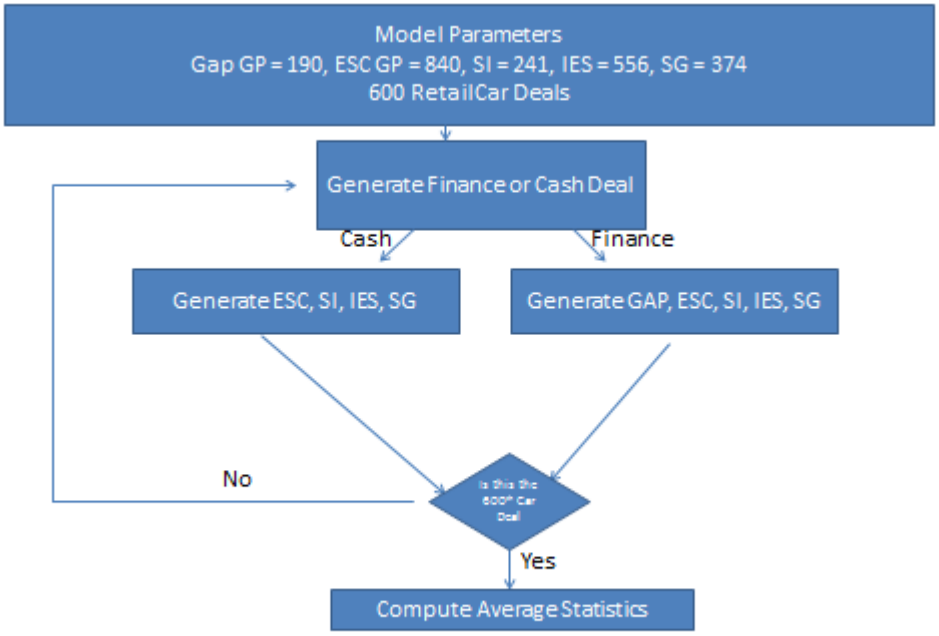
The difference between the two independent studies was considered immaterial, as both demonstrated a need to improve the financial results of the F&I department. The company decided to approach this task by analyzing the structure of the department, the products being sold, and the personnel involved. An initial planning session was conducted between the General Manager and the first author to assign tasks for the review.

Pay-plan Simulation

The first idea for applying the simulation model was to augment it to help simulate what F&I managers would make in compensation, if they achieved their penetration goals. The flow chart was revamped to illustrate the new approach for the model. As Figure 4 illustrates, the flow chart eliminated chargebacks and Line 5 calls. The reason for eliminating Line 5 calls was based, primarily, on the lack of historical information illustrated in the study. Using a heuristic was not considered appropriate for this form of analysis. It was accepted that Line 5 calls would happen, but that the specific methods for handling them would be addressed in F&I training. The use of charge-backs was eliminated because this study was now primarily concerned with the financial results of selling products at the required penetration goals. It was determined that including chargebacks only complicated the matter and was a topic to be addressed at a later date. Finally, the number of deals to be considered for the model was reduced to 600. This was done in an

attempt to tailor the model to 1 F&I manager. The original model considered all 1200 car deals, or the amount for 2 F&I managers.

Figure 4. Modified Flow Chart.



From the new flow chart, the basic structure of the original simulation model did not need to be changed in a drastic manner. In fact, the original model was kept but for a few additions and a re-organization of it. Figure 5 shows the modifications made to the simulation model.

As Figure 5 shows, the simulation trials format remained unchanged. What was modified was the input variables highlighted/shaded in yellow. This was done in attempt to make the model more user-friendly and also to make modifications of statistics easier to accomplish. Another addition can be seen on the right side of the model. The basic pay plan for an F&I manager was added. Columns and tables were kept for both chargebacks and Line 5 calls, but the values were all set to have no effect on the calculation. This was done in an attempt to follow the new flow chart, but also to keep those variables within the spreadsheet model for use when those topics could be addressed.

The model was run twice to show the current pay plan simulation and then again with the penetration statistics being met, with the following results:

	Annually	**Monthly**		**Annually**	**Monthly**
Current	$46,631	$3,886	**At Goal**	$101,257	$8,438

After reviewing the results, the penetration statistic for finance penetration was modified on the At-Goal model to the current penetration of 64%. This seemed to have very little effect with the pay plan calculation. The returned value still remained somewhere between $97,000 and

$102,000. This really was not a surprise, as the only difference between finance and cash deals would be from the sale of Gap. Gap can only be sold when financing a vehicle.

Figure 5. F&I Simulation Gross and Pay.

Tom Lehrer F&I Product Sales

F&I Manager Estimate Achieving Goals

Gross Profit Contributions		Cash Pen	Finance Pen
GAP	$190.00	NA	0.4
ESC	$840.00	0.4	0.4
Etch/Safe	$241.00	0.5	0.5
Sealants	$550.00	0.5	0.5
Splash Gard	$375.00	0.5	0.5
		NA	NA
Finance Deal Penetration	0.4	NA	NA
Line 5 Call	0	NA	NA
Number of Deals Annually	600		

Finance Penetration				
Current Pen Average	0.4	0	0.4	F
		0.41	1	C

Line 5 Call		Finance Only		
Current Odds	0	0	0	0
		0.01	1	1

Pen for Gap		Finance Only		
Current Pen Average	0.4	0	0.4	1
		0.41	1	0

Pen for ESC	Cash	Finance		Cash			Finance	
Current Pen Average	0.4	0.4	0	0.4	1	0	0.4	1
			0.41	1	0	0.41	1	0

Pen for SI	Cash	Finance		Cash			Finance	
Current Pen Average	0.5	0.5	0	0.5	1	0	0.5	1
			0.51	1	0	0.51	1	0

Interior Exterior Sealants	Cash	Finance		Cash			Finance	
Current Pen Average	0.5	0.5	0	0.5	1	0	0.5	1
			0.51	1	0	0.51	1	0

Splash Guard	Cash	Finance		Cash			Finance	
Current Pen Average	0.5	0.5	0	0.5	1	0	0.5	1
			0.51	1	0	0.51	1	0

Output	Total #	%	Goal	Pay Plan Annual Income	Pay Plan Monthly Income
# of Cash Dls	348	58%			
# of Fin Dls	252	42%	60%	17%	17%
	Total #	%	Goal		
Line 5 Calls	3	1%			
GAP/Fin Dls	106	42%	40%		
Esc/Veh Ret.	247	41%	40%		
SI/Veh Ret	300	50%	50%		
IES/Veh Ret	308	51%	50%		
SG/Veh Ret	329	55%	50%		
GAP Inc	$20,140	3%		$3,424	$285
ESC Inc	$207,480	35%		$35,272	$2,939
SI Inc	$71,818	12%		$12,209	$1,017
IES Inc	$168,850	29%		$28,705	$2,392
SG Inc	$122,250	21%		$20,783	$1,732
Ttl B4 ChgBk	$590,538			**$100,391.46**	**$ 8,365.96**
Avg	$984				

Simulation Trials

Trial	Cash Or Finance	No Line 5 Call	GAP Sold	ESC Sold Cash	ESC Sold Fin	SI Sold Cash	SI Sold Fin	IES Sold Cash	IES Sold Fin	SG Sold Cash	SG Sold Fin	Gap Income	ESC Income	SI Income	IES Income	SG Income	Charge Back	Total F&I Income
1	C	1	0	1	0	1	0	0	0	0	0	0	840	241	0	0	0	1081
2	C	1	0	1	0	1	0	0	0	0	0	0	840	241	0	0	0	1081
3	C	1	0	0	0	1	0	1	0	1	0	0	0	241	550	375	0	1166
4	C	1	0	0	0	1	0	1	0	1	0	0	0	241	550	375	0	1166
5	C	1	0	1	0	0	0	1	0	1	0	0	840	0	550	375	0	1765
6	C	1	0	0	0	1	0	1	0	1	0	0	0	241	550	375	0	1166
7	C	1	0	0	0	1	0	0	0	0	0	0	0	241	0	0	0	241
8	C	1	0	1	0	1	0	0	0	1	0	0	840	241	0	375	0	1456
9	C	1	0	1	0	1	0	0	0	1	0	0	840	241	0	375	0	1456
589	C	1	0	0	0	0	0	1	0	1	0	0	0	0	550	375	0	925
590	F	1	1	0	1	0	1	0	1	0	1	190	840	241	550	375	0	2196
591	C	1	0	0	0	0	0	1	0	0	0	0	0	0	550	0	0	550
592	F	1	0	0	1	0	1	0	0	0	1	0	840	241	0	375	0	1456
593	F	1	0	0	0	0	1	0	0	0	0	0	0	241	0	0	0	241
594	C	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
595	F	1	1	0	0	0	1	0	0	0	0	190	0	241	0	0	0	431
596	C	1	0	1	0	0	0	0	0	1	0	0	840	0	0	375	0	1215
597	C	1	0	0	0	0	0	1	0	1	0	0	0	0	550	375	0	925
598	C	1	0	0	0	1	0	1	0	0	0	0	0	241	550	0	0	791
599	C	1	0	0	0	0	0	0	0	1	0	0	0	0	0	375	0	375
600	C	1	0	0	0	0	0	1	0	0	0	0	0	0	550	0	0	550

The results of the newly formatted model indicated that each F&I manager with their current pay plan could reasonably expect to make close to $100,000 on an annual basis. The next step was to analyze the current F&I managers pay to determine if each of the three were closely making

what the model suggested the current penetration statistics indicated. The result of this analysis did not show this to be the case. On average, the F&I managers were making somewhere close to what the model demonstrated, around $46,000 under the current penetration statistics. However, this was an average number and was spread over 3 F&I managers and not the 2 that the model was engineered to review. It was also discovered that one F&I manager was making significantly more than the others. This data was incorporated into the discussions between the General Manager and the first author. Why was one F&I manager doing so much better than the other? Was this a training issue, a structure issue, a product issue, or some combination of these? These were the questions that needed answering in order to proceed with the change necessary in the F&I department.

Presentation to the 20 Group

At around the same time this analysis was being conducted, both the GM and the first author were scheduled to attend a meeting that included the dealers from the 20 Group previously mentioned. One of the requirements of the meeting was to bring a best-idea for improving F&I amongst these dealers. This model was used as the best-idea for Tom Lehrer Motors. The model was presented as a tool for managers to use in presenting both the desired penetration of product to F&I managers but also to demonstrate the financial gain an F&I manager would receive by meeting the set standards. Although well received, the model was not selected as the best idea of the meeting. However, feedback from some of the meeting participants was favorable and indicated an acknowledgement of the power of this tool. A copy of the model was sent to the group for their consideration and use.

OUTCOMES

There were several outcomes stemming from the application of this simulation model. As previously discussed, it was determined that two of the three F&I managers were the ones not meeting the standards. The third F&I manager was being paid somewhere near $90,000 (est.) annually. The GM and the first author interviewed each F&I manager to determine what could be leading to this stark difference amongst the three. These interviews led to several discoveries that would set the stage for changes to the F&I business model.

The results of the interviews suggested the following as being a part of the problem:

- Days off for the two underperforming managers were on the most helpful days of the week for getting bank approval, as well as being busy days for the dealership—Mondays, Tuesdays, and Wednesdays.
- The two underperforming managers felt that the most lucrative deals were being given to the third F&I manager and that is why her numbers looked so good.
- A lack of team-work from the third F&I manager.
- The third F&I manager would find ways to avoid a deal rotation or would arrange her time to take advantage of a pre-sold deal. A pre-sold deal is one where the salesperson secured a commitment from the customer to purchase F&I products prior to meeting with an F&I manager.
- The two underperforming F&I managers did not feel comfortable with the myriad of products and instead preferred to focus on one or two of them.

This feedback seemed consistent with the findings of the simulation model and the review of pay for the F&I department. The significance of Monday through Wednesday, in the auto industry, is shown through how lending institutions, or banks, typically work. A lending institution is closed Saturday and Sunday. Most lending institutions have an auto approval system accessed through a dealer specific web-site. One of the most common in the Eugene area is a system known as Credit Union Direct Lending (CUDL). The system takes the basic information of the car deal and either gives a tentative approval or rejection. If the customer appears to be financially solvent, and an auto approval is given, a dealership can deliver the car subject to final lender approval. Of those that are rejected, the dealership will need to call the lending institution the following week to determine if the customer could still be approved.

On Mondays, underwriters at lending institutions are typically working through the auto approvals from the weekend and are not as available to take phone calls. Therefore Tuesdays and Wednesdays are the typical days for dealerships to get answers from their lenders. By having the days off that were assigned, the two F&I managers would return and would have to deal with their older deals first, instead of accomplishing new business. The third F&I manager had been put on a Thursday and Friday day-off schedule. Therefore, she was in a prime position to call the banks early in the week and was able to maximize her opportunity the rest of the days worked.

The GM and the first author interviewed the sales managers to determine if they were favoring the third F&I manager with more lucrative deals. They admitted that in some cases, they either intentionally sent her deals with great potential, or gave her harder to sell deals but rewarded her with a lucrative deal to make up for it. Their collective justification was that her ability to sell over-rode the policy in place for deal rotation. Plus, they confirmed that she would also find ways to avoid the deal rotation.

It appeared to both the GM and the first author that the systemic problem in the F&I department might be classified as a human resource problem. The company decided to take a multi-step approach to correcting the issue. These changes would have far reaching effects on both the structure of the F&I department and the requirements of the F&I managers.

Change of Schedule

The first change implemented was to eliminate the 2-day off model that each F&I manager currently had. Each F&I manager would only have 1 day off each week. In addition, no two F&I managers would be gone at any one time. Also, each F&I manager was required to turn their unfinished deals over to the F&I manager on duty prior to their day off. This was instituted to insure that all deals would be processed more quickly and thereby free up time for selling.

Change of Product Margins and Training

Tom Lehrer Motors contacted Payment Plans Inc. (PPI), the fictional name of the company who's F&I products the dealership sold. They requested that they provide an analysis of changes that could be made to the existing product margins and also requested on-going training from

them for their F&I department. PPI reviewed the current products, set up a training schedule, and sent a primary trainer to the dealership to interview each of the current F&I managers. The interview process was designed to ascertain the strengths and weaknesses of the current staff. Tom Lehrer Motors thought it would be helpful to get a fresh perspective.

In terms of products and product margins, PPI first suggested stream lining the F&I product offering to four products: ESCs, GAP, Sealants, and Etch. This would eliminate Splash Guard. They also suggested setting the margin on ESCs to $1000 and to lower the goals for the non-cancellable products of Sealants and Etch to around 25% penetration. Additionally, they used 40% finance penetration in their calculations. They felt that this would result in the dealership improving their F&I performance as well as giving F&I managers a reasonable ability to achieve $100,000 in pay. Again the simulation model was used with these modifications. Figure 6 shows the modifications made to the input variables. The results can be seen in Table 3.

The results of the modifications demonstrated that the gross generated by 600 car deals would be approximately $380,000. Therefore all 1200 estimated car deals would be approximately $760,000 before chargebacks. However, the estimated pay for each manager was significantly less than $100,000: Pay Plan Annual Income 17% - $64,903.31, and Pay Plan Monthly Income 17% - $5410.86. Therefore, PPI's suggestion was rejected in terms of eliminating products and lowering, too drastically, the required penetration statistics for the non-cancellable products.

PPI's next suggestion was to add another F&I product and modified the penetration goals for the non-cancellable items. Figure 7 shows the entire modification made to the simulation model that incorporated these changes. The final model created for this project now incorporated all of the changes necessary to help not only the company succeed but also an individual F&I manager succeed.

A new product, Tire and Wheel Insurance, was added with an associated GP of $375. Penetration statistics were set back in an attempt to make the goals appear more achievable to an individual F&I manager. This stemmed from the discussion with the current F&I managers where they had indicated that they were most comfortable with 1 or 2 products and ignored the rest. PPI felt that the new penetration statistics were more realistic based on where Tom Lehrer Motors was in terms of staff and training. These penetration statistics could be modified at a later date as sustained performance increased in the F&I department. The pay plan, however, only resulted in annual income for an F&I manager of around $88,000 to $94,000 annually. One additional modification was made with PPI. The sales price and cost of sealants would be increased $20. This would result in the same margin, but would allow PPI to send a $20 check for each sealant package sold by an F&I manager. This could result in an addition $4,000 to $5,000 in 1099 income for the F&I manager—215 IS products times $20. This process is known as *packing* a product. This would set the potential income for the manager to around $100,000 on an annual basis.

Figure 6. PPI Initial Changes to Input.

Tom Lehrer F&I Product Sales				
F&I Manager Estimate Achieving Goals				
Gross Profit Contributions			**Cash Pen**	**Finance Pen**
GAP	$190.00		NA	0.4
ESC	$1,000.00		0.4	0.4
Etch/Safe	$241.00		0.25	0.25
Sealants	$550.00		0.25	0.25
Splash Gard	$0.00		0	0
			NA	NA
Finance Deal Penetration	0.4		NA	NA
Line 5 Call	0		NA	NA
Number of Deals Annually	600			

Table 3. Estimated Gross Output with Input Changes.

Output			
	Total #	**%**	**Goal**
# of Cash Dls	207	35%	
# of Fin Dls	393	66%	64%
	Total #	**%**	**Goal**
Line 5 Calls	0	0%	
GAP/Fin Dls	163	41%	40%
Esc/Veh Ret.	263	44%	40%
SI/Veh Ret	141	24%	25%
IES/Veh Ret	151	25%	25%
SG/Veh Ret	0	0%	0%
GAP Inc	$30,970	8%	
ESC Inc	$263,000	64%	
SI Inc	$33,981	8%	
IES Inc	$83,050	20%	
SG Inc	$0	0%	
Ttl B4 ChgBk	$411,001		
Avg	$685		

Figure 7. Final Model.

Tom Lehrer F&I Product Sales

F&I Manager Estimate Achieving Goals

Gross Profit Contributions		Cash Pen	Finance Pen
GAP	$190.00	NA	0.4
ESC	$1,000.00	0.4	0.4
Etch/Safe	$241.00	0.35	0.35
Sealants	$550.00	0.35	0.35
Splash Gard	$375.00	0.35	0.35
Tire and Wheel Insurance	$250	0.35	0.35
Finance Deal Penetration	0.64	NA	NA
Line 5 Call	0	NA	NA
Number of Deals Annually	600		

Finance Penetration				
Current Pen Average	0.64	0	0.64	F
		0.65	1	C

Line 5 Call		Finance Only		
Current Odds	0	0	0	0
		0	0	1

Pen for Gap		Finance Only		
Current Pen Average	0.4	0	0.4	1
		0.41	1	0

Pen for ESC	Cash	Finance	Cash			Finance		
Current Pen Average	0.4	0.4	0	0.4	1	0	0.4	1
			0.41	1	0	0.41	1	0

Pen for SI	Cash	Finance	Cash			Finance		
Current Pen Average	0.35	0.35	0	0.35	1	0	0.35	1
			0.36	1	0	0.36	1	0

Interior Exterior Sealants	Cash	Finance	Cash			Finance		
Current Pen Average	0.35	0.35	0	0.35	1	0	0.35	1
			0.36	1	0	0.36	1	0

Splash Guard	Cash	Finance	Cash			Finance		
Current Pen Average	0.35	0.35	0	0.35	1	0	0.35	1
			0.36	1	0	0.36	1	0

Tire and Wheel Insurance	Cash	Finance	Cash			Finance		
Current Pen Average	0.35	0.35	0	0.35	1	0	0.35	1
			0.36	1	0	0.36	1	0

Output	Total #	%	Goal	Pay Plan Annual Income	Pay Plan Monthly Income
# of Cash Dls	199	33%			
# of Fin Dls	401	67%	64%	17%	17%
	Total #	%	Goal		
Line 5 Calls	0	0%			
GAP/Fin Dls	184	46%	40%		
Esc/Veh Ret.	256	43%	40%		
SI/Veh Ret	206	34%	35%		
IES/Veh Ret	201	34%	35%		
SG/Veh Ret	225	38%	35%		
T&W/Veh Ret	232	39%	35%		
GAP Inc	$34,960	7%		$5,943	$495
ESC Inc	$256,000	48%		$43,520	$3,627
SI Inc	$49,646	9%		$8,440	$703
IES Inc	$110,550	21%		$18,794	$1,566
SG Inc	$84,375	16%		$14,344	$1,195
T&W Inc	$54,250	10%		$9,223	$1,568
Ttl B4 ChgBk	$535,531			**$ 91,040.27**	**$ 7,586.69**
Avg	$893				

Simulation Trials

Trial	Cash Or Finance	No Line 5 Call	GAP Sold	ESC Sold Cash	ESC Sold Fin	SI Sold Cash	SI Sold Fin	IES Sold Cash	IES Sold Fin	SG Sold Cash	SG Sold Fin	T&W Sold Cash	T&W Sold Fin	Gap Income	ESC Income	SI Income	IES Income	SG Income	T&W Income	Charge Back	Total F&I Income
1	F	1	0	0	1	0	1	0	0	0	1	0	0	0	1000	241	0	375	$0.00		1616
2	F	1	0	0	0	0	1	0	0	0	0	0	0	0	0	241	0	0	$0.00		241
3	C	1	0	0	0	1	0	0	0	1	0	0	0	0	0	241	0	375	$0.00		616
4	F	1	0	0	1	0	0	0	0	0	0	0	0	0	1000	0	0	0	$0.00		1000
5	C	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	$0.00		0
6	C	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	$0.00		0
7	F	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	$0.00		0
8	C	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	550	0	$0.00		550
9	C	1	0	1	0	1	0	0	0	0	0	0	0	0	1000	241	0	0	$0.00		1241
589	F	1	1	0	0	0	1	0	1	0	1	0	1	190	0	241	550	375	$250.00		1356
590	C	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	$0.00		0
591	C	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	375	$0.00		375
592	F	1	0	0	1	0	0	0	0	0	0	0	0	0	1000	0	0	0	$0.00		1000
593	C	1	0	1	0	0	0	0	0	1	0	1	0	0	1000	0	0	375	$250.00		1375
594	C	1	0	0	0	0	0	1	0	0	0	1	0	0	0	0	550	0	$250.00		550
595	F	1	0	0	1	0	1	0	1	0	1	0	1	0	1000	241	550	375	$250.00		2166
596	C	1	0	0	0	0	0	1	0	1	0	0	0	0	0	0	550	375	$0.00		925
597	F	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	375	$0.00		375
598	C	1	0	0	0	1	0	1	0	0	0	0	0	0	0	241	550	0	$0.00		791
599	F	1	1	0	0	0	0	0	1	0	0	0	0	190	0	0	550	0	$0.00		740
600	F	1	1	0	1	0	0	0	1	0	1	0	0	190	1000	0	550	375	$0.00		2115

Turn Over of Staff

It was not surprising to either the first author or the General Manager that the entire F&I staff turned over during the course of these changes. One of the underperforming F&I managers quit, two weeks after the change of scheduled days off. The successful F&I manager left at the end of November siting a desire to retire. The other underperforming F&I manager lasted until the end of 2011 and was dismissed due to a lack of any increase in performance. Along the way,

however, two new F&I managers were hired. The company has decided to remain with a two person F&I department with a third person in training. This third person is for the express purpose of allowing for a more generous day-off schedule and also to have a back-up in case of employee turnover. As of the writing of this paper, the ending averaging per vehicle retailed for January 2012 was $750 and $950 respectively with accomplishment towards achieving each of the penetration goals required by the company.

SUMMARY

This project began with the idea of trying to adapt a quantitative method to improving business operations. The research showed several key themes in the quantitative methods community that seemed to be supported by this study. This study used an application method versus a mathematical approach to the use of a quantitative method. The original model provided clarity, ease of comparability, logical power, and transparency. The model was clear in how it worked, offered the user an ability to compare goals to actual, followed a logical progression in steps, and worked by using simple spreadsheet modeling. This project also utilized the collaborative effort of the first author, who worked at the dealership, and his professor, which came in the form of his knowledge and experience being utilized as the authors worked through creating the model.

Overall, this paper demonstrates the applicability of a quantitative method in detecting and helping to solve practical business problems. By creating the original simulation model, it became evident that there was a problem with profitability. Even though the company was going to make a significant net profit, it was striking how much profit was left on the table. Through the process of making decisions, the same simulation model was modified to help the decision makers in their planning and execution of change.

REFERENCES

Albritton, M. David, and McMullen, Patrick R. (2006). Teaching Brief Classroom Integration of Statistics and Management Science Via Forecasting. *Decision Sciences Journal of Innovative Education,* 4(2), 331—336

Anderson, David R., Sweeney, Dennis J., Williams, Thomas A., Camm, Jeffrey D., Martin, Kipp (2011). *An Introduction to Management Science Quantitative Approaches to Decision Making*. 13th edition, Mason, OH: South-Western Cengage Learning.

Grossman Jr., Thomas A. (1999). *Teachers' Forum: Spreadsheet Modeling and Simulation Improves Understanding of Queues.* Institute for Operations Research and the Management Sciences, 88-103.

Harrison, J. Richard, Lin, Zhiang, Carrol, Glenn R., Carley, and Kathleen M. (2007), Simulation Modeling in Organizational and Management Research, *Academy of Management Review*, 32(4), 1229—1245.

Joaquin, Domingo Castelo (2007). Loss Modeling Using Spreadsheet-Based Simulation. *Risk Management and Insurance Review,* 10(2), 283—287.