Assessment 2

26776 Foundations of Business Analytics - Spring 2024

Boosting Profits with Data-Driven Insights in the Used Car Market

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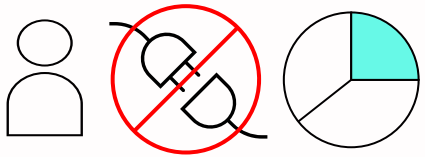
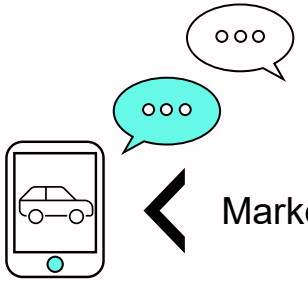
Opportunity

> “The used car market has **accelerated** since the pandemic. Customers are displaying a **considerable preference** towards used cars and the gap between new cars and used car sales is reducing phenomenally. As per the report, the organised used car market share is expected to **increase** from 20 per cent in FY 2021-2022 to **45 per cent** in FY 2026-2027 ”
>
> - Business Today

The Gap in the market.....

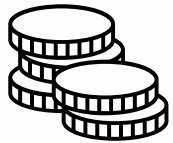


Individual sellers do not have access to market data



Market Value

Used cars are sold at undervalued rates



Opportunity to maximize profits by findings undervalued but in demand used cars

Understanding the data

Data Description:

Nearly 2000 Recent Used Cars Sales

Details of each sale:

Attributes of the sold used car such as shown in the image

Assumptions:

1. Which attributes are important to a used car customer.
2. All cars will be sold at market value
3. Acquisition cost, pricing analysis, sentiment analysis and discounts are not considered.

Objective

Create a model to analyze and find which attributes(variables) matter most to used car customers.

Alphabetic List of Variables and Attributes

#	Variable	Type	Len	Format	Informat	Label
8	colour	Char	6	$6.	$6.	Colour of the car
15	drivetrain	Char	3	$3.	$3.	RWD/FWD/AWD
10	engine_size	Char	7	$7.	$7.	engine_size
20	fuel_tank	Num	8	BEST.		Size of fuel tank
5	fuel_type	Char	12	$12.	$12.	Type of Fuel Needed
18	height	Num	8	BEST.		Height of the car
4	kilometers	Num	8	BEST.		Kilometers driven
16	length	Num	8	BEST.		Length of the car
7	location	Char	16	$16.	$16.	City the car is purchased from
1	make	Char	13	$13.	$13.	Make of the Used Car
11	max_power(BHP)	Num	8	BEST.		max_power(BHP)
12	max_power(RPM)	Num	8	BEST.		max_power(RPM)
13	max_torque(Nm)	Num	8	BEST.		max_torque(Nm)
14	max_torque(rpm)	Num	8	BEST.		max_torque(rpm)
9	owner	Char	16	$16.	$16.	Number of previous owners
19	seats	Num	8	BEST.		Number of seats in the car
2	selling_price	Num	8	BEST.		Price at which Car was sold
6	transmission	Char	9	$9.	$9.	Transmission Type
17	width	Num	8	BEST.		Width of the car
3	year	Num	8	BEST.		Year the model was released

Findings

Insight #1 – Model Year

Estimate: 167,307 (P-Value: <0.0001)

Interpretation: For each year increase in model age, car value rises by approximately INR 167,307 holding all other variables constant. This indicates that newer cars have a higher resale value.

Recommendation: Prioritize acquiring newer models as they tend to fetch a higher price, contributing positively to profitability.

Parameter Estimates

Parameter	DF	Estimate	Standard Error	t Value	Pr > |t|
year	1	167307	11412	14.66	<.0001

Findings

Insight #2 – Kilometers Driven

Estimate: -1.68 (P-Value: <0.0010)

Interpretation: Each kilometer driven reduces value by INR 1.68. High mileage lowers car value, reflecting depreciation and potential wear and tear.

Recommendation: Acquire cars with lower mileage, as they maintain higher value, potentially enhancing resale profitability.

Parameter Estimates

Parameter	DF	Estimate	Standard Error	t Value	Pr > |t|
kilometers	1	-1.678505	0.508897	-3.30	0.0010

Findings

Insight #3 – Engine Power(Max Power)

Estimate: 21736 (P-Value: <0.0001)

Interpretation: Cars with higher engine power (BHP) generally have a higher price.

Recommendation: Focus on cars with higher max power ratings, such as performance-oriented models (e.g., premium sedans or sports cars). These cars appeal to buyers seeking powerful engines, potentially leading to better margins.

Parameter Estimates

Parameter	DF	Estimate	Standard Error	t Value	Pr > |t|
max_power(BHP)	1	21736	2365.885749	9.19	<.0001

Findings

Insight #4 – Body Dimensions (Length, Width, Height)

Length Estimate: 563.49 (P-Value: 0.0025)
Width Estimate: -1,947 (P-Value: 0.0001)
Height Estimate: 2,078.96 (P-Value: <0.0001)

Interpretation: Increased length and height contribute positively to value, while increased width has a negative impact. Larger dimensions generally correlate with luxury or premium models, likely driving up the value.

Recommendation: Acquire larger vehicles, particularly SUVs and luxury sedans, which align with the positive impact of height and length, contributing to higher resale values.

Parameter Estimates

Parameter	DF	Estimate	Standard Error	t Value	Pr > |t|
length	1	563.489026	186.156741	3.03	0.0025
width	1	-1947.036913	508.372085	-3.83	0.0001
height	1	2078.955224	493.018099	4.22	<.0001

Findings

Insight #5 – Number of Seats

Estimate: -261,980 (P-Value: < 0.0001)

Interpretation: Higher seat count correlates with lower price. This may indicate that compact cars and smaller sedans hold their value better than large, multi-seat vehicles (e.g., minivans).

Recommendation: Focus on compact or standard 4–5-seat models over multi-seat vehicles, as they likely offer better resale potential.

Parameter Estimates					
Parameter	DF	Estimate	Standard Error	t Value	Pr > |t|
seats	1	-261980	61959	-4.23	<.0001

Findings

Insight #6 – Fuel Type

Hybrid Estimate: 4,941,410 (P-Value: 0.0004)

Interpretation: Hybrid vehicles hold a much higher value, likely due to their fuel efficiency and environmental appeal.

Recommendation: Prioritize hybrid vehicles where possible. Given the rising demand for fuel-efficient and eco-friendly options, hybrids can offer a high resale value, supporting profitability.

Parameter Estimates					
Parameter	DF	Estimate	Standard Error	t Value	Pr > |t|
fuel_type CNG	1	50092	1163597	0.04	0.9657
fuel_type CNG + CNG	1	1128975	1652541	0.68	0.4946
fuel_type Diesel	1	-770898	1165599	-0.66	0.5085
fuel_type Hybrid	1	4941410	1396069	3.54	0.0004
fuel_type LPG	1	1049672	1306207	0.80	0.4217
fuel_type Petrol	1	85997	1150792	0.07	0.9404
fuel_type Petrol + CNG	0	0	.	.	.

Findings

Insight #7 – Transmission Type

Automatic Estimate: -166,577 (P-Value: 0.0427)

Interpretation: Cars with automatic transmission are priced lower than their manual counterparts. This trend may reflect market preferences in certain regions or availability.

Recommendation: Prefer manual cars if targeting price-sensitive buyers, but also consider market demand; automatic cars may sell more quickly despite lower resale prices due to convenience preference.

Parameter Estimates					
Parameter	DF	Estimate	Standard Error	t Value	Pr > |t|
transmission Automatic	1	-166577	82140	-2.03	0.0427
transmission Manual	0	0	.	.	.

Findings

Insight #8 – Car Make

Positive Estimate by make:
Ferrari: 22,859,293 (P-Value: < 0.0001)
Land Rover: 2,933,930 (P-Value: < 0.0001)
Porsche: 2,567,771 (P-Value: < 0.0001)
Rolls-Royce: 11,478,550 (P-Value: < 0.0001)
Maserati: 3,390,472 (P-Value: 0.0050)

Interpretation: Luxury and performance brands such as Ferrari, Rolls-Royce, and Porsche carry significantly higher resale values, reflecting their premium market status.

Recommendation: If available within budget, invest in luxury brands such as Ferrari, Porsche, or Maserati. These brands offer high resale values, allowing for greater profitability on a per-unit basis, though they may also carry higher acquisition costs. Cars such as Mercedes and BMW are very popular as well which is why focusing acquisition on them will ensure regular turnover.

No.	Make	Average Selling Price(Sorted)		Quantity Sold by Make
1	Ferrari	INR	35,000,000.00	1
2	Lamborghini	INR	24,000,000.00	1
3	Rolls-Royce	INR	20,000,000.00	2
4	Maserati	INR	9,000,000.00	1
5	Porsche	INR	8,424,000.00	10
6	Land Rover	INR	6,724,312.50	32
7	Lexus	INR	4,530,000.00	5
8	Mercedes-Benz	INR	4,397,672.70	165
9	BMW	INR	3,718,114.02	114
10	Jaguar	INR	3,564,647.06	17

Findings

Insight #8 – Car Make

Negative Estimate by make:
Kia: -1,173,424 (P-Value: = 0.0056)
Jeep: -1,936,431 (P-Value: < .0001)
MG: -2,160,358 (P-Value: < .0001)

Interpretation: Some brands may have lower resale values, indicating market trends or perceptions affecting profitability.

Recommendation: Limit acquisition of brands with low resale values, focusing instead on brands with a strong reputation for longevity and value retention. If these are already in the inventory, then start promotions to improve turnover.

Parameter Estimates

Parameter	DF	Estimate	Standard Error	t Value	Pr > |t|
make Audi	1	-727007	341855	-2.13	0.0336
make BMW	1	88961	358824	0.25	0.8042
make Chevrolet	1	-656994	669872	-0.98	0.3268
make Datsun	1	-825947	547880	-1.51	0.1319
make Ferrari	1	22859293	1371363	16.67	<.0001
make Fiat	1	-328644	1218527	-0.27	0.7874
make Ford	1	-625596	380500	-1.64	0.1003
make Honda	1	-622260	364187	-1.71	0.0877
make Hyundai	1	-778115	346946	-2.24	0.0250
make Isuzu	1	-839102	905838	-0.93	0.3544
make Jaguar	1	-122460	474422	-0.26	0.7963
make Jeep	1	-1936431	454281	-4.26	<.0001
make Kia	1	-1173424	423102	-2.77	0.0056
make Land Rover	1	2933930	409482	7.16	<.0001
make Lexus	1	-675600	706826	-0.96	0.3393
make MG	1	-2160358	486726	-4.44	<.0001
make MINI	1	826638	575670	1.44	0.1512

Findings

Insight #9 – Ownership History

Estimate:
First owner Estimates: -1,515,129, (P-Value: < .0001)
Second owner Estimates: -1,678,956, (P-Value: < .0001)
Third owner Estimates: -1,345,996, (P-Value: 0.0004)

Interpretation: Ownership history significantly impacts value, with prices decreasing as the number of previous owners increases. Cars from the first owner retain more value.

Recommendation: Prioritize single-owner cars, as they hold greater appeal and value compared to cars with multiple past owners.

Parameter Estimates

Parameter	DF	Estimate	Standard Error	t Value	Pr > |t|
owner First	1	-1515129	289376	-5.24	<.0001
owner Second	1	-1678956	298761	-5.62	<.0001
owner Third	1	-1345996	378688	-3.55	0.0004

Conclusion

Ideal Car profile for maximum profitability:-

- **Year (Age)**: Newer Models (More Recently released models).
- **Kilometers Driven**: Lower the mileage, the higher the value.
- **Body Dimension**: Larger Length and Height with moderate width.
- **Seating**: Limited Seating (4-5).
- **Fuel Type**: Hybrid.
- **Transmission Type**: Manual.
- **Ownership History:** Single previous owner.
- **Brand Focus:** Premium and Luxury Brands (Ferrari, Land Rover, etc.), with highest priority given to Mercedes and BMW Acquisition.
- **Color and Location**: Are statistically insignificant in predicting resale value based on current dataset.

Next Steps.....

1. Define Acquisition Criteria Based on Key Variables
2. Evaluate Current Inventory and Adjust Acquisition Targets
3. Setup Automated budgeting and valuation system
4. Implement Dynamic Pricing strategies
5. Monitor and Evaluate Acquisition Outcomes Regularly

Thank you ☺

Any Questions ?