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A Quick Statistical Analysis of American Car-Buying Trends from 2015-2022

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***Abstract*— In this paper, data has been collected relating Top best-selling cars in the USA from the year 2015-2022. The data collected are analyzed to establish a relation between the variables using statistical tools like correlation analysis; their significance of relation is tested using statistical tests, and graphs are plotted between these two variables to understand their relationship better. Based on the results obtained from the statistical analysis, a conclusion analysis is drawn.**

***Keywords*— Economy, Automobiles, Investment, Trends.**

I. INTRODUCTION

The American automotive landscape has seen a remarkable transformation over the past decade. The choices of vehicles on U.S. roads have shifted, and consumer preferences have evolved. The period from 2015 to 2022 has witnessed the rise and fall of various automobile models, reflecting changes in technology, fuel efficiency, and the ever-evolving needs of the American driver.

During this time frame, best-selling cars have acted as barometers for the industry, revealing the pulse of the nation's driving habits and priorities. The top choices for American consumers have been not only a reflection of style and performance but also a response to economic and environmental concerns.

In this exploration, the researchers have delved into the dynamic journey of the top best-selling cars in the United States from 2021 to 2022 (Table 1). Tracking the annual ebb and flow of the market, shedding light on the vehicles that consistently garnered the favour of consumers, and exploring the factors that shaped these trends.

II. DATA

TABLE 1. 2021-2022 TOP SELLING AUTOMOBILES

USA - Top 10 best selling models

-	Maker/Brand	Model	Jul. 2022	Jul. 2021	Y-o-Y	Jan.-Jul. 2022	Jan.-Jul. 2021	Y-o-Y
1	Ford	Ford F-Series	63,341	52,314	21.1%	362,686	414,346	-12.5%
2	Ram (2021-)	Ram P/U	42,387	43,776	-3.2%	287,370	356,844	-19.5%
3	Chevrolet	Silverado	38,155	53,046	-28.1%	297,671	339,456	-12.3%
4	Toyota	RAV4	37,995	42,507	-10.6%	238,880	263,702	-9.4%
5	Toyota	Camry	24,841	33,184	-25.1%	160,766	210,855	-23.8%
6	Toyota	Tacoma	24,530	23,185	5.8%	133,178	162,481	-18.0%
7	Honda	CR-V	21,799	31,530	-30.9%	138,401	244,729	-43.4%
8	Tesla	Model Y	20,113	14,000	43.7%	155,168	86,800	78.8%
9	Jeep (2021-)	Wrangler (Jeep (2009-))	19,533	17,572	11.2%	119,030	136,238	-12.6%
10	Tesla	Model 3	18,000	10,900	65.1%	123,000	63,459	93.8%

Source: MarkLines Data Center

In July 2022, the American automotive landscape witnessed a dynamic interplay of consumer preferences and industry trends, as the top-selling cars in the USA embarked on yet another transformative journey. These vehicles, much more than just modes of transportation, reflect the pulse of the nation's driving habits and priorities, embarking on a journey through the highways of the present, exploring the names that currently dominate American roads. From the enduring dominance of pickup trucks, which continue to define the essence of versatility and utility for American drivers, to the rise of compact SUVs tailored for urban living, this analysis showcases how automakers adapt to changing consumer demands [1].

The models that make it to the top in July 2022 represent not only style and performance but also the collective response to economic dynamics, environmental considerations, and the ever-evolving needs of the American driver. Moreover, the technological innovations and safety features integrated into these cars offer a glimpse into the future of the automotive industry.

From the enduring reign of pickup trucks as the heartbeat of American transportation to the rise of compact SUVs tailored for urban living, this analysis showcases how automakers adapted to the changing landscape. The dominance of certain models, the impact of fuel efficiency, and the push toward environmentally conscious choices are threads that run through this narrative [2].

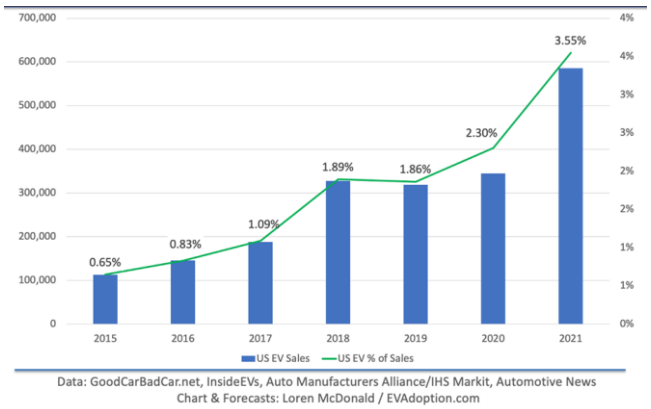

Figure 1. *2015-2022 Automobile Purchasing Trends*

Market share represents the proportion of total vehicle sales in the U.S. that a particular model holds. It demonstrates a car's competitiveness in the market.

These indicators collectively provide a comprehensive view of the best-selling cars in the USA from 2015 to 2022. They reflect the complex decision-making processes of consumers and the strategies of automakers aiming to capture a substantial share of the market. Understanding these variables is crucial for both industry professionals and consumers seeking insights into the automotive market.

The model that gained the most sales in 2022, meanwhile, was the Ioniq 5, of which Hyundai apparently managed to sell 153 in 2021, all of which were sold in December of that year. That wasn't a hard total to beat in 2022, as the Korean automaker sold 14,920 percent more, or 22,982 in all [3].

In terms of overall numbers, though, the Detroit Three's full-size pickups still reigned supreme. The top three sellers were the Ford F-Series (653,957), the Chevrolet Silverado (520,936), and the Ram pickup family (468,344), with the GMC Sierra (241,521) coming in sixth place overall, helping to propel General Motors into the top spot in terms of overall truck sales.

III. DATA ANALYSIS & RESULTS

The Data variables annual Y-O-Y in 2021 and 2022 in the USA are studied with 62 samples distributed over a period of 2015 to 2022. The data is studied using the IBM SPSS package and, in the analysis, to establish a relation between the two data variables, a regression analysis is performed to check the Pearson correlation between the variables and also to check the validity of their relation, a signal tailed t-test is performed with 99% confidence interval. Finally, the histogram, scatter plot, and normal p-p plot of regression charts are plotted to visualize the results. Definitions are provided by Statista [4].

Variable: The type of a variable determines whether it is numeric, character, quantitative, or qualitative. It also determines the kind of statistical analysis techniques that are suitable for the given data.

Treatment: Categorical independent variables are referred to as factors in an ANOVA in SPSS. A treatment is a specific arrangement of factor levels or classifications.

Correlation: A statistical method called correlation demonstrates the degree of relationship between two variables or how closely two variables are related to one another. For instance, we may determine how these two variables are related if we have the weight and height data of taller and shorter people, along with the correlation between them.

Regression: A statistical method called regression links a dependent variable to one or more independent (explanatory) variables. A regression model can demonstrate whether changes in one or more of the explanatory variables are related to changes in the dependent variable.

Experimental Unit: The object about which a researcher seeks to draw conclusions (in the population) from the sample is known as the experimental unit (in the experiment). As a result, this is the entity that requires proper replication. The number of experimental units per group is the sample size.

Mean: Mean is an evaluation of the central tendency The amount divided by the total cases is the arithmetic average.

Deviation: A standard deviation is a measurement of how widely apart a collection of numbers are from one another. The range of a standard deviation is 0 to infinity. A list of numbers with a standard deviation of 0 are all equal and do not differ from one another in any way.

Variation: The statistical assessment of the variation in numbers within a data collection is known as variance. In more detail, variance assesses how far apart each number in the collection is from the mean (average) and, consequently, from each other.

Slope: The slope of a regression line indicates how steep it is. A vertical line has an infinite slope, while a horizontal line has a slope of 0. A diagonal line from the lower left to the upper right has a slope of 1. When the independent variable is equal to 0, the regression line's intercept is where it intersects the Y axis.

Intercept: The expected mean value of Y when all X=0 is the intercept, which is frequently referred to as the constant. Create a regression equation with X as the only predictor to begin. The expected mean value of Y at that value is the intercept in the event that X occasionally equals 0.

Independent: Independent variables are those that do not change as a function of another relevant variable. Because families do not make more money if their children perform better in school, family income is an independent variable in studies examining family income and educational outcomes.

Dependent: Dependent variables are those that alter when a different important variable does. For instance, I may surmise that kids from lower-income households have it harder in school than kids from wealthier families. The dependent variable in this hypothesis is academic performance.

Linear Equation: After correlation, the linear regression equation is the next level up. When predicting the value of a variable based on the value of another variable, it is employed. The dependent variable is the one we're trying to forecast (or, sometimes, the outcome variable). The independent variable is the one we are utilizing to forecast the value of the other variable (or, sometimes, the predictor variable).

Scattergram: Scatterplot is defined as a form of plot to show the correlation between two variables. It aids in visualizing the relationship between the two variables' direction (positive or negative) and intensity (weak, moderate, strong).

Prediction: It is the process of estimating how big statistical variations will be at some point in the future.

Slope = Δx / Δy or m = Sx / Sy and y = mx + b (m = slope, b = constant): The ratio of Y to X (y/x, as seen above) determines a line's slope (m). For instance, a slope of 4/3 indicates that, on average, as the x-value rises by 4 units, the y-value rises by 3 units.

TABLE II

Descriptive Statistics

	N	Mean	Std. Deviation
July2022	10	31033.40	14390.400
July2021	10	32201.40	15495.385
YoY	10	4.900	31.6384

- Mean is the numerical average of the data set
- Standard deviation is the square root of variance

TABLE III

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	July2022[b]	.	Enter

a. Dependent Variable: YoY

b. All requested variables entered.

TABLE IV

Model Summary

R	R Square	Adjusted R Square	Std. Error of the Estimate
.164	.027	-.095	33.105

The independent variable is July2022.

The Independent variable is July 2022 and YoY is the dependent variable.

TABLE V

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	241.551	1	241.551	.220	.651[b]
	Residual	8767.369	8	1095.921		
	Total	9008.920	9			

a. Dependent Variable: YoY

b. Predictors: (Constant), July2022

TABLE VI

Coefficients

	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	t	Sig.
July2022	.000	.001	-.164	-.469	.651
(Constant)	16.072	25.998		.618	.554

Examine the output and determine the regression equation for each comparison

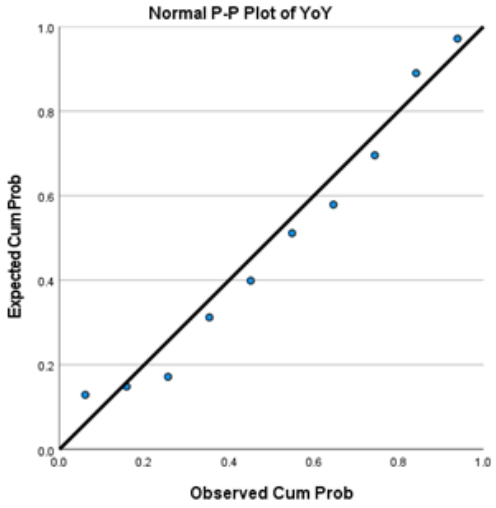

Figure 2. *P-P Plot of YoY*

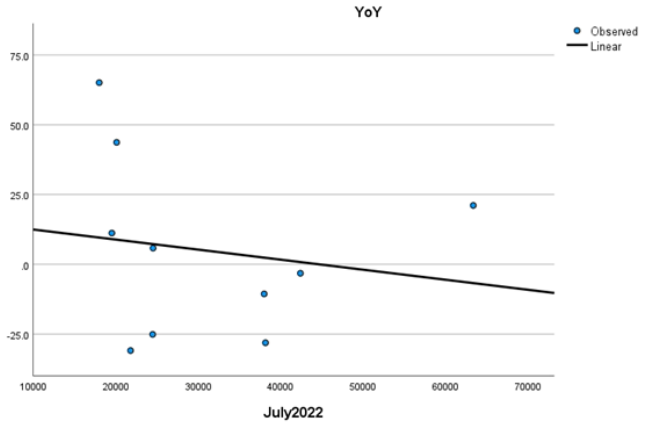

Figure 3. *Scatter Plot of YoY July 2022*

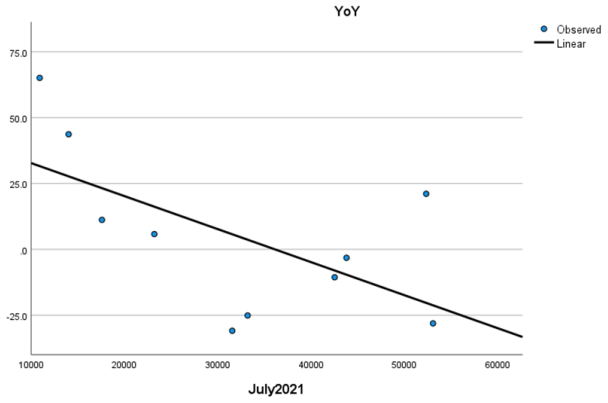

Figure 4. *Scatter Plot of YoY July 2021*

From the above scatter plots, it can be said that the YOY is dependent on the sales of July 2022 and as well as July 2021.

IV. CONCLUSION

In conclusion, the best-selling cars in the USA between 2021 and 2022 reveal a nuanced narrative of consumer choices, automaker strategies, and economic influences. The top-three contenders were Ford (Ford F-Series Trucks), Dodge (Ram Trucks), and General Motors (Chevrolet Silverado Trucks). The data may be multi-faceted, but it is clear that the automotive market is ever-evolving, shaped by the interplay of variables that continually redefine the preferences and priorities of American drivers. These conclusions underline the adaptability and resilience of the automotive industry as it navigates an ever-changing landscape.

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