

To Restore, Modify or Somewhere In Between, A Classic Muscle Car Project

by

Troy D. Stempfley

A Term Paper
Submitted to ERAU Worldwide
in Partial Fulfillment of the Requirements of the Degree of
PGMT 524

Embry-Riddle Aeronautical University
Worldwide
Online Campus
May 2014

Abstract

Researcher: Authors Full Name

Title: To Restore, Modify or Somewhere In Between, A Classic Muscle Car Journey

Institution: Embry-Riddle Aeronautical University

Degree: Master of Science in

Year: 2013

“During the Great Depression, with nearly a quarter of all Americans unemployed, new cars are too expensive for many people; so, young car enthusiasts start to refurbish old cars rescued from junk yards, often swapping out engines, transmissions and other components. This leads to self-styled car customizers enhancing their cars with more powerful V-8 engines and other improvements.”(Ury, 2014) Restoring, customizing a car or somewhere in between can be an expensive operation. The final value of these cars is subjectively particular to those who own or purchase them. The intrinsic value is based on the fad, current fashions and trends which can create a quantitative decision making nightmare for those who involved in a project. This paper will demonstrate a quantitative value added approach to the restoration and modification of a 1967 Chevelle Super Sport. A value determined by the subjective desires of the mechanic will be included, with regards to comfort, durability and maintaining the intended nostalgia of the car, without reducing the overall market value.

Chapter I

The summer of 1980 a 15 year old boy, due to the misfortunes of another, became the owner of a 1967 Chevrolet Chevelle Super Sport (SS). The car was in poor shape and required a great deal of work to be road worthy. It was defiantly what some would call a “fixer upper.” There were several parts missing; the engine was blown and the paint and body was in very poor condition. But what would you expect for the purchase price of \$500.

Taking a Job at a local auto parts store he began to make repairs and before the beginning of his senior year in high school he completed a restoration of sorts with some performance touches. The engine which came with the car had already been modified but the new added updates made the car quite the contender at races and the home town cruise scene. The body work was not perfect but it had color and the rims were chromed. The engine compartment was immaculate and the 402 cubic inch big block chevy (BBC) was the envy of many in the car club he belonged to.

As time passed the car gained a reputation as a marker to beat at the local drag strip. Of course these back road events weren't sanction but, the reputation earned was held in high regard. As the glory days of High School faded into the sunset like teen football heroes, track stars and teenage crushes it became time to press on to more important pursuits. The teen sold his car to his father who had always dreamed of owning it and completing the restoration process began by the youth.

The father, with 2 children and military retirement had commitments at home which took priority. He placed as much priority time and money wise as possible on restoring the car. The restoration process was started but progress was extremely slow. After 15 years the car was still in pieces. Then a heart attack turned off the money supply. Any serious hard work was put on

hold. Through an additional ten year process the car was somewhat completed with only minor improvements over what the son had done early. It was still far from a quality restoration. Not able to do more the car was gifted back to the son who had a good job and his family was grown and moving on.

The car has an attractive body style with potential for good performance in today's standard and the decision was made to perform what has become known as a "restomod." He would blend the style and look of the old school 1967 car with modern upgrades to suspension, engine transmission and paint.

The Chevelle had a reputation as a street brawler. Its heavy steal body and big cubic inch engine were respected in the past but, the turbo charged 4 cylinders cars that dominate the 21st century cruise-in have high horsepower engines and lighter body which have become a force to be reckoned with. The performance desires for this project is not to be the fastest car on the road. The goal is more realistic: to maintain the Chevelle performance image and update the ride and safety features making the car more comfortable and desirable.

List of Definitions

Restoration: essentially refers to taking a great classic car and bringing it back to life with all (or most) of the original factory parts. The process involves repair of the visible parts (e.g., body trim, interior, etc.), as well as the parts not easily seen (e.g., electrical, suspension, brakes, etc.). The result is a beautifully preserved automobile in factory-new condition with authentic parts – just like it came off the showroom floor decades ago

Restomod: (restoration + modern parts/technology) draws from all the amazing advancements in automobile technology over the past 40 plus years to enhance the performance, comfort and safety of the classic car. A restomod car has the timeless

appearance of the original, but the outdated guts of the car have been replaced with the more modern, high-performance parts of today. You achieve the same great look, but your vintage car will be revved up with all the latest bells and whistles to create a much better ride for the owner. (Restomod vs Restoration)

List of Acronyms

BBC- Big Block Chevy engine.

SS -Super Sport

Chapter II

Description of the Problem

In 1967 there were 63,000 Chevelle SSs produced. The SS had a unique hood, chrome trim other features including the engine and transmission combinations that were prized among car enthusiasts. Through the years many have copied the SS trim and style but there are few true SSs remaining. The value of an original SS is high as long as the car has matching numbers, meaning that all the parts numbers from the engine transmission and all other components are from the correct year, body style and manufacturer. Finding these components is costly and sometimes impossible considering the car is nearly 50 years old.

There are a number of aftermarket companies that make copies of the original components. When these are installed the car may look like the original but to the purest you might as well have created one of the copies. The value is not as high. However, there are many people who feel that serial numbers aren't everything that make a car and are just as happy to have the older style. These people tend to feel that while you're into a rebuild project maybe some upgrades to make the car more fun to drive would be appropriate.

Cars of the 1960's were just coming of age and their handling, braking, ride characteristics and creature comforts were lacking. As an example, in 1967 the desire for horse power outweighed the drivability of this particular car; although it sported a large engine and front disc brakes it had manual steering which requires a good deal of effort to turn at low speeds. There was no air conditioner to rob the engine of power. Modern engine, air conditioning, power steering and computer controlled engine management systems have reduced these concerns considerably. You can install these creature comforts and the computer can turn them on or off as needed for performance demands based on the throttle position and other factors.

Car restoration and modification shops provide an endless supply of parts to upgrade a car and make it as personal as you like. The range of improvements covers from suspension handling to engine performance to creature comforts and the whole range of stylization upgrades. A decision needs to be made of how far a person is willing to go and how much money they want to spend.

For this project the mechanic is sort of a purest in look but, wants to get the maximum enjoyment from driving the car. Installing power steering and air conditioning are a must as required by Chief Financial Officer, his wife. He also wants to make sure if some performance enhanced Subaru Evo with an overdriven turbo charger pulls up next to him at the stop light, he can hold his own on an acceleration test. All of this without drastically affecting the over market value of the car

Summary

To meet these goals we will compare the market value for restoration vs restomod Chevilles. Identify the cost of both types of restoration. And lastly, Quantify the personal likes and dislikes of the owner and make suggestions of possible improvement that may add to the overall appeal and sale-ability of the car even though it's not for sale.

The area to be evaluated will be engine and drive train, suspension system, creature comfort improvements and style verses functionality. Two utility factors will be considered. Look and style will garner higher utility with more original appearance .65 for original .35 for custom. Performance and comfort will be rated .65 for modernized .35 for more original.

Chapter III

Methodology

To develop a method to evaluate the project, data needed to be acquired and evaluated. Like any research project the information can come from a number of sources, the internet is a vast treasure trove of information. There are articles, studies, forums to evaluate trends and blogs which can be a great source of polling information. Since value is relative buyer and selling markets, this information can be used to explain that value if quantified based on known market selling prices.

Magazine articles, technical manuals, performance reports and customer feedback on products document critical information and help to decide what modifications will achieve the desired outcome. There are several of these types' publications most of which can be found online.

In this paper, outside of the textbook for formulations, the internet is used exclusively because the most up to date information on the subjects discussed is available there. Written publications on a 50 year old car tend to be outdated, with the exception of many magazines that can be acquire online.

To evaluate the public perceptions and validate intrinsic values Blogs, web posts and discussion forums were used as polling data. This information can be more accurate than a formally conducted pole because, when a topic of discussion is open to the public, as in these medias, people who post things typically have a passion for the subject and will therefore do their best to provide serious input verses, those randomly contacted for polling information, who may at time give a "whatever" type of answer just to complete the poll.

Sources of Data

Data was obtained from a Canadian study on longevity of vehicles. This data showed the percentage of vehicles still on in use in five, five year periods. It gave an initial point to quantify. With that percentage an estimate of how many 67 Chevelle SSs are available today was developed.

The number of vehicles registered in the United States was obtained from the internet United States - vehicle registrations 2012 Statistic. This data will be compared against the estimated numbers of Chevelles available to establish rarity. To help provide a value

The personal desire aspect of the car will be difficult to demonstrate. To show this data from sales of current performance vehicles and prices will be used to show how much the population pay for a modern performance vehicle this with the rarity or uniqueness value will help establish overall desirability.

Lastly, data from vehicle sales sites will establish price. A poll from forum for car enthusiast of all kinds will be developed to determine which types of modification should be done without detracting from the overall value of the car. And a value chart will be developed based on the mechanics personal desires to help orchestrate the findings of the previous analysis.

Procedures

There is no data showing how many cars are still on the road after 50 years so several weighted forecast models placing priority on the oldest model data were used to develop a forecast back to 50 years. This will have to be seen as an estimate. No one has evaluate how many of cars this old have been resurrected from the junk yard nor is data tracked on how many of what level of restoration is accomplished on a given car. These cars may have been restored

to original state or may have been converted to all out racing vehicles which wouldn't fit into our scenario.

A decision tree will be established to show the utility of the two types modifications. This will help to quantify the decision making process and give a guide into what maybe the best course of action to take. Using the personal likes and experience of the mechanic a subjective utility probability will be developed.

All of these analyses will be available to provide the most logical economic decision which provides the greatest utility. And, provide the mechanic with confidence that the project can be accomplished without devaluing the vehicle.

Chapter IV

Data Collection

In 2010 Dennis DesRosiers of DesRosier Automotive Consultants Inc. completed a study of the percentages of vehicles on the road after 25 years the following chart is data taken from that survey to indicate the longevity of Chevrolet products. (2010)

Figure 1

Years old	25-21	20-16	15-11	10-6	5-1	Total
Chevrolet	5.5%	13.6%	56.3%	92.4%	98.1%	47.5%

Data retrieved from DeRosier Autotive Consultants, published in DesRosier Automotive Reports Volume 24 Issue 23, dated December 15, 2010 table titled *Passenger Cars-Percent of Vehicles Still Remaining on the Road Today Full-Line Brands*.

Because this information only gave a 25 year record, five separate weighted forecasts were accomplished using the oldest data as the greatest value to achieve the additional data in

Figure 2.

Figure 2.

Years old	50-46	45-41	40-36	35-31	30-26	25-21
Chevrolet	7.63%	7.75%	7.3%	8.2%	8.2%	5.5%

Data developed in QM Excel, Forecasting, Weighted Moving Averages, The function was completed 5 separate time placing maximum values on the oldest time period to obtain a viable result.

Initially the evaluator was surprised at the rise in percentages in the forecasts models but considering the initial percentage drop for the first 15 years for numbers of cars on the road and the fact many of these vehicles have been repaired and placed back in operations the viability of the data seemed logical. There were 63,006 Chevelle SSs in the two door hardtop and convertible produced in 1967. Not more than 29,937 of these were convertibles which leaves

33,069 two door hardtops. (Facts) With a surviving percentage of 7.63 this means there are approximately 2523 original SS two door hardtops being driven. There were nearly 3 times as many of the same body style car produced in a non SS form. Many of these have been converted to the SS style using aftermarket parts these have become known as clones. With more than 253,000,000 cars registered in the US in 2012 a real 1967 chevelle SS makes up only .0001% of the cars on the registered in the United States. (United States)

The value of these cars varies with condition and personal taste. A quality clone, in a general market, sales for nearly the same price as an original SS. There are a few purists with relatively unlimited resources who place a much greater price on what is known as a numbers matching car.

A numbers matching car has been restored to its original state with all original year specific parts to include correct bolts, spare tires, rims, types of tires and manufacture stickers. In 2013 a matching numbers 67 Chevelle SS sold at Barrett-Jackson Auction in Scottsdale AZ for \$66,000. A similar car in this prestigious auction with modification drew in \$61,000.

(Barrett-Jackson) In the general market the same type of car is selling from \$29,000 - \$55,000 depending on the local economy, clones or modified cars are selling for similar prices.

(Classifieds)

Since the goal is not selling the car as a monetary investment but, maintaining general market value and increasing the personal satisfaction of the mechanic. Decisions will be place a greater value utility as discussed earlier. The beginning value of the car, as it stands, is estimated at \$19000.

Chapter V

Data Analysis

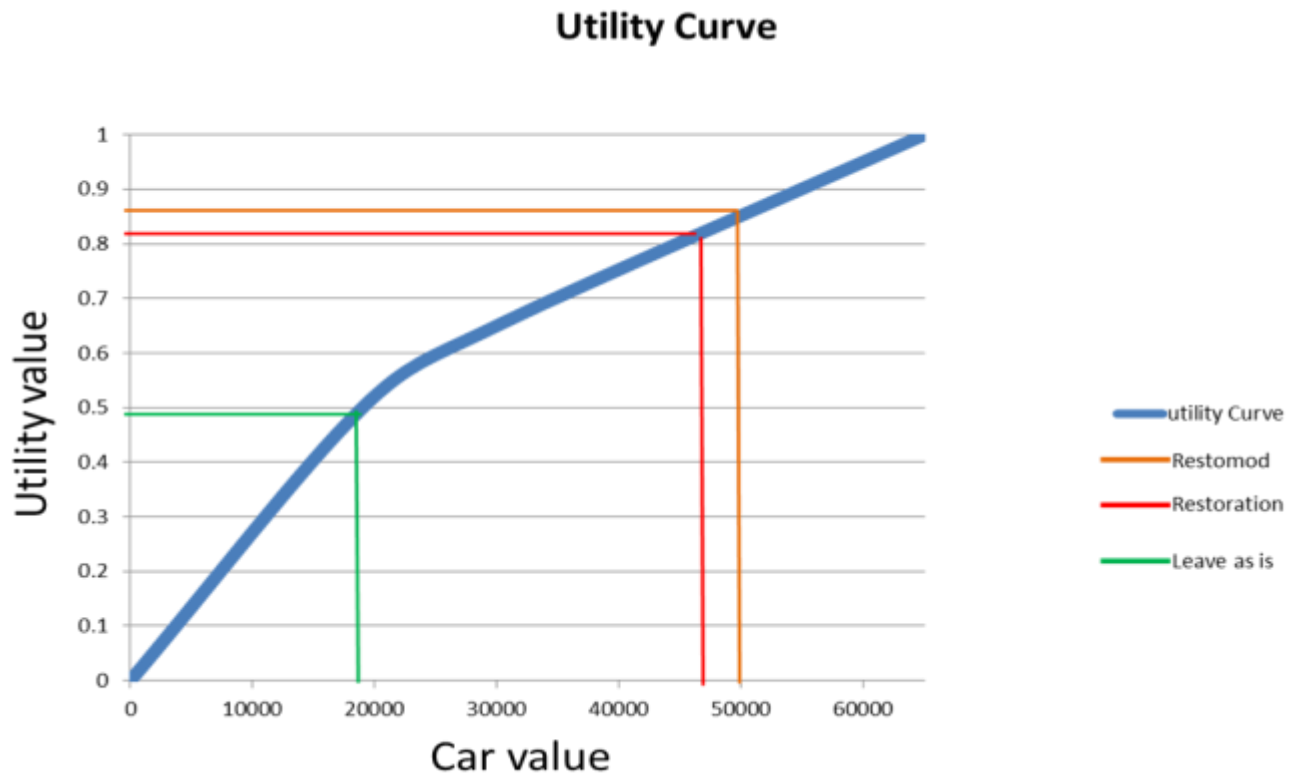
In analyzing the data we first need to establish the costs to be analyzed. Then create a decision tree to evaluate the utility and overall value of the project in three scenarios: the restomod, original restoration and leaving the car as it is and doing nothing. The cost will be compared to the market values to help decide which way to proceed.

After months of research and parts to price evaluations the mechanic estimates the cost of performing the restomod as: \$13000 for engine and drive train, \$4000 for suspension, \$8000 for body work and paint and \$6000 for creature comfort upgrades. This comes to a total estimated cost of \$31,000 which is \$1000 dollars over the budget set aside for the project. Fortunately, there is credit available to perform the project but should the mechanic choose to use it?

The cost of performing the restoration would be slightly less. Many of the original parts are difficult to find which will add to the cost may surprise the simple mechanic. Unlike simply finding used parts in a junk yard these parts need to be numbers matching. Because the perceived value of a numbers matching car these part usually come at a higher premium than ordinary used parts. The Cost estimates are: \$11000 for the engine and transmission, \$1,000 for suspension, \$8,000 for Paint and body work, and \$8,000 for creature comfort upgrades.

Since utility of the project is the driving factor a utility curve was developed. Using the \$66,000 figure as the maximum value of 1 and \$19,000 current value of the car as the 50% point the following graph was drawn.

Figure3



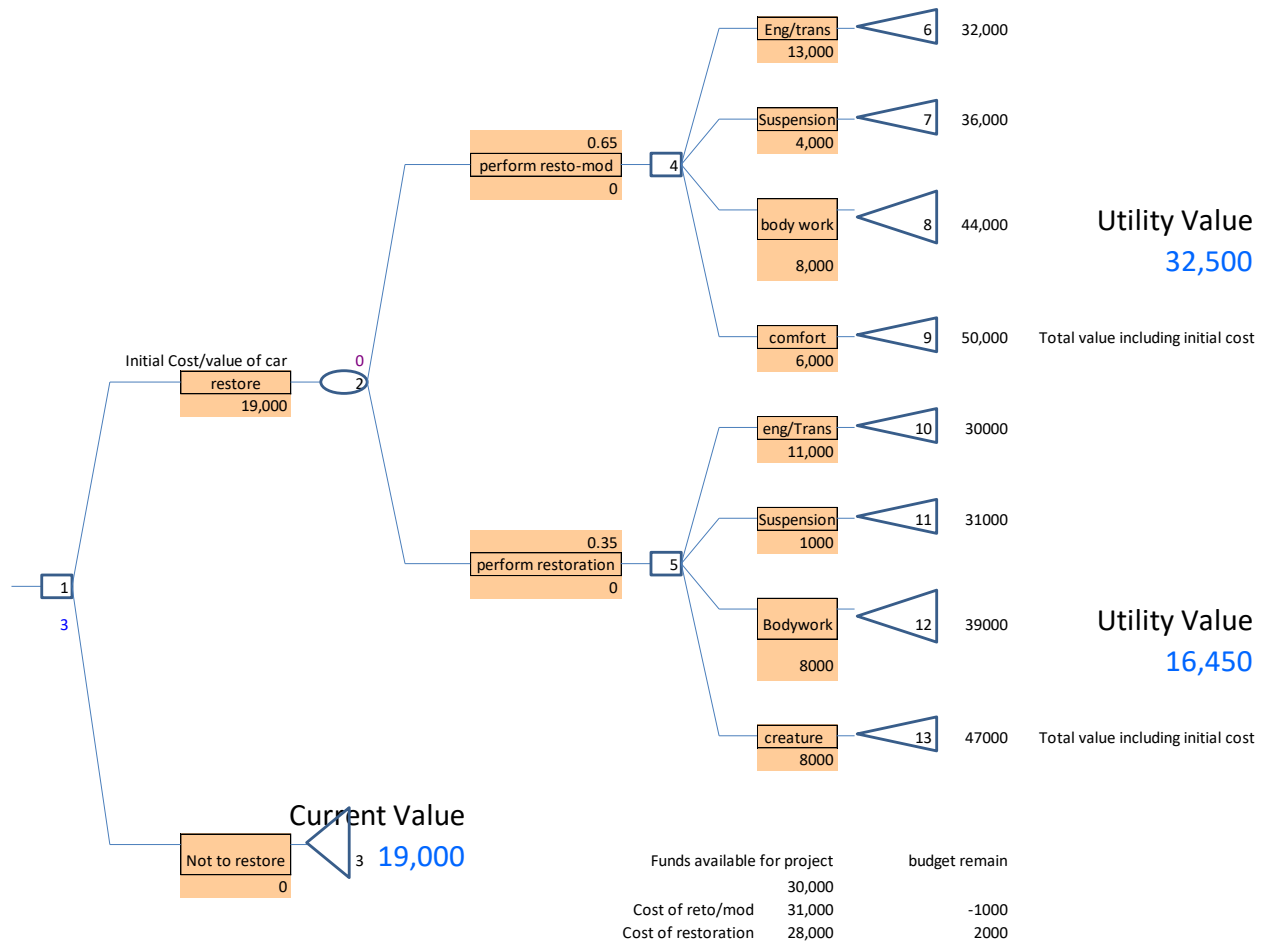
Utility Value Curve, written by researcher, demonstrates the utility of the market value of the restoration project. Data was obtained by input from the mechanic, market values from Barrett-Jackson Auctions and Classifieds for 67 Chevelle SS.

The cost of the restomod was estimated at \$31,000 + \$19,000 the original value of the car the mechanic would have an approximately \$50,000 invested. By the graph there would be a utility of 86%. To perform the restoration will cost \$29,000 + \$19,000 giving a slightly less utility value of 81%. However, when creating a decision tree to evaluate the estimated utility, there is much greater difference between the two choices.

The decision tree was drawn using two decision points. The first decision point was to take action or not the second choice was to perform the restomod or restorations. The utility factors of .65 for restomod and .35 for restoration were calculated in. This gave us an estimated

utility value of the project from the mechanics perspective which was not related to the market value of the car.

Figure 4.



Data obtained by the mechanic's estimates of cost and calculated using QM Excel, Decision Tree software. The last line of values is accumulative not additive to give the overall value of the project in the Total Value Including Initial Cost line.

Calculating the utility we considered all the system cost, initial car value and multiplied it by the utility probability value: Thus $\$19,000 + \$31,000 = \$50,000 \times .65 = 32,500$ for performing the restomod, $\$19,000 + \$29,000 = \$47,000 \times .35 = 16,450$ for performing the restoration (Figure 4). Although the decision to do nothing would reflect a zero utility value there is the initial value of the vehicle to consider. With a zero utility and zero risk leaving the statuesque would be more valuable to the mechanic than risking \$29,000 and not receiving the

desired utility. The expected utility by the mechanic demonstrated in the utility chart shows that the restomod is nearly double the utility of the restoration. Indeed leaving the car as is without risking the additional money is of greater value to him than performing the restoration.

Chapter VI

Recommendations

Since the mechanic is to perform the restoration is not a purist and prefers comfort over nostalgia, performing the restomod is the preferred course of action. It will yield much greater utility and the overall value of the car is within the expectable range of the utility curve. The \$1000 over budget cost would be a small price to pay when you compare the \$16050 difference in utility value from the restoration to the restomod. The mechanic should find the means to spend the extra money.

This project was developed in part to demonstrate that you can quantify any problem that has a value and make a more informed decision. Much of the outcome was already known and in process was already started by the mechanic. Quantification was done by hours of research and stumbling through the decision process. The time it took to gather and evaluate the data in this paper made the process much faster and gave a logical reason for the results. This was easier to sell to the CFO (wife) on the modifications than just the mechanics gut feeling.

References

- Barrett-Jackson Auction Company the worlds greatest collector car auction. (n.d.). . Retrieved May 28, 2014, from <http://www.barrett-jackson.com/application/onlineSubmission/archiveCarlist.aspx?year=1967&make=CHEVROLET&model=CHEVELLE%20SS%20396>
- Classifieds for 1967 Chevrolet Chevelle SS. (n.d.). 19 Available. Retrieved May 28, 2014, from <http://classiccars.com/listings/find/1967/chevrolet/chevelle-ss>
- Derosier, D. (2010, December 15). Twenty-Five Years of Vehicle Longevity. . Retrieved , from <http://www.fleetbusiness.com/pdf/DD7.pdf>
- Facts_and_figures. (n.d.). facts_and_figures. Retrieved May 28, 2014, from http://67chevelle.org/facts_and_figures.htm
- Render, B., & Stair, R. M. (2012). Quantitative analysis for management (11th ed.). Upper Saddle River, N.J.: Pearson Prentice Hall.
- Restomod vs Restore. (nd). *The RestoMod Store*. Retrieved , from <http://restomodstore.com/restomod-vs-restore/>
- Ury, A. (2014,). A Short History of the American Hot Rod. . Retrieved , from <http://automotivetechnology.wyotech.edu/articles/short-history-of-the-american-hot-rod>
- United States - vehicle registrations 2012 Statistic. (n.d.). Statista. Retrieved, from <http://www.statista.com/statistics/183505/number-of-vehicles-in-the-united-states-since-1990/>