ReCell

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Business Problem Overview and Solution Approach

- A market opportunity exists to enter the cell phone reseller industry.
- There is an abundance of phone characteristics that can affect the pricing of used cell phones. How can a company efficiently and effectively calculate pricing for used cell phones despite a multitude of variables?
- Pricing affects all businesses and can determine the market position of a company. Market forces consistently weigh on price. A pricing strategy will determine financial margins, how investors value the firm, and top line profitability of the company.
- Using regression to identify a line of best fit equation for pricing can allow for an efficient and consistent opportunity to price used phones. Consistency of decisions, including pricing, over time periods is valued by customers and investors.

Data Overview

- Data on 3,571 used phones were collected
- This data included 15 variables

Brand Name	Name of manufacturing brand
Operating System	OS on which the phone runs
Screen Size	Size of the screen in cm
4g	Whether 4G is available or not
5g	Whether 5G is available or not
Main Camera Megapixels	Resolution of the rear camera in megapixels
Selfie Camera Megapixels	Resolution of the front camera in megapixels
Internal Memory	Amount of internal memory (ROM) in GB

RAM	Amount of RAM in GB
Battery	Energy capacity of the phone battery in mAh
Weight	Weight of the phone in grams
Release Year	Year when the phone model was released
Days Used	Number of days the used/refurbished phone has been used
New Price	Price of a new phone of the same model in euros
Used Price	Price of the Used/Refurbished phone in euros

Data Overview

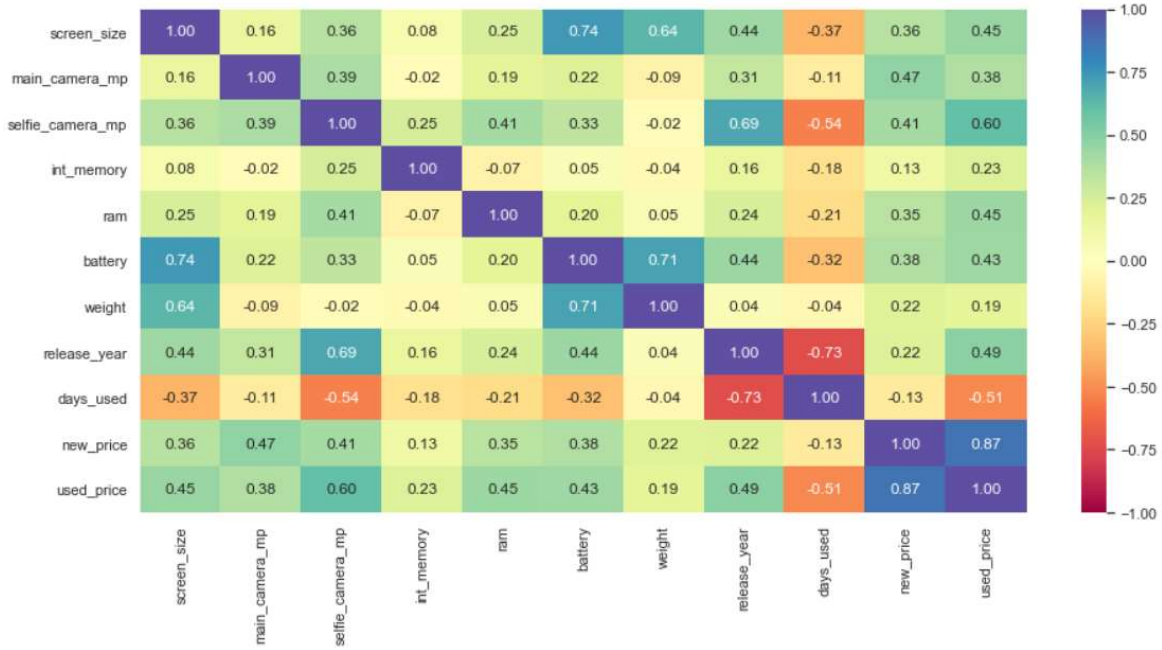
There were several variables missing data values within the 3,571 used phone population:

- Main Camera megapixels: missing 180 values
- Internal Memory: missing 10 values
- RAM: missing 10 values
- Weight: missing 7 values
- Battery: missing 6 values
- Selfie Camera megapixels: missing 2 values

As these are integer values, we replaced the missing values with the following median values:

- Main Camera megapixels: median value of 8
- Internal Memory: median value of 32
- RAM: median value of 4
- Weight: median value of 159
- Battery: median value of 3000
- Selfie Camera megapixels: median value of 5

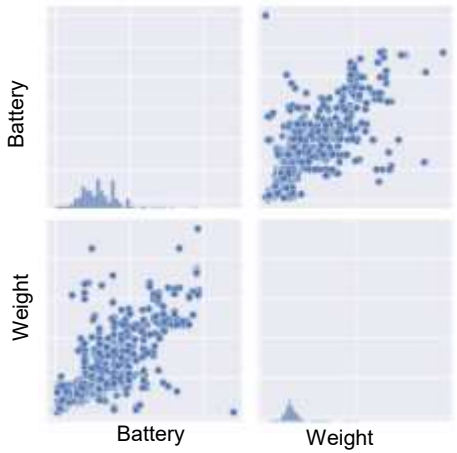
Correlation Data Analysis

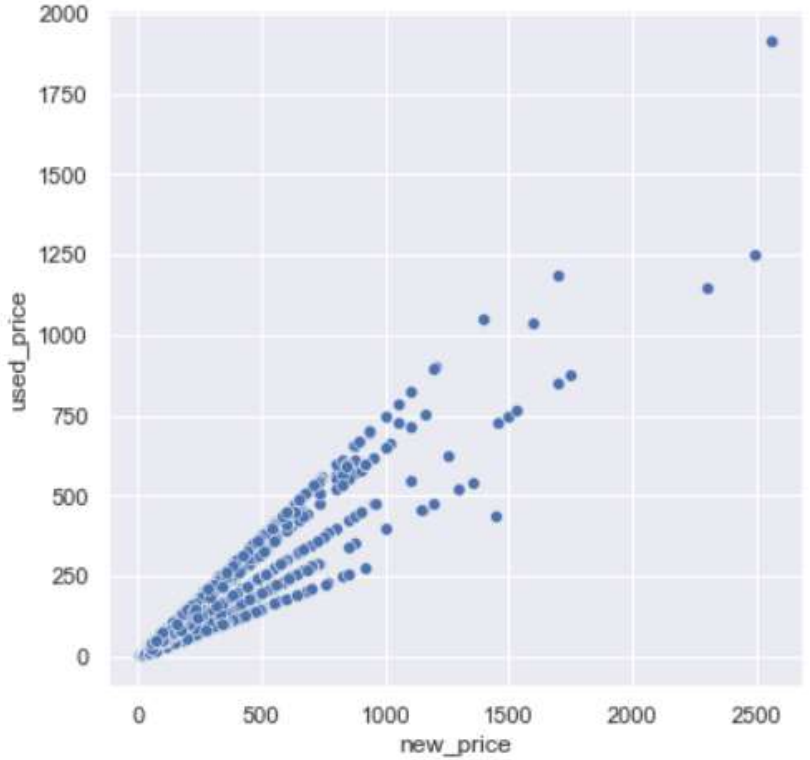


- Used price is most closely correlated to the new price.
- Selfie camera megapixels also provides a relatively strong correlation to the price.
- All variables appear positively correlated except days used.

Exploratory Data Analysis – Strong Linear Patterns

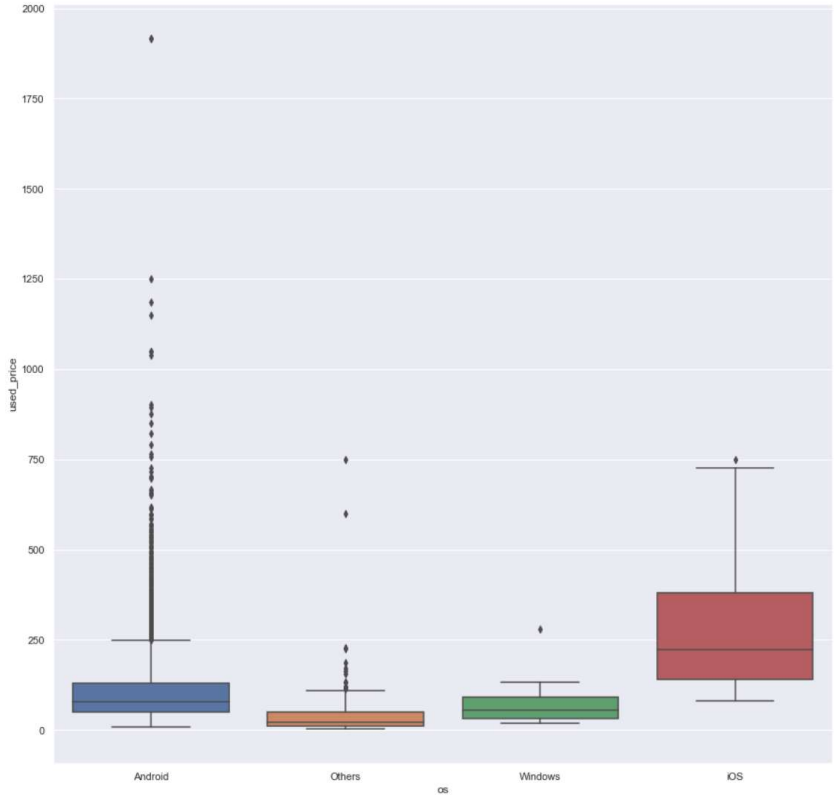
- The Scatterplot paring the used price with new prices visualizes strong linear relationships
- Battery and Weight are two other variables that appear to be positively correlated with normal distributions.





Exploratory Data Analysis – Outlier Identification

- Operating systems were isolated to identify outliers for used and new prices.
- The Android Operating system was identified as having a significant amount of outliers.
- Outliers were identified and removed from the data to better fit a regression model.
- Removing outliers within new and used prices decreased the data population to 3,450.



Model Performance Summary

- Regression testing was leveraged to identify a line of best fit to price all used phones.
- Accuracy of line of best fit can be explained by the following statistics:

Statistic	Training Set	Test Set
R-Squared	0.9452839434052618	0.9367482592294135
Root Mean Square Error	16.394726139321644	17.119211146538838

Key Values Affecting Price

- Main Camera Megapixels
- Selfie Camera Megapixels
- Internal Memory
- Ram
- Release Year
- Days Used
- New Price

Pricing Model Deliverable #1

The following equation can be used to price all phones:

Price = -1624.7380934470625 + (0.053543257233632964)*(screen_size) + (-0.8059880670283929)*(main_camera_mp) + (0.6139278221200691)*(selfie_camera_mp) + (0.035250008079695194)*(int_memory) + (2.8047927240222434)*(ram) + (-0.00036886250308776347)*(battery) + (-0.007773780146768772)*(weight) + (0.8475793211476059)*(release_year) + (-0.09539020733014647)*(days_used) + (0.42192819655928737)*(new_price) + (0.17683870408045266)*(brand_name_Acer) + (0.11409920144222552)*(brand_name_Alcatel) + (-3.611314225928028)*(brand_name_Apple) + (0.08677380329715056)*(brand_name_Asus) + (5.661038962081446)*(brand_name_BlackBerry) + (4.932112901893202)*(brand_name_Celkon) + (-0.8951047730223278)*(brand_name_Coolpad) + (-6.186673023060855)*(brand_name_Gionee) + (38.91975923037877)*(brand_name_Google) + (-0.4720491164182672)*(brand_name_HTC) + (-4.7617104438507285)*(brand_name_Honor) + (-2.3828550916040747)*(brand_name_Huawei) + (-16.73142429585952)*(brand_name_Infinix) + (2.400784090794901)*(brand_name_Karbonn) + (1.3911476829752747)*(brand_name_LG) + (1.1825602038011374)*(brand_name_Lava) + (-3.9500638709963978)*(brand_name_Lenovo) + (-1.0382852126359072)*(brand_name_Meizu) + (1.549807013143882)*(brand_name_Micromax) + (-0.7052107172917577)*(brand_name_Microsoft) + (-2.1718328954287993)*(brand_name_Motorola) + (-8.527877119398536)*(brand_name_Nokia) + (6.782538413228437)*(brand_name_OnePlus) + (-5.523623518801358)*(brand_name_Oppo) + (-0.10193153821370382)*(brand_name_Others) + (-1.4685938547421555)*(brand_name_Panasonic) + (-8.524781297587573)*(brand_name_Realme) + (-1.4863879512396525)*(brand_name_Samsung) + (2.1179308231072813)*(brand_name_Sony) + (6.4320040767325235)*(brand_name_Spice) + (-3.842788929304269)*(brand_name_Vivo) + (1.9907604163679307)*(brand_name_XOLO) + (-2.4274846546746947)*(brand_name_Xiaomi) + (1.0718370067356204)*(brand_name_ZTE) + (1.1183201070051179)*(os_Android) + (-0.915886693708293)*(os_Others) + (3.4088808126179195)*(os_Windows) + (-3.6113142259284348)*(os_iOS) + (1.854242784269469)*(4g_no) + (-1.8542427842662619)*(4g_yes) + (-23.19104135493962)*(5g_no) + (23.191041354939664)*(5g_yes)

Pricing Model Deliverable #2

The following equation removed several variables to better fit the data. The equation can be used to price all brand names except Google, OnePlus, Spice, and XOLO:

Price = -704.0531737377777 + (0.053543257239236475)*(selfie_camera_mp) + (-0.8059880670267164)*(int_memory) + (0.6139278221304648)*(ram) + (0.03525000807973884)*(release_year) + (2.804792724014244)*(days_used) + (-0.00036886250306190026)*(new_price) + (-0.007773780147057652)*(used_price) + (0.8475793210455903)*(brand_name_Acer) + (-0.09539020733050882)*(brand_name_Alcatel) + (0.4219281965590277)*(brand_name_Apple) + (-17.87580677639521)*(brand_name_Asus) + (-17.938546279024962)*(brand_name_BlackBerry) + (-111.92718710861979)*(brand_name_Celkon) + (-17.965871677170913)*(brand_name_Coolpad) + (-12.391606518485354)*(brand_name_Gionee) + (-13.12053257869044)*(brand_name_HTC) + (-18.947750253461447)*(brand_name_Honor) + (-24.23931850354949)*(brand_name_Huawei) + (20.867113750086492)*(brand_name_Infinix) + (-18.52469459690521)*(brand_name_Karbonn) + (-22.814355924283312)*(brand_name_LG) + (-20.435500572040812)*(brand_name_Lava) + (-34.784069776286586)*(brand_name_Lenovo) + (-15.651861389722239)*(brand_name_Meizu) + (-16.66149779749055)*(brand_name_Micromax) + (-16.870085276632167)*(brand_name_Microsoft) + (-22.002709351459313)*(brand_name_Motorola) + (-19.090930693058638)*(brand_name_Nokia) + (-16.502838467313005)*(brand_name_Oppo) + (-18.757856197639022)*(brand_name_Others) + (-20.224478375858393)*(brand_name_Panasonic) + (-26.580522599802514)*(brand_name_Realme) + (-11.270107067227393)*(brand_name_Samsung) + (-23.576268999273246)*(brand_name_Sony) + (-18.154577018661403)*(brand_name_Vivo) + (-19.521239335173487)*(brand_name_Xiaomi) + (-26.57742677796724)*(brand_name_ZTE) + (-19.53903343170927)*(os_Android) + (-15.934714657404236)*(os_Others) + (-11.620641403789392)*(os_Windows) + (-21.895434409766995)*(os_iOS) + (-16.061885064125164)*(4g_no) + (-20.480130135145345)*(4g_yes) + (-16.980808473725084)*(5g_no) + (-197.4607801779984)*(5g_yes)

Business Insights and Recommendations

- Demand and Revenue can be increased by focusing on:
  - Newer models and recent release
  - Phones with more internal memory and RAM
  - Main and selfie cameras with more megapixels
- Outliers removed from the pricing model should be further investigated if a viable opportunity exists to target tech super users who typically spend more on phones and other electronics.

Business Insights and Recommendations

Additional Data can be collected to further improve the pricing equation such as:

- Mobile carrier promotions
- Monthly demand
- Used and Refurbished Phone transaction dates
- Acquisition costs

These variables provide a more systemic approach that will allow for demand forecasting and better understanding of profit margins.

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