



INVESTMENT IN USED CARS WITHIN EUROPE MARKET

PREPARED FOR

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Introduction

Europe underwent a challenging period in 2020 with the COVID-19 epidemic-related financial problems and isolation measures. Despite an increase in immunization rates, several regions are still in crisis. For instance, new automobile sales in the automotive sector have not yet reached their usual levels (Research and Markets, 2022).

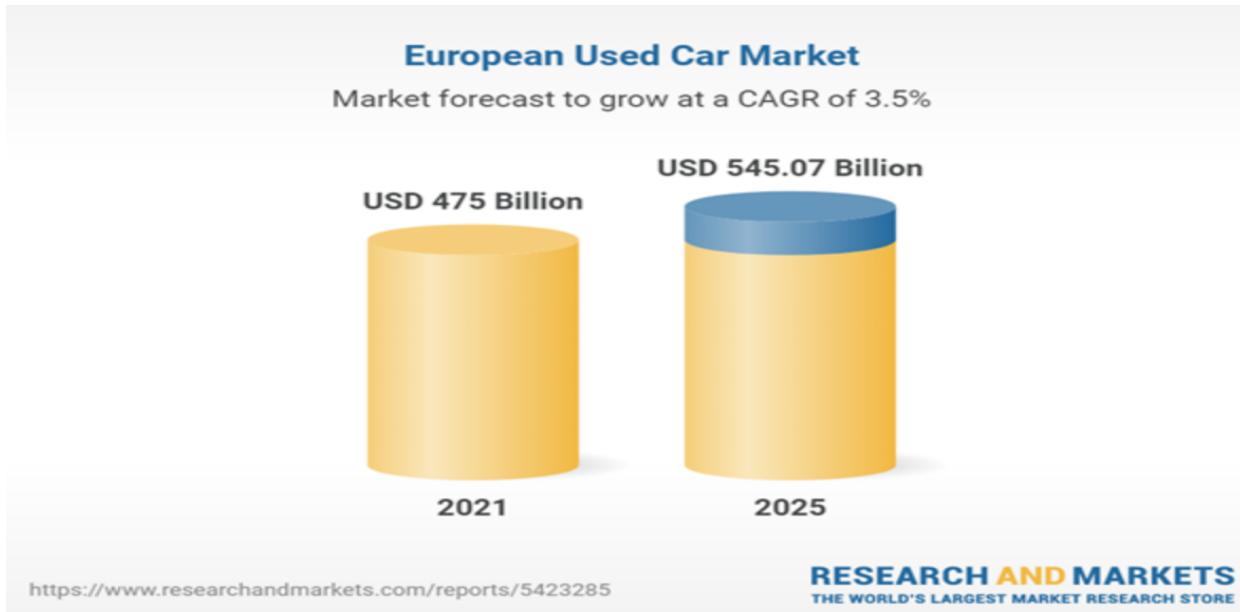
The protracted crisis between Russia and Ukraine and the global shortage of microchips have both had an impact on auto production and increased the used car market. Due to the increased demand in 2021, the average price of used cars increased across Europe (Research and Markets, 2022).

Franchised and non-franchised legacy vehicle dealers dominate the European used automobile industry, which is fragmented. The major companies in the European used automobile market are Arnold Clark Automobiles Limited, Lookers PLC, Pendragon PLC, and Emil Frey Group.

This report will provide a comprehensive analysis for a sound investment decision and avoid irreversible financial damage for Aufsteller Group investors in the used car industry within Europe. Furthermore, based on the dealership's need to sell 10 cars per day on average, this report will recommend 10 brands of used cars that suits the dealership's requirements.

Market Research

Figure 1



It is anticipated that over the next four years, the European used automobile market would grow. According to estimates shown in **Figure 1** from Research and Markets, the European Used Car Market will be worth \$475 billion in 2021. By 2025, it is predicted that the European Used Car Market would be worth \$545.07 billion, growing at a 3.5% annual rate.

An expansion in the used car market is suggested by the growing advantages of used cars over new ones, as well as by rising disposable income, an increase in the urban population, an increase in online used car sales, and a rise in the overall population.

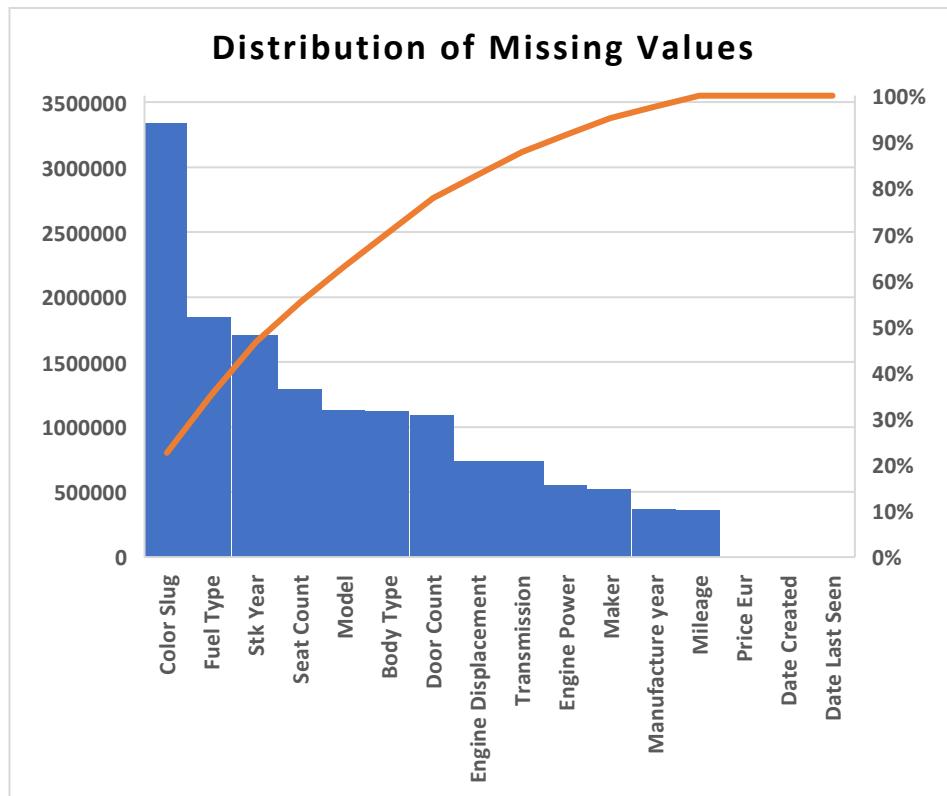
In 2020, the European Union's average annual net earnings were 13.99 thousand euros (D. Clark, 2022). According to the world population review, the median income in Europe is about \$17,000 or 16876.38 Euros. A household's disposable income that falls between 75% and 200% of the median disposable income for each nation is in the middle class (Eurofound n.d.). Therefore, it is right to assume that any household disposable income that falls below or above the middle class will be regarded as the lower class and upper class respectively.

They are numerous factors that can influence an individual's car choice or buying behaviour, this analysis will be focusing on the **Age and Mileage** of the car. A car may be deemed to have a high mileage if the reading is over 24,000. In addition, a car's value can decrease by up to 60% within the first four to five years (Staff, C 2021), though regular car maintenance will extend its life cycle (Dan Winter, 2021).

Data Cleaning

Table 1: Data Dictionary

Variable Name	Data Type	Missing Value
Maker	String	518915
Model	String	1133361
Mileage	Int	362585
Manufacture year	Int	370579
Engine Displacement	Int	743415
Engine Power	Int	554878
Body Type	String	1122914
Colour Slug	String	3343411
Stk Year	String	1708156
Transmission	String	741630
Door Count	Int	1090067
Seat Count	Int	1287100
Fuel Type	String	1847606
Date Created	String	0
Date Last Seen	String	0
Price Eur	Float	1



Assumptions:

The following assumptions will be implemented in the data-cleaning process.

The manufacturing year will be limited to just between 2000 and 2018 and all values, not within the specified range will be removed.

The price range will be limited to 2,000 to 2,500,000 Euros and all values, not within the specified range will be removed.

These assumptions were because of market research carried out in the used cars marketplace (*autoscout24*, n.d.) that shows the cost of used cars below 2,000 Euros and above 2,500,000 Euros for luxury cars.

Data Analysis:

Based on the market research, this analysis will focus on two segments of consumer group: the lower- and middle-class income levels. The following criteria will be applied in recommending used cars suited for these segments.

Income Class	Mileage	Price Range in Euros
Economy class/Lower class	Less than 1000	3500 - 15000
Middle class	Less than 1000	15000 - 200000

Top 5 car brands recommended for Economy Class

The top 5 brands of used cars recommended for the economy or lower-income class are Audi, Volkswagen, Opel, Hyundai, and Toyota. These recommendations are based on the data from the best-selling car brands in Europe in 2021, which ranked the car brands as top 20.

Figure 2: Audi

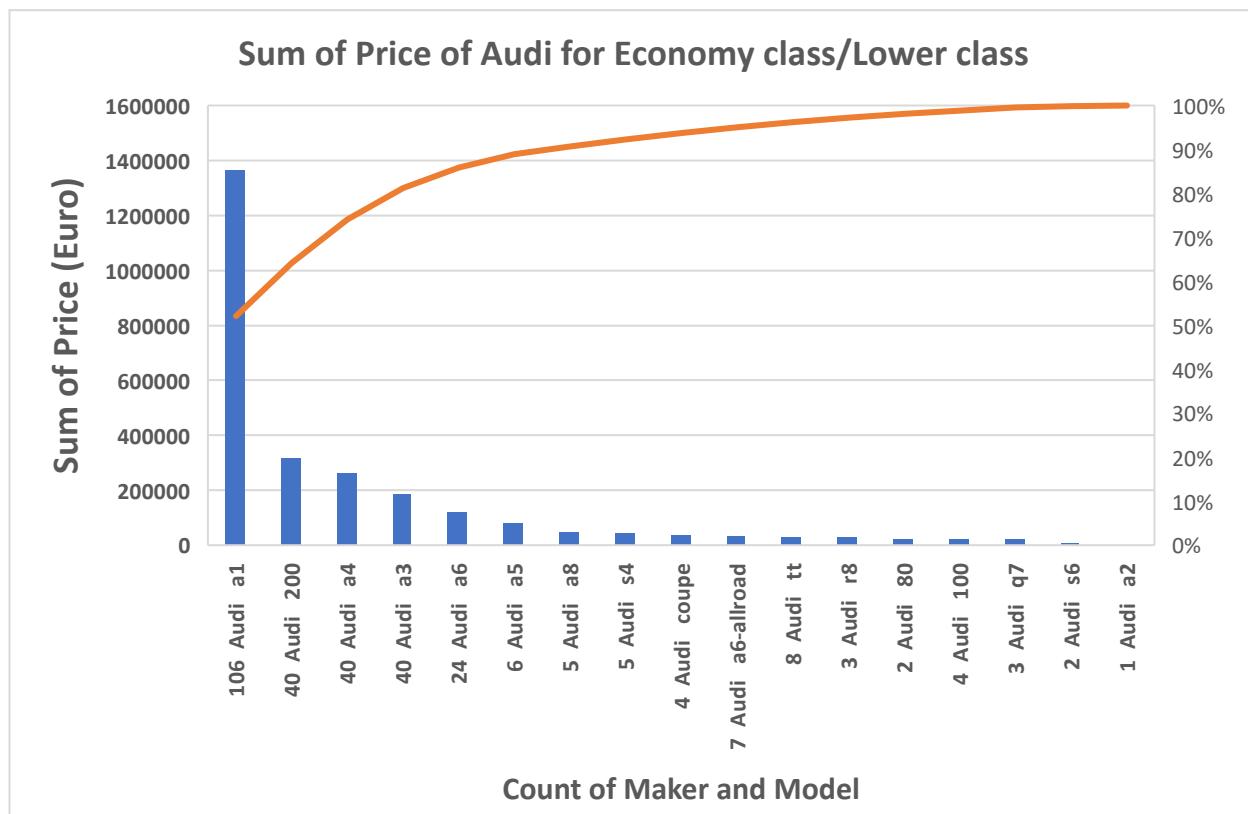


Figure 2 above shows 300 used cars that meet the specified criterion. The total investment required is about 2,619,348.65 Euros. Audi model A1 has the highest quantity available with over 80% of the total cost.

Figure 3: Volkswagen

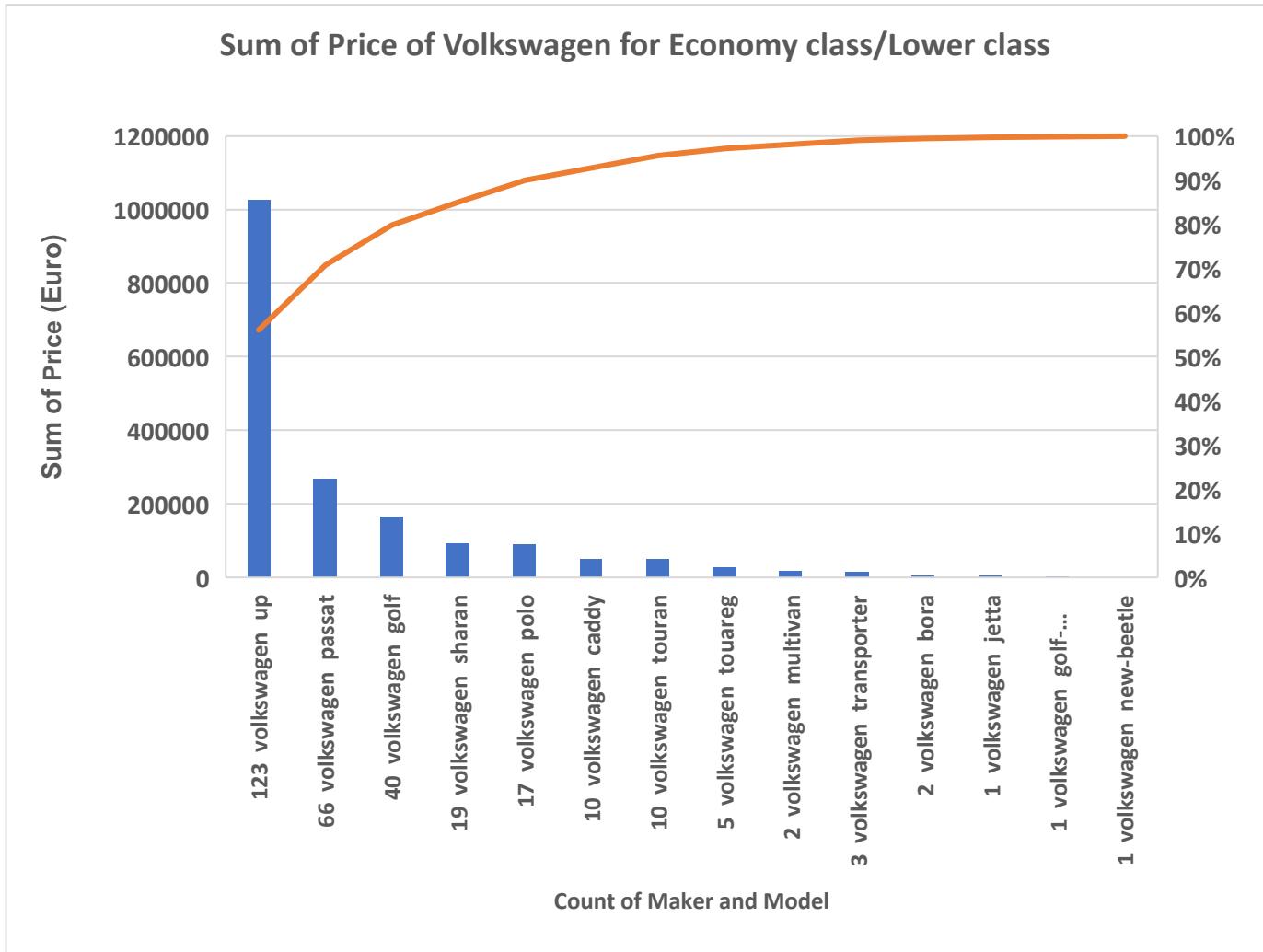


Figure 3 above shows 300 used cars that meet the specified criterion. The total investment required is about 1,829,306.63 Euros. Volkswagen model up has the highest quantity available with over 80% of the total cost.

Figure 4: Opel

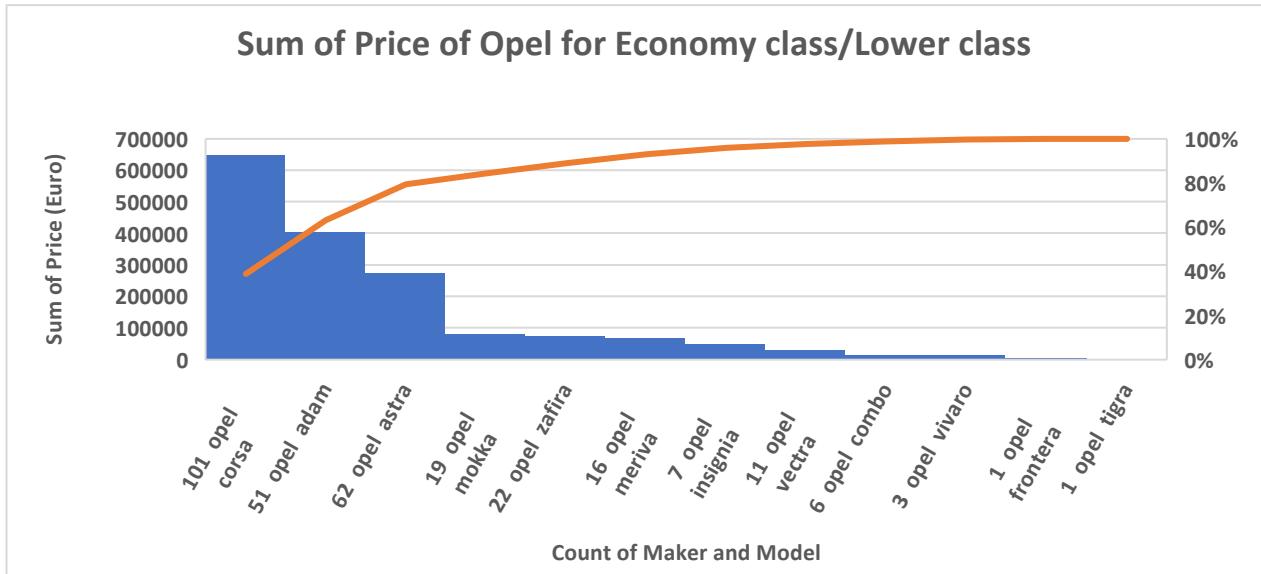


Figure 4 above shows 300 used cars that meet the specified criterion. The total investment required is about 1,670,677.08 Euros. Opel model Corsa has the highest quantity available with over 80% of the total cost.

Figure 5: Hyundai

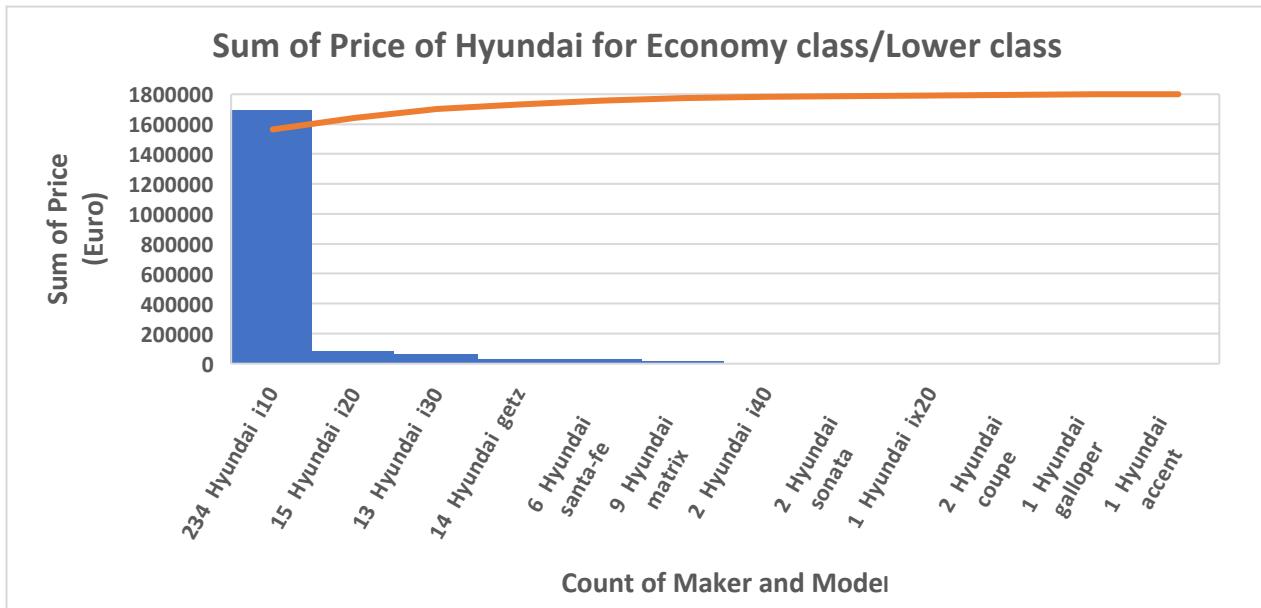


Figure 5 above shows 300 used cars that meet the specified criterion. The total investment required is about 1,670,677.08 Euros. Hyundai model i10 has the highest quantity available with over 90% of the total cost concentration.

Figure 6: Toyota

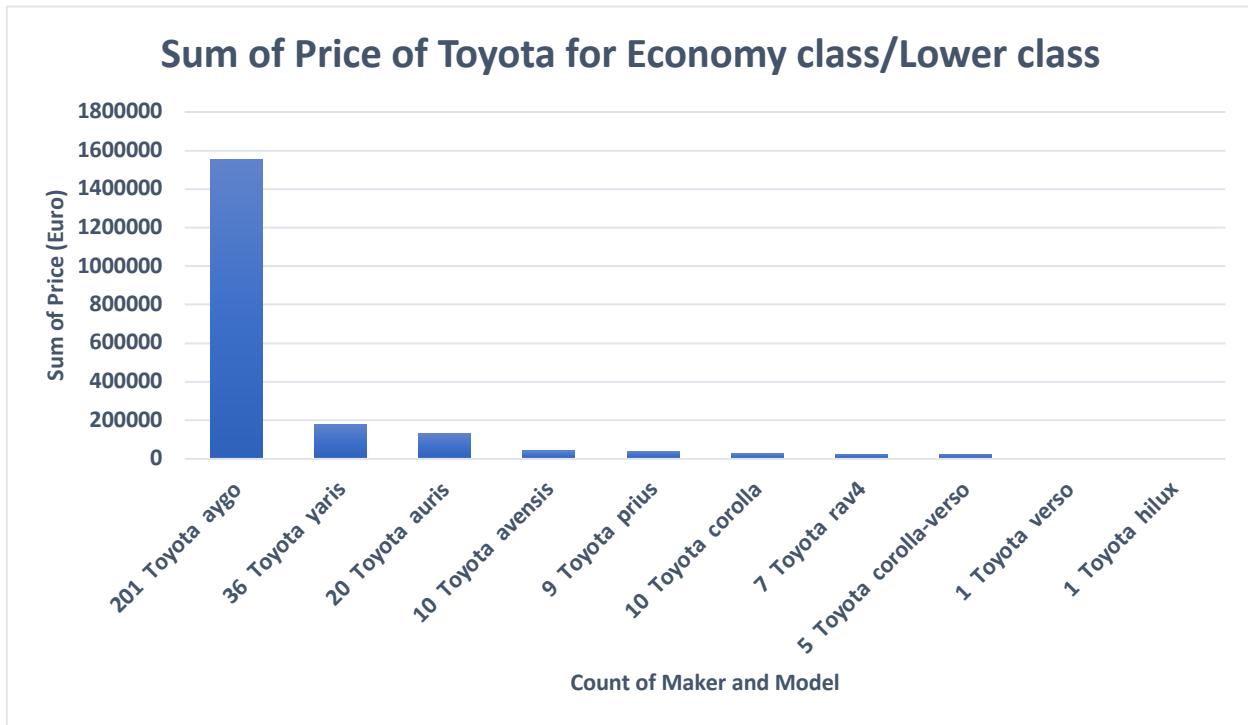


Figure 6 above shows 300 used cars that meet the specified criterion. The total investment required is about 2,048,645.61 Euros. Toyota model Aygo has the highest quantity available with over 80% of the total cost concentration.

Top 6 car brands recommended for Middle Class

The top 6 brands of used cars recommended for the middle-income class are Mercedes-Benz, Mazda, Nissan, Tesla, Audi, and Fiat. These recommendations are based on the data from the best-selling car brands in Europe in 2021, which ranked the car brands as top 20.

Figure 7: Mercedes Benz

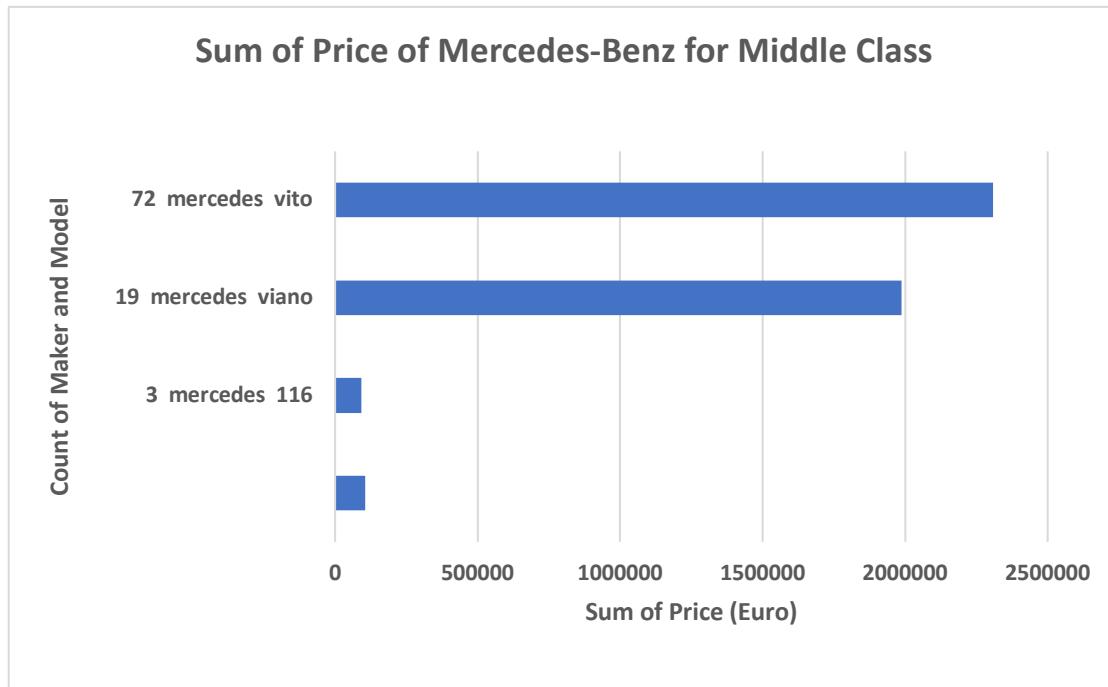


Figure 7 above shows 95 used cars that meet the specified criterion. The total investment required is about 4,493,097.17 Euros. Mercedes-Benz model Vito has the highest quantity available with over 80% of the total cost concentration.

Figure 8: Mazda

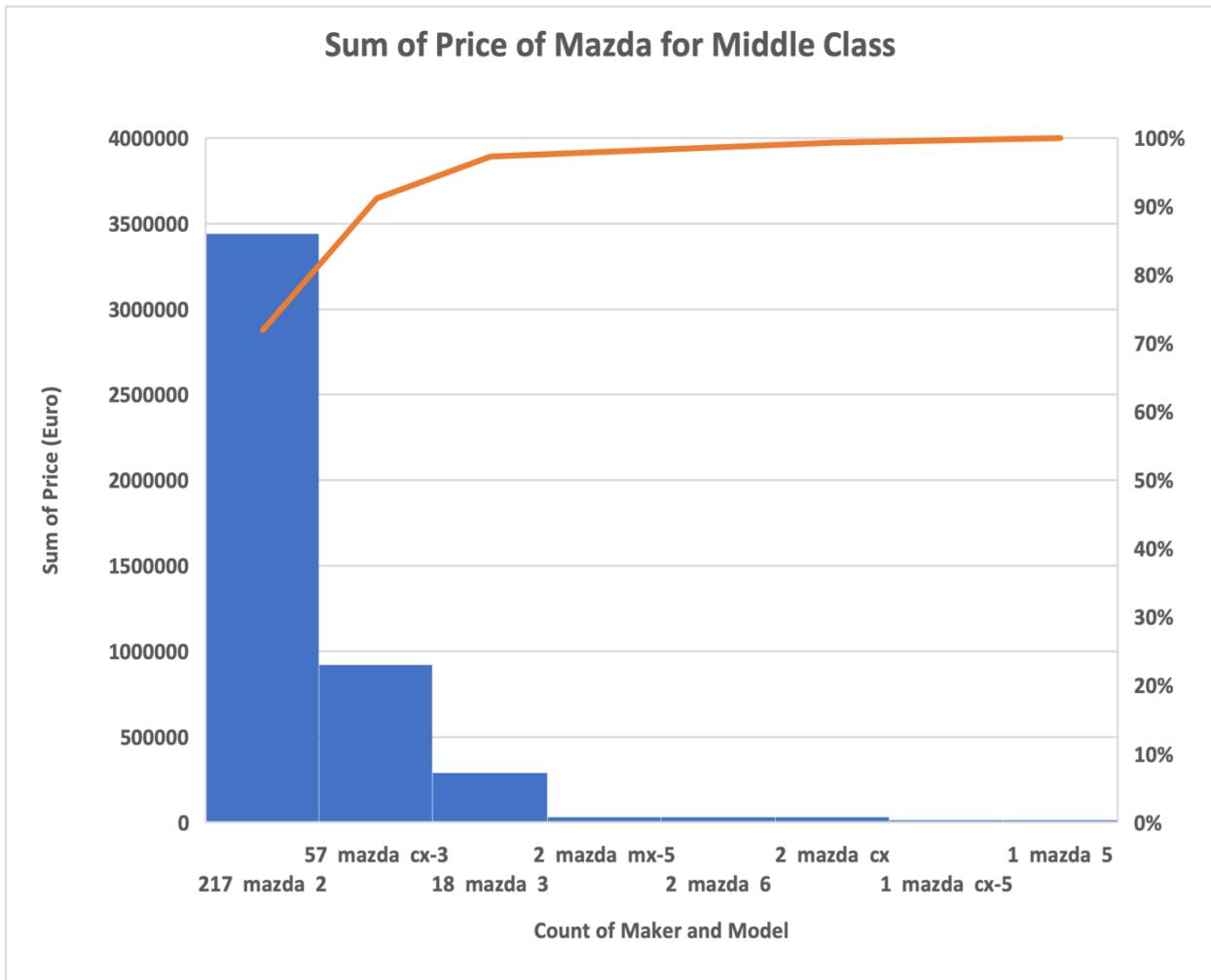


Figure 8 above shows 300 used cars that meet the specified criterion. The total investment required is about 4,786,222.46 Euros with an average unit cost of 15954.07487 Euros. Mazda model 2 has the highest quantity available with over 80% of total cost concentration with an average price of 15865.68327 Euros each.

Figure 9: Nissan

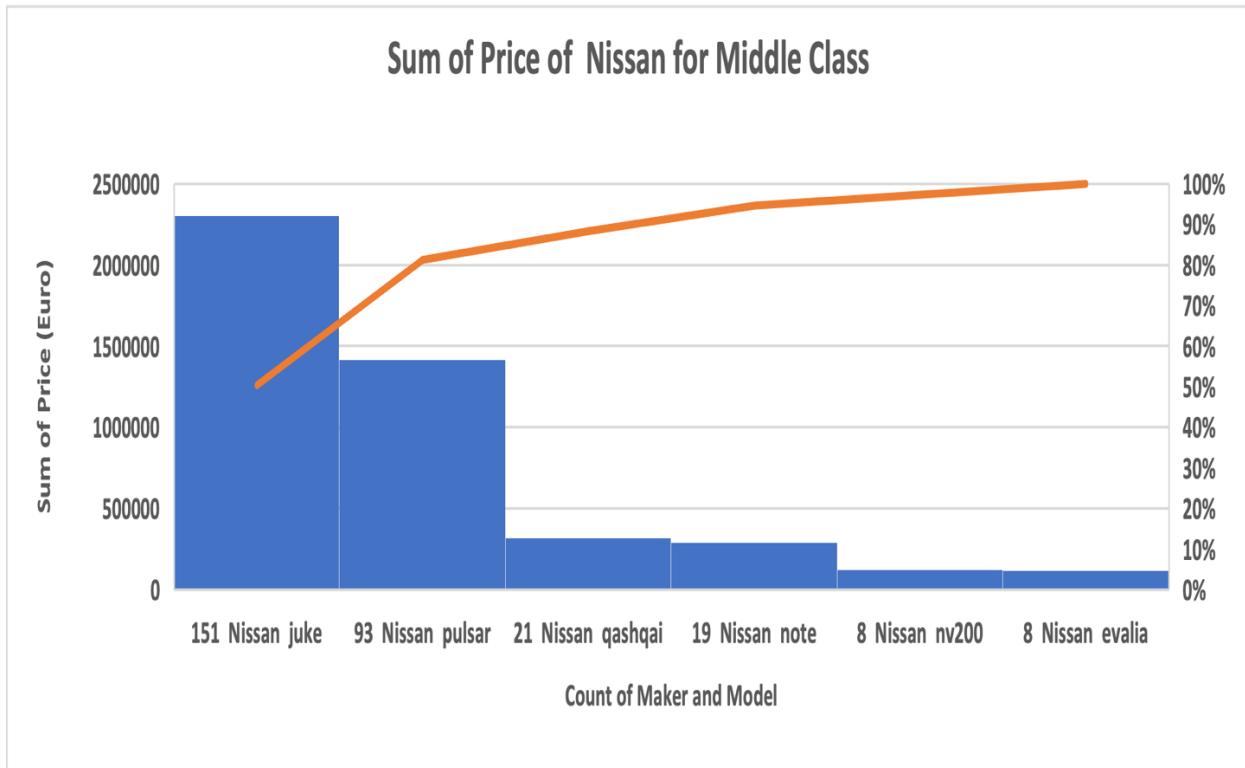


Figure 9 above shows 300 used cars that meet the specified criterion. The total investment required is about 4,576,108.27 Euros with 15253.69423 average unit cost. Nissan model Juke has the highest quantity available with over 80% of the total cost concentration.

Figure 10: Audi and Tesla

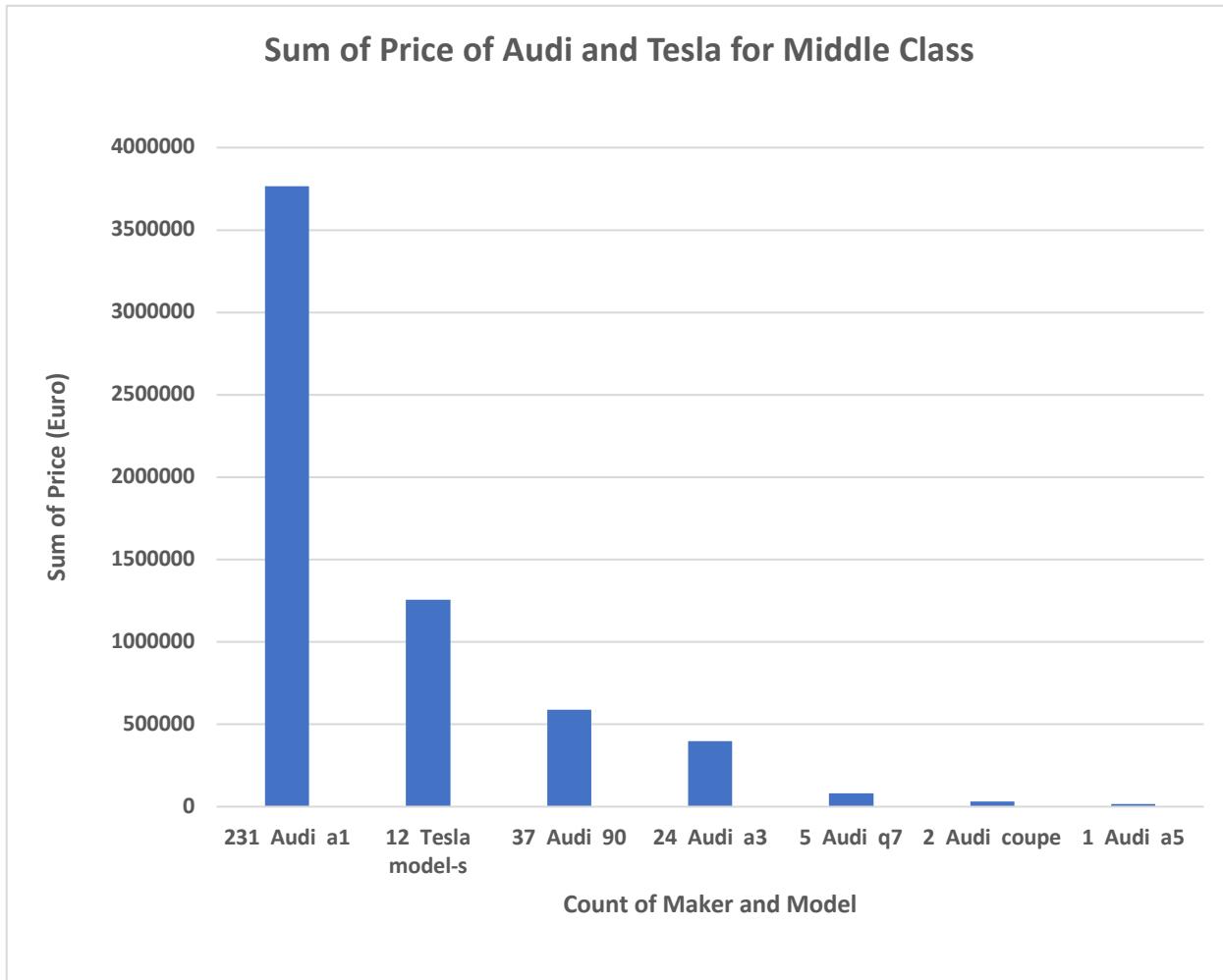


Figure 10 above shows 312 used cars that meet the specified criterion. The total investment required is about 6140372.65 Euros. Audi models will cost a total of 4,883,707.96 Euros with an average cost of about 16,279.0265 Euros. While the Tesla Model-s will cost around 1,256,664.69 Euros with an average cost per unit of 104,722.058 Euros.

Figure 11: Fiat

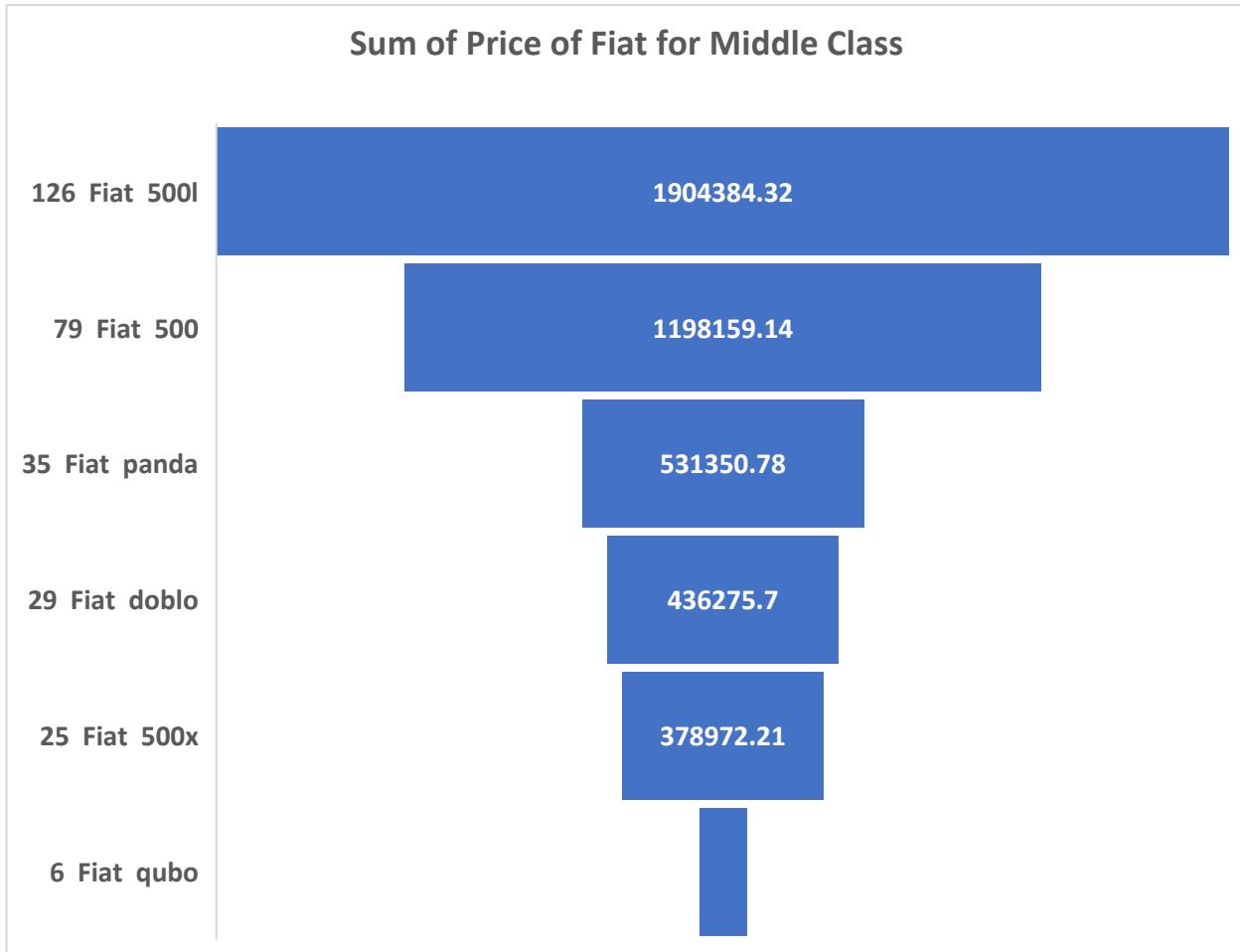
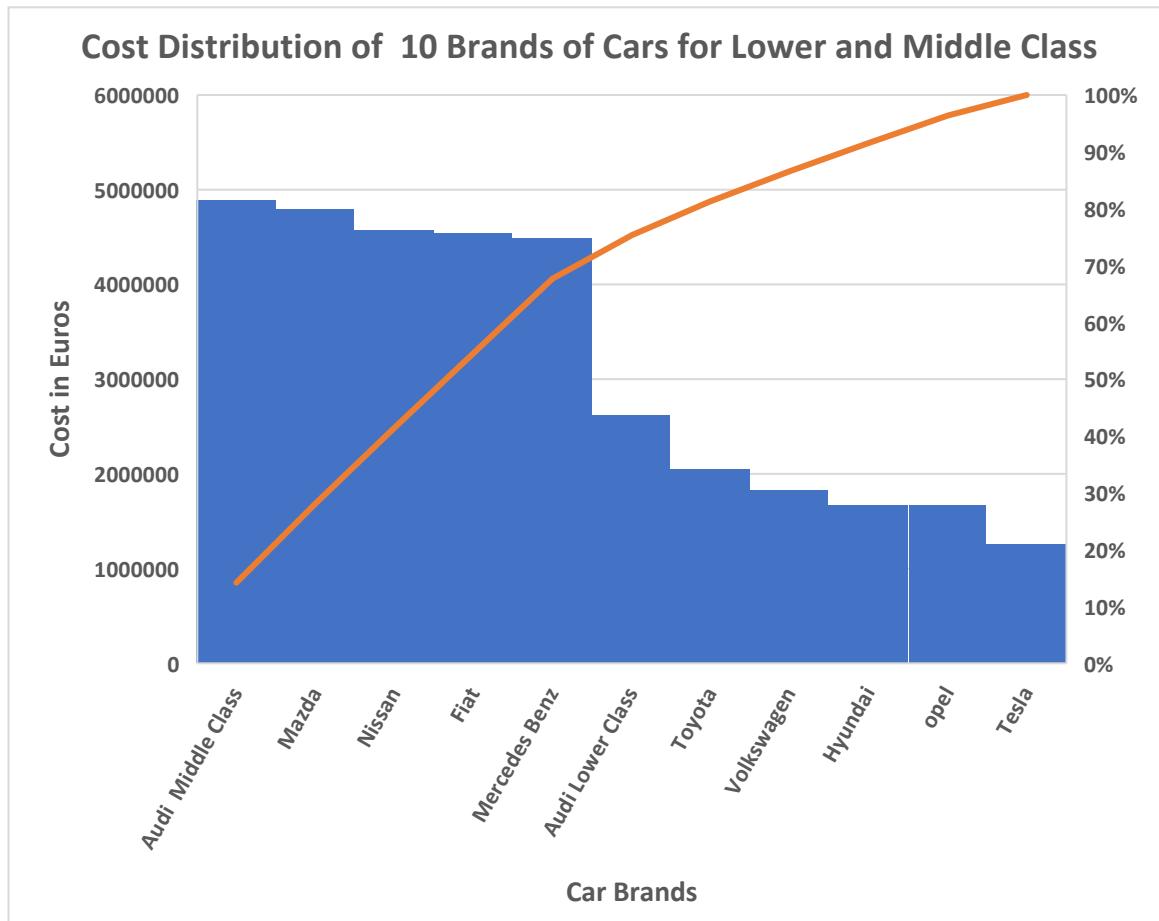


Figure 11 above shows 300 used cars that meet the specified criterion. The total investment required is about 4,540,029.54 Euros with 15,133.4318 Euro average cost per unit. Fiat model 500i has the highest quantity available with over 90% of the total cost concentration.

Conclusion

This report focussed on the analysis of the used car market within Europe and identified the key players in the industry. In addition, the report also analyzed the income levels of consumers and categorized them. Furthermore, this report dived deep to understand why there is a high demand for used cars in Europe.

Figure 12



For a profitable investment decision, a total of 2,807 cars were recommended from 10 brands with different models. Furthermore, it is estimated that the total amount of investment excluding tax and other expenses will cost around 34,374,485.14 Euros. In addition, it is expected for the prices of used cars will increase in the next few years. Finally, when laws of demand and supply take effect in the market, we can project the industry to be profitable.

Appendix 1: Loading of data into Hive

```
goodnewsagbadu@mid-term-m:~$ head cars.csv
maker,model,mileage,manufacture_year,engine_displacement,engine_power,body_type,color_slug,stk_year,transmission,door_count,seat_count,fuel_type,date_created,date_last_seen,price_eur
ford,galaxy,151000,2011,2000,103,,None,man,5,7,diesel,2015-11-14 18:10:06.838319+00,2016-01-27 20:40:15.46361+00,10584.75
skoda,octavia,143476,2012,2000,81,,None,man,5,5,diesel,2015-11-14 18:10:06.853411+00,2016-01-27 20:40:15.46361+00,8882.31
bmw,,97676,2010,1995,85,,None,man,5,5,diesel,2015-11-14 18:10:06.861792+00,2016-01-27 20:40:15.46361+00,12065.06
skoda,fabia,111970,2004,1200,47,,None,man,5,5,gasoline,2015-11-14 18:10:06.872313+00,2016-01-27 20:40:15.46361+00,2960.77
skoda,fabia,128886,2004,1200,47,,None,man,5,5,gasoline,2015-11-14 18:10:06.880335+00,2016-01-27 20:40:15.46361+00,2738.71
skoda,fabia,140932,2003,1200,40,,None,man,5,5,gasoline,2015-11-14 18:10:06.894643+00,2016-01-27 20:40:15.46361+00,1628.42
skoda,fabia,167220,2001,1400,74,,None,man,5,5,gasoline,2015-11-14 18:10:06.915376+00,2016-01-27 20:40:15.46361+00,2072.54
bmw,,148500,2009,2000,130,,None,auto,5,5,diesel,2015-11-14 18:10:06.924123+00,2016-01-27 20:40:15.46361+00,10547.74
skoda,octavia,105389,2003,1900,81,,None,man,5,5,diesel,2015-11-14 18:10:06.936239+00,2016-01-27 20:40:15.46361+00,4293.12
goodnewsagbadu@mid-term-m:~$ hadoop fs -mkdir /BigData
goodnewsagbadu@mid-term-m:~$ hadoop fs -copyFromLocal /home/goodnewsagbadu/cars.csv /BigData/
goodnewsagbadu@mid-term-m:~$ hadoop fs -ls /BigData
Found 1 items
-rw-r--r-- 1 goodnewsagbadu hadoop 419466302 2022-10-27 20:15 /BigData/cars.csv
goodnewsagbadu@mid-term-m:~$ hive
Hive Session ID = 5c2e4ffe-9c94-47b4-8911-073caa37aa88

Logging initialized using configuration in file:/etc/hive/conf.dist/hive-log4j2.properties Async: true
Hive Session ID = b2b02739-deef-4e4d-90e9-fe959714d2bf
hive> 
```

```
hive> CREATE EXTERNAL TABLE IF NOT EXISTS used_cars_goodnews (
    > maker STRING,
    > model STRING,
    > mileage INT,
    > manufacture_year INT,
    > engine_displacement INT,
    > engine_power INT,
    > body_type STRING,
    > color_slug STRING,
    > stk_year STRING,
    > transmission STRING,
    > door_count INT,
    > seat_count INT,
    > fuel_type STRING,
    > date_created STRING,
    > date_last_seen STRING,
    > price_eur FLOAT)
    > ROW FORMAT DELIMITED FIELDS TERMINATED BY ','
    > LOCATION '/BigData/';
OK
Time taken: 0.487 seconds
hive> SELECT * FROM used_cars_goodnews LIMIT 5;
Query ID = goodnewsagbadu_20221027202500_073a8248-0ac8-42e3-8f6b-e37d4f4b38e9
Total jobs = 1
Launching Job 1 out of 1
Tez session was closed. Reopening...
Session re-established.
Session re-established.
Status: Running (Executing on YARN cluster with App id application_1666900914085_0002)

-----  

      VERTICES      MODE      STATUS TOTAL COMPLETED RUNNING PENDING FAILED KILLED  

-----  

Map 1 ..... container SUCCEEDED 5 5 0 0 0 0  

-----  

VERTICES: 01/01 [=====>>>] 100% ELAPSED TIME: 11.84 s  

-----  

OK
toyota corolla 181000 2002 1598 81 other man 5 5 2016-06-24 18:46:35.028279+00 2016-07-08 17:03:10.455408
+00 2183.57
skoda rapid 19976 2015 1197 63 other man 5 5 2016-06-24 18:46:35.912252+00 2016-07-30 16:56:27.391382
+00 10695.78
ford mondeo 139000 2013 2179 147 other auto 5 5 2016-06-24 18:46:36.134351+00 2016-08-11 17:01:34.445387
+00 13656.55
skoda rapid 10928 2015 1197 63 other man 5 5 2016-06-24 18:46:36.395324+00 2016-07-04 17:08:24.367613
+00 10362.32
bmw 14660 NULL 1499 100 other auto 5 5 2016-06-24 18:46:36.633624+00 2016-07-25 17:00:01.038165
```

Appendix 2: Removing any records that do not have a price and checking the records to confirm.

```

hive> INSERT OVERWRITE TABLE used_cars_goodnews
    > SELECT * FROM used_cars_goodnews
    > WHERE price_eur IS NOT NULL or price_eur <> '';
Query ID = goodnewsagbadu_20221105183347_5c19a6f2-e8b4-4e85-a80b-ee4fad9b24d8
Total jobs = 1
Launching Job 1 out of 1
Status: Running (Executing on YARN cluster with App id application_1667672896161_0001)

-----  

      VERTICES      MODE      STATUS      TOTAL      COMPLETED      RUNNING      PENDING      FAILED      KILLED  

-----  

Map 1           container     INITED       5          0          0          0          5          0  

-----  

      0  

      VERTICES      MODE      STATUS      TOTAL      COMPLETED      RUNNING      PENDING      FAILED      KILLED  

-----  

-----  

Map 1           container     INITED       5          0          0          0          5          0  

-----  

      0  

      VERTICES      MODE      STATUS      TOTAL      COMPLETED      RUNNING      PENDING      FAILED      KILLED  

-----  


```

```

hive> select count(*) from used_cars_goodnews where price_eur is null or price_eur = '';
Query ID = goodnewsagbadu_20221105183902_ad5dacc9ead4b6a-8e0a-7e9386b0ea07
Total jobs = 1
Launching Job 1 out of 1
Status: Running (Executing on YARN cluster with App id application_1667672896161_0001)

-----  

      VERTICES      MODE      STATUS      TOTAL      COMPLETED      RUNNING      PENDING      FAILED      KILLED  

-----  

Map 1           container     RUNNING       5          0          3          2          0  

-----  

      0  

      VERTICES      MODE      STATUS      TOTAL      COMPLETED      RUNNING      PENDING      FAILED      KILLED  

-----  

-----  

Map 1           container     RUNNING       5          0          3          2          0  

-----  

      0  

      VERTICES      MODE      STATUS      TOTAL      COMPLETED      RUNNING      PENDING      FAILED      KILLED  

-----  

-----  

Map 1 .....    container     RUNNING       5          3          2          0          0  

-----  

      0  

      VERTICES      MODE      STATUS      TOTAL      COMPLETED      RUNNING      PENDING      FAILED      KILLED  

-----  

-----  

Map 1 .....    container     SUCCEEDED     5          5          0          0          0  

-----  

      0  

      VERTICES      MODE      STATUS      TOTAL      COMPLETED      RUNNING      PENDING      FAILED      KILLED  

-----  

-----  

Map 1 .....    container     SUCCEEDED     5          5          0          0          0  

Reducer 2 .....    container     SUCCEEDED     1          1          0          0          0  

-----  

VERTICES: 02/02  [=====>>] 100%  ELAPSED TIME: 2.24 s  

-----  

OK  

0  

Time taken: 3.077 seconds, Fetched: 1 row(s)
hive> █

```

Appendix 3: Removing any records that do not have a model listed and checking the records to confirm.

```
hive> INSERT OVERWRITE TABLE used_cars_goodnews
> SELECT * FROM used_cars_goodnews
> WHERE model <> '';
Query ID = goodnewsagbadu_20221105184723_4eec1659-88f7-47aa-94d5-47dac1a801e0
Total jobs = 1
Launching Job 1 out of 1
Tez session was closed. Reopening...
Session re-established.
Session re-established.
Status: Running (Executing on YARN cluster with App id application_1667672896161_0002)

-----  

      VERTICES     MODE      STATUS  TOTAL  COMPLETED  RUNNING  PENDING  FAILED  KILLED  

-----  

Map 1           container    INITED    5       0          0        0       5       0  

-----  

0  

      VERTICES     MODE      STATUS  TOTAL  COMPLETED  RUNNING  PENDING  FAILED  KILLED  

-----  

0  

Map 1           container    INITED    5       0          0        0       5       0  

-----  

0  

      VERTICES     MODE      STATUS  TOTAL  COMPLETED  RUNNING  PENDING  FAILED  KILLED  

-----  

0  

Map 1           container    INITED    5       0          0        0       5       0  

-----  

0
```

```
hive> select count(*) from used_cars_goodnews where model is null or model = '';
Query ID = goodnewsagbadu_20221105185009_4ec2ee4d-49de-43a4-b687-671d67eb3d57
Total jobs = 1
Launching Job 1 out of 1
Status: Running (Executing on YARN cluster with App id application_1667672896161_0002)

-----  

      VERTICES     MODE      STATUS  TOTAL  COMPLETED  RUNNING  PENDING  FAILED  KILLED  

-----  

Map 1 ..... container    SUCCEEDED    6       6          0        0       0       0  

Reducer 2 ..... container    SUCCEEDED    1       1          0        0       0       0  

-----  

VERTICES: 02/02  [=====>>] 100%  ELAPSED TIME: 12.14 s  

-----  

OK  

0  

Time taken: 13.003 seconds, Fetched: 1 row(s)
hive> █
```

Appendix 4: Group the price column and count the number of unique prices

```

hive> select count(price_eur) AS count_price, price_eur from used_cars_goodnews group by price_eur having count(price_eur) >= 100 order by count_price DESC limit 10;
Query ID = goodnewsagbadu_20221105190020_ba9e6e82-d097-486e-ac74-bc556fb1f8dc
Total jobs = 1
Launching Job 1 out of 1
Status: Running (Executing on YARN cluster with App id application_1667672896161_0003)

-----  
 VERTICES | MODE | STATUS | TOTAL | COMPLETED | RUNNING | PENDING | FAILED | KILLED |
-----  

Map 1 ..... container SUCCEEDED 6 6 0 0 0 0  

Reducer 2 ..... container SUCCEEDED 2 2 0 0 0 0  

Reducer 3 ..... container SUCCEEDED 1 1 0 0 0 0  

-----  

VERTICES: 03/03 [=====>>>] 100% ELAPSED TIME: 14.59 s  

-----  

OK  

574753 1295.34  

5298 9900.0  

5002 12900.0  

4954 10900.0  

4807 11900.0  

4590 4900.0  

4481 8900.0  

4254 5900.0  

4146 4500.0  

4146 3500.0  

Time taken: 15.405 seconds, Fetched: 10 row(s)
hive> █

```

Appendix 5: Removing the single price that is repeating across the ads

```

hive> INSERT OVERWRITE TABLE used_cars_goodnews
>   SELECT * FROM used_cars_goodnews
>   WHERE price_eur <> 1295.34;
Query ID = goodnewsagbadu_20221105190751_a0f7742d-fcbc-4e60-afcd7-a6d05b8fc1f2
Total jobs = 1
Launching Job 1 out of 1
Tez session was closed. Reopening...
Session re-established.
Session re-established.
Status: Running (Executing on YARN cluster with App id application_1667672896161_0004)

-----  
 VERTICES | MODE | STATUS | TOTAL | COMPLETED | RUNNING | PENDING | FAILED | KILLED |
-----  

Map 1 ..... container INITED 6 0 0 6 0  

-----  

0  

-----  
 VERTICES | MODE | STATUS | TOTAL | COMPLETED | RUNNING | PENDING | FAILED | KILLED |
-----  

-----  

Map 1 ..... container INITED 6 0 0 6 0  

-----  

0  

-----  
 VERTICES | MODE | STATUS | TOTAL | COMPLETED | RUNNING | PENDING | FAILED | KILLED |
-----  

-----  

Map 1 ..... container INITED 6 0 0 6 0  

-----  

0

```

```

hive> select count(price_eur) AS count_price, price_eur from used_cars_goodnews group by price_eur having count(price_eur) >= 100 order by count_price DESC limit 10;
Query ID = goodnewsagbadu_2022110519107_333b02cc-70a3-4de6-81ff-b2ba8a63cc05
Total jobs = 1
Launching Job 1 out of 1
Status: Running (Executing on YARN cluster with App id application_1667672896161_0004)

-----  
 VERTICES | MODE | STATUS | TOTAL | COMPLETED | RUNNING | PENDING | FAILED | KILLED |
-----  

Map 1 ..... container SUCCEEDED 5 5 0 0 0 0  

Reducer 2 ..... container SUCCEEDED 1 1 0 0 0 0  

Reducer 3 ..... container SUCCEEDED 1 1 0 0 0 0  

-----  

VERTICES: 03/03 [=====>>>] 100% ELAPSED TIME: 12.86 s  

-----  

OK  

5298 9900.0  

5002 12900.0  

4954 10900.0  

4807 11900.0  

4590 4900.0  

4481 8900.0  

4254 5900.0  

4146 3500.0  

4146 4500.0  

4143 6900.0  

Time taken: 13.845 seconds, Fetched: 10 row(s)
hive> █

```

Appendix 6: records where the model does not have a maker value

```

hive> select model,maker from used_cars_goodnews where maker is null or maker = '';
Query ID = goodnewsagbadu_20221105193236_98ac97a7-b552-4d42-9739-5fc50112d675
Total jobs = 1
Launching Job 1 out of 1
Status: Running (Executing on YARN cluster with App id application_1667672896161_0005)

-----
      VERTICES      MODE      STATUS  TOTAL  COMPLETED  RUNNING  PENDING  FAILED  KILLED
-----
      VERTICES      MODE      STATUS  TOTAL  COMPLETED  RUNNING  PENDING  FAILED  KILLED
-----
Map 1 ..... container      SUCCEEDED      5       5       0       0       0       0       0
-----
VERTICES: 01/01  [======>>] 100%  ELAPSED TIME: 0.41 s
-----
OK
Time taken: 1.127 seconds
hive> 

```

Appendix 7: limit price to 2,000 to 3,000,000 Euros

```

hive> INSERT OVERWRITE TABLE used_cars_goodnews SELECT * FROM used_cars_goodnews where price_eur between 2000 and 3000000;
Query ID = goodnewsagbadu_20221106013949_f5b1cd8b-7f16-4b77-859b-06387aedcd4a
Total jobs = 1
Launching Job 1 out of 1
Status: Running (Executing on YARN cluster with App id application_1667672896161_0007)

-----
      VERTICES      MODE      STATUS  TOTAL  COMPLETED  RUNNING  PENDING  FAILED  KILLED
-----
Map 1       container      INITED      5       0       0       5       0
-----           container      INITED      1
0          VERTICES      MODE      STATUS  TOTAL  COMPLETED  RUNNING  PENDING  FAILED  KILLED
-----           00/02  [>>-----]
Map 1       container      INITED      5       0       0       5       0
-----           container      INITED      1
0

```

Appendix: 8 manufacture year will be limited just between 2000 and 2018

```

hive> INSERT OVERWRITE TABLE used_cars_goodnews SELECT * FROM used_cars_goodnews where manufacture_year between 2000 and 2017;
Query ID = goodnewsagbadu_20221106013625_87e3c717-3f8c-4644-9f88-82f394891db7
Total jobs = 1
Launching Job 1 out of 1
Status: Running (Executing on YARN cluster with App id application_1667672896161_0007)

-----
      VERTICES      MODE      STATUS  TOTAL  COMPLETED  RUNNING  PENDING  FAILED  KILLED
-----
Map 1       container      INITED      5       0       0       5       0
-----           container      INITED      1
0          VERTICES      MODE      STATUS  TOTAL  COMPLETED  RUNNING  PENDING  FAILED  KILLED
-----           00/02  [>>-----]
Map 1       container      INITED      5       0       0       5       0
-----           container      INITED      1
0

```

Appendix: 9 Creating a new table to remove color slug and fuel type which has missing value above 50% of the count of clean data.

```

hive> CREATE TABLE used_cars_goodnews1 AS SELECT maker,model,mileage,manufacture_year,engine_displacement,engine_power,body_type,stk_year,transmission,door_count,
seat_count,date_created,date_last_seen,price_eur FROM used_cars_goodnews;
Query ID = goodnewsagbadu_20221106022407_e2be903a-eb20-40fc-8f9b-1a288759ac17
Total jobs = 1
Launching Job 1 out of 1
Tez session was closed. Reopening...
Session re-established.
Session re-established.
Status: Running (Executing on YARN cluster with App id application_1667672896161_0010)

-----  

  VERTICES      MODE      STATUS TOTAL COMPLETED RUNNING PENDING FAILED KILLED  

-----  

  VERTICES      MODE      STATUS TOTAL COMPLETED RUNNING PENDING FAILED KILLED  

-----  

  VERTICES      MODE      STATUS TOTAL COMPLETED RUNNING PENDING FAILED KILLED

```

Appendix: 10 Top 15 average prices of cars.

```

hive> select maker, model,round(avg(price_eur),2) as price_avg from used_cars_goodnews1 group by maker,model order by price_avg DESC limit 15;
Query ID = goodnewsagbadu_20221107032631_40343a53-162b-4b18-b1fb-ffbae309bba3
Total jobs = 1
Launching Job 1 out of 1
Status: Running (Executing on YARN cluster with App id application_1667672896161_0016)

-----  

  VERTICES      MODE      STATUS TOTAL COMPLETED RUNNING PENDING FAILED KILLED  

-----  

Map 1 ..... container    SUCCEEDED   5      5      0      0      0      0  

Reducer 2 ..... container    SUCCEEDED   1      1      0      0      0      0  

Reducer 3 ..... container    SUCCEEDED   1      1      0      0      0      0  

-----  

VERTICES: 03/03 [=====>>>] 100% ELAPSED TIME: 12.37 s  

-----  

OK
lamborghini     aventador     365960.99
porsche         carrera-gt    302045.22
bmw             z8           245118.6
tesla           roadster     192880.28
tesla           model-x      176418.32
bentley         brooklands   138501.3
rolls-royce     wraith      137663.46
bentley         continental-gtc 129138.88
bmw             i8           112273.43
bentley         continental-gt 105946.89
lamborghini     gallardo     103514.99
honda           nsx          99911.1
maserati         grancabrio   94099.4
audi             r8           92666.45
audi             rs7          85153.2
Time taken: 13.37 seconds, Fetched: 15 row(s)
hive>

```

Appendix: 11 Lowest 15 average Price of cars.

```

hive> select maker, model,round(avg(price_eur),2) as price_avg from used_cars_goodnews1 group by maker,model order by price_avg ASC limit 15;
Query ID = goodnewsagbadu_20221107033552_46f60898-a4fb-4fa0-a61d-4558218d460f
Total jobs = 1
Launching Job 1 out of 1
Status: Running (Executing on YARN cluster with App id application_1667672896161_0016)

-----  

  VERTICES      MODE      STATUS TOTAL COMPLETED RUNNING PENDING FAILED KILLED  

-----  

Map 1 ..... container    SUCCEEDED   5      5      0      0      0      0  

Reducer 2 ..... container    SUCCEEDED   1      1      0      0      0      0  

Reducer 3 ..... container    SUCCEEDED   1      1      0      0      0      0  

-----  

VERTICES: 03/03 [=====>>>] 100% ELAPSED TIME: 2.43 s  

-----  

OK
renault         safrane     2200.81
chrysler        neon        2350.45
opel            manta       2390.08
kia              joice       2455.31
chrysler        300m       2532.7
kia              shuma       2549.38
ford             puma        2577.43
skoda            favorit    2590.67
seat             inca        2615.11
dodge            intrepid   2654.51
hyundai         santamo    2659.15
chevrolet       alero       2661.57
mazda            626        2690.32
kia              clarus     2700.41
ford             cougar     2707.52
Time taken: 3.21 seconds, Fetched: 15 row(s)
hive>

```

Appendix: 12 Audi Economy class 3000 - 15000 Price range and Mileage < 1000

```
hive> insert overwrite local directory '/home/goodnewsagbadu/hive_output' row format delimited fields terminated by ','
  > select maker, model,price_eur from used_cars_goodnews1 where price_eur between 2000 and 15000 and mileage < 1000 and maker = 'audi' order by price_eur ASC 1
limit 300;
Query ID = goodnewsagbadu_20221120044718_544e7fa9-5831-4164-9d4e-fa60411053e2
Total jobs = 1
Launching Job 1 out of 1
Status: Running (Executing on YARN cluster with App id application_1668874956988_0012)

-----  

  VERTICES    MODE      STATUS TOTAL COMPLETED RUNNING PENDING FAILED KILLED  

-----  

Map 1        container    INITED   5      0      0      5      0  
-user 2        container    INITED   1      0      0      0      0  
-----  

  VERTICES    MODE      STATUS TOTAL COMPLETED RUNNING PENDING FAILED KILLED  

-----  

0 s  Map 1        container    INITED   5      0      0      5      0  
-user 2        container    INITED   1      0      0      0      0  
-----  

  VERTICES    MODE      STATUS TOTAL COMPLETED RUNNING PENDING FAILED KILLED  

-----  

1 s  Map 1        container    INITED   5      0      0      5      0  
-user 2        container    INITED   1      0      0      0      0  
-----
```

Appendix: 13 Audi Economy class 3000 - 15000 Price range and Mileage < 1000

```
hive> insert overwrite local directory '/home/goodnewsagbadu/hive_output' row format delimited fields terminated by ','
  > select maker, model,price_eur from used_cars_goodnews1 where price_eur between 2000 and 15000 and mileage < 1000 and maker = 'volkswagen' order by price_eur
ASC limit 300;
Query ID = goodnewsagbadu_20221120053904_db46a333-a9e6-4431-b3d5-af805348a7fe
Total jobs = 1
Launching Job 1 out of 1
Status: Running (Executing on YARN cluster with App id application_1668874956988_0014)

-----  

  VERTICES    MODE      STATUS TOTAL COMPLETED RUNNING PENDING FAILED KILLED  

-----  

Map 1        container    INITED   5      0      0      5      0  
-user 2        container    INITED   1      0      0      0      0  
-----  

  VERTICES    MODE      STATUS TOTAL COMPLETED RUNNING PENDING FAILED KILLED  

-----  

0 s  Map 1        container    INITED   5      0      0      5      0  
-user 2        container    INITED   1      0      0      0      0  
-----  

  VERTICES    MODE      STATUS TOTAL COMPLETED RUNNING PENDING FAILED KILLED  

-----  

0 s  Map 1        container    INITED   5      0      0      5      0  
-user 2        container    INITED   1      0      0      0      0  
-----
```

Appendix: 14 Opel Economy class 3000 - 15000 Price range and Mileage < 1000

```
hive> insert overwrite local directory '/home/goodnewsagbadu/hive_output' row format delimited fields terminated by ','
  > select maker, model,price_eur from used_cars_goodnews1 where price_eur between 2000 and 15000 and mileage < 1000 and maker = 'opel' order by price_eur ASC 1
limit 300;
Query ID = goodnewsagbadu_20221120055033_c9d9e0e3-602d-4c33-ad9-427be68cd073
Total jobs = 1
Launching Job 1 out of 1
Status: Running (Executing on YARN cluster with App id application_1668874956988_0015)

-----  

  VERTICES    MODE      STATUS TOTAL COMPLETED RUNNING PENDING FAILED KILLED  

-----  

Map 1        container    INITED   5      0      0      5      0  
-user 2        container    INITED   1      0      0      0      0  
-----  

  VERTICES    MODE      STATUS TOTAL COMPLETED RUNNING PENDING FAILED KILLED  

-----  

0 s  Map 1        container    INITED   5      0      0      5      0  
-user 2        container    INITED   1      0      0      0      0  
-----  

  VERTICES    MODE      STATUS TOTAL COMPLETED RUNNING PENDING FAILED KILLED  

-----  

0 s  Map 1        container    INITED   5      0      0      5      0  
-user 2        container    INITED   1      0      0      0      0  
-----
```

Appendix: 15 Toyota Economy class 3000 - 15000 Price range and Mileage < 1000

```

hive> insert overwrite local directory '/home/goodnewsagbadu/hive_output' row format delimited fields terminated by ','
> select maker, model, price_eur from used_cars_goodnews1 where price_eur between 2000 and 15000 and mileage < 1000 and maker = 'toyota' order by price_eur ASC
limit 300;
Query ID = goodnewsagbadu_20221120060820_2bb0bec1-b939-4f82-bca5-9bb4560d673d
Total jobs = 1
Launching Job 1 out of 1
Status: Running (Executing on YARN cluster with App id application_1668874956988_0016)

-----  

      VERTICES    MODE     STATUS TOTAL COMPLETED RUNNING PENDING FAILED KILLED  

-----  

Map 1       container    INITED   5      0      0      5      0  

-----  

1          0  

      VERTICES    MODE     STATUS TOTAL COMPLETED RUNNING PENDING FAILED KILLED  

-----  

-----  

2 s  

Map 1       container    INITED   5      0      0      5      0  

-----  

1          0  

      VERTICES    MODE     STATUS TOTAL COMPLETED RUNNING PENDING FAILED KILLED  

-----  

-----  

-TICES: 00/02 [>>-----] 0% ELAPSED TIME: 0.0  

-----  

-TICES: 00/02 [>>-----] 0% ELAPSED TIME: 0.5

```

Appendix: 14 Mercedes Middle class/High Income 15000 200000 Price range and Mileage < 1000

```
hive> insert overwrite local directory '/home/goodnewsagbadu/hive_output' row format delimited fields terminated by ',''
  > select maker, model,price_eur from used_cars_goodnews1 where price_eur between 15000 and 200000 and mileage < 1000 and maker = 'mercedes-benz' order by pric
e_eur ASC limit 300;
Query ID = goodnewsagbadu_20221120172624_e7d302bf-c4a0-4a7b-a03e-fa6899a3c935
Total jobs = 1
Launching Job 1 out of 1
Status: Running (Executing on YARN cluster with App id application_1668874956988_0022)

-----

| VERTICES  | MODE      | STATUS    | TOTAL | COMPLETED | RUNNING | PENDING | FAILED | KILLED |
|-----------|-----------|-----------|-------|-----------|---------|---------|--------|--------|
| Map 1     | container | SUCCEEDED | 5     | 5         | 0       | 0       | 0      | 0      |
| Reducer 2 | container | SUCCEEDED | 1     | 1         | 0       | 0       | 0      | 0      |


-----  

VERTICES: 02/02 [=====>>>] 100% ELAPSED TIME: 12.68 s  

-----  

Moving data to local directory /home/goodnewsagbadu/hive_output
OK
Time taken: 17.337 seconds
hive>
```

Appendix: 15 Mazda Middle class/High Income 15000 200000 Price range and Mileage < 1000

```

hive> insert overwrite local directory '/home/goodnewsagbadu/hive_output' row format delimited fields terminated by ','
  > select maker, model, price_eur from used_cars_goodnews1 where price_eur between 15000 and 200000 and mileage < 1000 and maker = 'mazda' order by price_eur AS
C limit 300;
Query ID = goodnewsagbadu_20221120204130_0e0df419-000a-4fc0-8d3f-06cd9bae0f84
Total jobs = 1
Launching Job 1 out of 1
Status: Running (Executing on YARN cluster with App id application_1668874956988_0024)

-----  

      VERTICES    MODE      STATUS  TOTAL  COMPLETED  RUNNING  PENDING  FAILED  KILLED  

-----  

Map 1 ..... container  SUCCEEDED   5      5      0      0      0      0  

Reducer 2 ..... container  SUCCEEDED   1      1      0      0      0      0  

-----  

VERTICES: 02/02 [=====>>>] 100% ELAPSED TIME: 13.84 s

Moving data to local directory /home/goodnewsagbadu/hive_output
OK
Time taken: 18.539 seconds
hive> []

```

Appendix: 16 Nissan Middle class/High Income 15000 200000 Price range and Mileage < 1000

```
hive> insert overwrite local directory '/home/goodnewsagbadu/hive_output' row format delimited fields terminated by ',''
> select maker, model,price_eur from used_cars_goodnews1 where price_eur between 15000 and 200000 and mileage < 1000 and maker = 'nissan' order by price_eur ASC
SC limit 300;
Query ID = goodnewsagbadu_20221120204628_25d6fdf6-edec-45c5-92e7-05fe4ae5105c
Total jobs = 1
Launching Job 1 out of 1
Status: Running (Executing on YARN cluster with App id application_1668874956988_0024)

-----  

      VERTICES    MODE     STATUS TOTAL COMPLETED RUNNING PENDING FAILED KILLED  

-----  

Map 1 ..... container SUCCEEDED   5      5      0      0      0      0      0  

Reducer 2 ..... container SUCCEEDED   1      1      0      0      0      0      0  

-----  

VERTICES: 02/02 [=====>>>] 100% ELAPSED TIME: 12.01 s  

-----  

Moving data to local directory /home/goodnewsagbadu/hive_output
OK
Time taken: 12.864 seconds
hive> █
```

Appendix: 17 Tesla Middle class/High Income 15000 200000 Price range and Mileage < 1000

```
hive> insert overwrite local directory '/home/goodnewsagbadu/hive_output' row format delimited fields terminated by ',''
> select maker, model,price_eur from used_cars_goodnews1 where price_eur between 15000 and 200000 and mileage < 1000 and maker = 'tesla' order by price_eur ASC
C limit 300;
Query ID = goodnewsagbadu_20221120205428_7bbd6fc1-8f7c-42a4-a8ae-d1596c77386e
Total jobs = 1
Launching Job 1 out of 1
Status: Running (Executing on YARN cluster with App id application_1668874956988_0025)

-----  

      VERTICES    MODE     STATUS TOTAL COMPLETED RUNNING PENDING FAILED KILLED  

-----  

Map 1 ..... container SUCCEEDED   5      5      0      0      0      0      0  

Reducer 2 ..... container SUCCEEDED   1      1      0      0      0      0      0  

-----  

VERTICES: 02/02 [=====>>>] 100% ELAPSED TIME: 12.87 s  

-----  

Moving data to local directory /home/goodnewsagbadu/hive_output
OK
Time taken: 13.783 seconds
hive> █
```

Appendix: 18 Tesla Middle class/High Income 15000 200000 Price range and Mileage < 1000

```
hive> insert overwrite local directory '/home/goodnewsagbadu/hive_output' row format delimited fields terminated by ',''
> select maker, model,price_eur from used_cars_goodnews1 where price_eur between 15000 and 200000 and mileage < 1000 and maker = 'audi' order by price_eur ASC
limit 300;
Query ID = goodnewsagbadu_20221120210017_4ccdd421-44e2-4359-bf38-d8887246eb35
Total jobs = 1
Launching Job 1 out of 1
Tez session was closed. Reopening...
Session re-established.
Session re-established.
Status: Running (Executing on YARN cluster with App id application_1668874956988_0026)

-----  

      VERTICES    MODE     STATUS TOTAL COMPLETED RUNNING PENDING FAILED KILLED  

-----  

Map 1 ..... container SUCCEEDED   5      5      0      0      0      0      0  

Reducer 2 ..... container SUCCEEDED   1      1      0      0      0      0      0  

-----  

VERTICES: 02/02 [=====>>>] 100% ELAPSED TIME: 13.75 s  

-----  

Moving data to local directory /home/goodnewsagbadu/hive_output
OK
Time taken: 21.833 seconds
hive> █
```

Appendix: 19 Fiat Middle class/High Income 15000 200000 Price range and Mileage < 1000

```
hive> insert overwrite local directory '/home/goodnewsagbadu/hive_output' row format delimited fields terminated by ',''
  > select maker, model,price_eur from used_cars_goodnews1 where price_eur between 15000 and 200000 and mileage < 1000 and maker = 'fiat' order by price_eur ASC
limit 300;
Query ID = goodnewsagbadu_20221120224311_fb57b0f4-7fec-491a-8f7b-9106474df223
Total jobs = 1
Launching Job 1 out of 1
Status: Running (Executing on YARN cluster with App id application_1668874956988_0027)

-----  

  VERTICES    MODE      STATUS TOTAL COMPLETED RUNNING PENDING FAILED KILLED  

-----  

Map 1 ..... container    SUCCEEDED   5      5      0      0      0      0  

Reducer 2 ..... container    SUCCEEDED   1      1      0      0      0      0  

-----  

VERTICES: 02/02 [=====>>>] 100% ELAPSED TIME: 12.97 s  

-----  

Moving data to local directory /home/goodnewsagbadu/hive_output
OK
Time taken: 13.806 seconds
hive>
```

Reference:

Anna. (2022, September 13). *Top cheapest countries to buy a car in Europe [2022]*.

Russianvagabond. Retrieved November 5, 2022, from <https://russianvagabond.com/top-cheapest-countries-to-buy-a-car-in-europe/>

New and used cars marketplace autoscout24. AutoScout24. (n.d.). Retrieved November 5, 2022, from <https://www.autoscout24.com/?genlnk=navi&genlnkorigin=gb-vm-uc-list>

R. and M. (n.d.). *European used car market: Size & Forecast with Impact Analysis of covid-19 (2021-2025)*. Research and Markets - Market Research Reports - Welcome. Retrieved November 7, 2022, from <https://www.researchandmarkets.com/reports/5423285/european-used-car-market-size-and-forecast>

Europe's shrinking middle class. Eurofound. (n.d.). Retrieved November 8, 2022, from <https://www.eurofound.europa.eu/sv/publications/blog/europes-shrinking-middle-class>

Published by D. Clark, & 27, S. (2022, September 27). *Annual Net Earnings Europe 2020*. Statista. Retrieved November 8, 2022, from <https://www.statista.com/statistics/1201068/annual-net-earnings-in-the-eu/>

Median income by country 2022. (n.d.). Retrieved November 8, 2022, from <https://worldpopulationreview.com/country-rankings/median-income-by-country>

Research and Markets. (2022, August 3). *European used car market report 2022: The need for trustworthy technical car inspection companies is expected to drive market growth.* GlobeNewswire News Room. Retrieved November 8, 2022, from <https://www.globenewswire.com/en/news-release/2022/08/03/2491377/28124/en/European-Used-Car-Market-Report-2022-The-Need-for-Trustworthy-Technical-Car-Inspection-Companies-is-Expected-to-Drive-Market-Growth.html>

Bekker, H. (2022, January 26). *2021 (full year) Europe : Best-selling car manufacturers and brands.* Car Sales Statistics. Retrieved November 21, 2022, from <https://www.best-selling-cars.com/europe/2021-full-year-europe-best-selling-car-manufacturers-and-brands/>

Staff, C. (2021, July 12). *Mileage or age? what to look for when buying a used car.* Carpages Blog. Retrieved November 21, 2022, from <https://www.carpages.ca/blog/mileage-or-age/>

Dan Winter. (2021, October 6). *5 benefits of regular auto maintenance.* Dependable Car Care. Retrieved November 21, 2022, from <https://www.dependablecarcare.com/blog/5-benefits-of-regular-auto-maintenance>