Exploratory Data Analysis

G2M insight for Cab Investment firm

March 6, 2021

Agenda

Executive Summary

Problem Statement

Approach

EDA

EDA Summary

Recommendations

Executive Summary

- Descriptive, correlation and contextual analysis were made to help XYZ firm in identification of the right cab company to make investment.
- 6 hypothesis were constructed to gain knowledge on the subject and formulate final recommendation. Main topics included:
  - patterns among cities when it comes to population and cab users
  - market size and access
  - cost, income and profit per each company
  - trip patterns in particular cities per each company
  - payment method preferences
  - economic trends and seasonality
- I recommended XYZ firm to invest in Yellow Cab based on evidence collected and outcome of my analysis.

Problem Statement

XYZ is a private firm in US. Due to remarkable growth in the Cab Industry in last few years and multiple key players in the market, it is planning for an investment in Cab industry and as per their Go-to-Market (G2M) strategy they want to understand the market before taking final decision.

Objective:

XYZ is interested in actionable insights to help them identify the right company to make their investment.

Approach

1. Verification of data sets provided by XYZ, features descriptive analysis and combining into joint data frame.
2. Formulation of hypothesis.
3. Performing EDA over formulated hypothesis (correlation and contextual analysis).
4. Concluding EDA and writing recommendation.

EDA – provided data sets

```
            City  Population   Users
0     NEW YORK NY     8405837  302149
1      CHICAGO IL     1955130  164468
2  LOS ANGELES CA     1595037  144132
3        MIAMI FL     1339155   17675
4  SILICON VALLEY     1177609   27247
Size of 'Cities': (20, 3)

   Transaction ID Date of Travel   Company        City  KM Travelled  \
0        10000011     2016-01-08  Pink Cab  ATLANTA GA         30.45
1        10000012     2016-01-06  Pink Cab  ATLANTA GA         28.62
2        10000013     2016-01-02  Pink Cab  ATLANTA GA          9.04
3        10000014     2016-01-07  Pink Cab  ATLANTA GA         33.17
4        10000015     2016-01-03  Pink Cab  ATLANTA GA          8.73

   Price Charged  Cost of Trip
0         370.95       313.635
1         358.52       334.854
2         125.20        97.632
3         377.40       351.602
4         114.62        97.776
Size of 'Cabs': (359392, 7)

   Customer ID Gender  Age  Income (USD/Month)
0        29290   Male   28               10813
1        27703   Male   27                9237
2        28712   Male   53               11242
3        28020   Male   23               23327
4        27182   Male   33                8536
Size of 'Customers': (49171, 4)

   Transaction ID  Customer ID Payment_Mode
0        10000011        29290         Card
1        10000012        27703         Card
2        10000013        28712         Cash
3        10000014        28020         Cash
4        10000015        27182         Card
Size of 'Transactions': (440098, 3)
```

- XYZ provided 4 data sets:
  - City.csv
  - Cab_Data.csv
  - Customer_ID.csv
  - Transaction_IDta.csv
- There was total of 17 features in provided data sets.
- 4 features repeated across data sets and as master features were used to integrate data into one data frame.
- There was no data duplication while checking on master features in each data sets:
  - ‚City' in City.csv
  - ‚Transaction ID' in Cab_Data.csv
  - ‚Customer ID' in Customer_ID.csv
  - ‚Transaction ID' in Transaction_IDta.csv
- There was no NaN values in provided data.

EDA – created joint data frame

Joint DF:

- Time period of the data: 2016-01-02 to 2018-12-31.
- Total features: 13
- Total data points: 359,392

	Transaction ID	Date of Travel	Company	City	KM Travelled	Price Charged	Cost of Trip	Cost per 1km	Customer ID	Payment_Mode	Gender	Age	Income (USD/Month)
0	10000011	2016-01-08	Pink Cab	ATLANTA GA	30.45	370.95	313.635	10.3	29290	Card	Male	28	10813
1	10000012	2016-01-06	Pink Cab	ATLANTA GA	28.62	358.52	334.854	11.7	27703	Card	Male	27	9237
2	10000013	2016-01-02	Pink Cab	ATLANTA GA	9.04	125.20	97.632	10.8	28712	Cash	Male	53	11242
3	10000014	2016-01-07	Pink Cab	ATLANTA GA	33.17	377.40	351.602	10.6	28020	Cash	Male	23	23327
4	10000015	2016-01-03	Pink Cab	ATLANTA GA	8.73	114.62	97.776	11.2	27182	Card	Male	33	8536

Supporting DF:

- Statistical information about cities
- Total features: 4
- Total data points: 20

	City	Population	Users	Users_100k
0	NEW YORK NY	8405837	302149	3594.514145
1	CHICAGO IL	1955130	164468	8412.126048
2	LOS ANGELES CA	1595037	144132	9036.279409
3	MIAMI FL	1339155	17675	1319.862152
4	SILICON VALLEY	1177609	27247	2313.756094

EDA – hypothsis

- Hypothesis no. 1: bigger cities have more cab users.
- Hypothesis no. 2: bigger cities provide more profit and equal opportunities to cab companies.
- Hypothesis no. 3: costs for cab companies are lower in big cities
- Hypothesis no. 4: drivers in smaller cities have shorter rides than in bigger ones.
- Hypothesis no. 5: customers like to pay by cash.
- Hypothesis no. 6: cab market is stable business and there is no seasonality in the demand.

EDA - Hypothesis no. 1

- Size of the city does not determine quantity of cab users.
- There are cities like San Francisco, Boston or Washington D.C. to have more cab users per 100k citizens than much bigger cities.
- NYC has relatively low number of cab users when calculated per 100k of population. It might be due to developed network of public transpo-rtation.
- To make best investment decision we should analyse more closely market size and market share between Yellow and Pink Can companies in: NYC, San Francisco, Boston, Washington D.S., Loas Angeles and Chicago.

Ranking of cities – total no of users

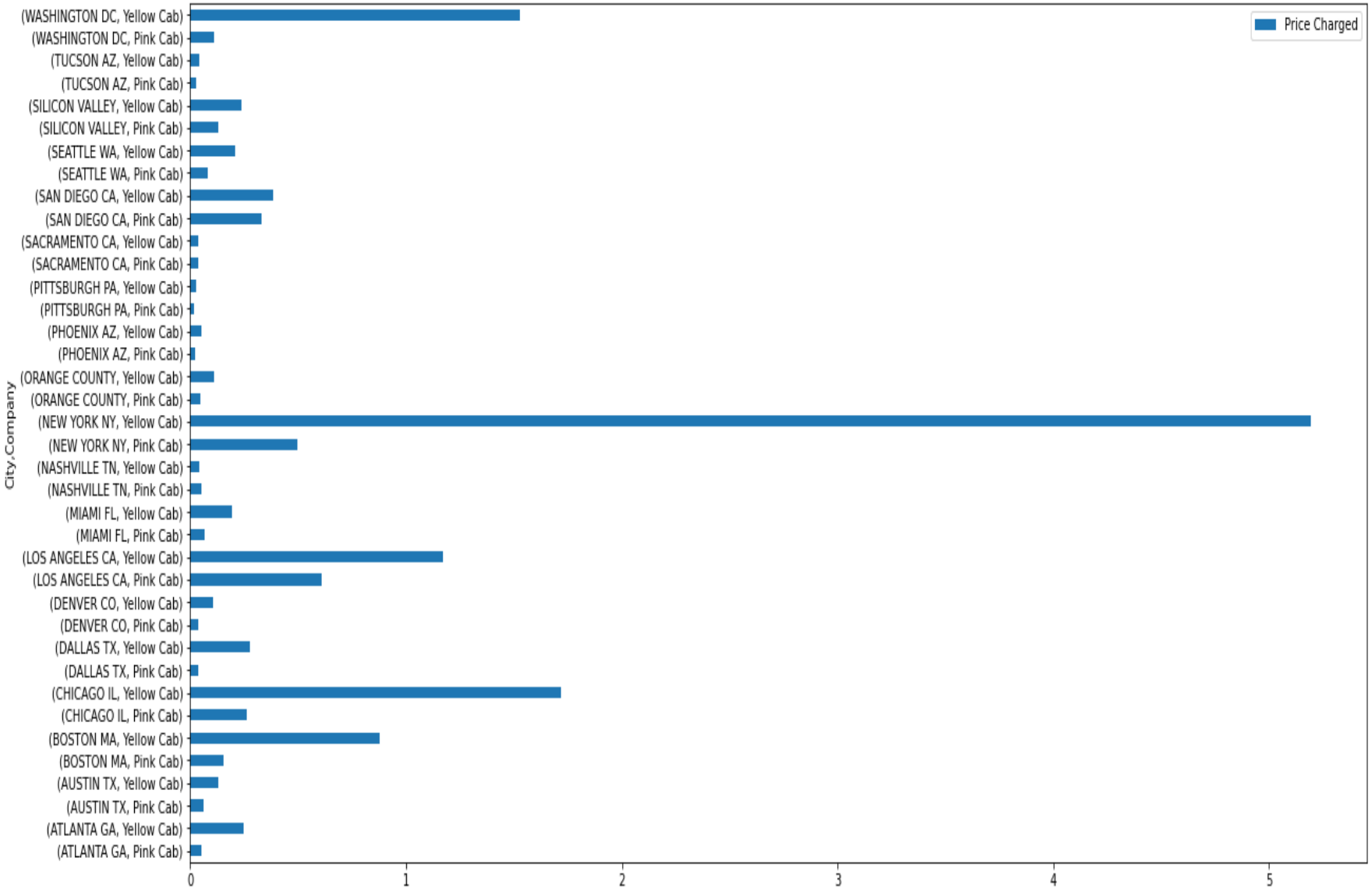
City	Population	Users	Users_100k
NEW YORK NY	8405837	302149	3594.514145
SAN FRANCISCO CA	629591	213609	33928.216890
CHICAGO IL	1955130	164468	8412.126048
LOS ANGELES CA	1595037	144132	9036.279409
WASHINGTON DC	418859	127001	30320.704581
BOSTON MA	248968	80021	32141.078372
SAN DIEGO CA	959307	69995	7296.412931
SILICON VALLEY	1177609	27247	2313.756094
SEATTLE WA	671238	25063	3733.847011
ATLANTA GA	814885	24701	3031.225265
DALLAS TX	942908	22157	2349.858099
MIAMI FL	1339155	17675	1319.862152
AUSTIN TX	698371	14978	2144.705321
ORANGE COUNTY	1030185	12994	1261.326849
DENVER CO	754233	12421	1646.838576
NASHVILLE TN	327225	9270	2832.913133
SACRAMENTO CA	545776	7044	1290.639383
PHOENIX AZ	943999	6133	649.682892
TUCSON AZ	631442	5712	904.596147
PITTSBURGH PA	542085	3643	672.034828

Ranking of cities – users per 100k

City	Population	Users	Users_100k
SAN FRANCISCO CA	629591	213609	33928.216890
BOSTON MA	248968	80021	32141.078372
WASHINGTON DC	418859	127001	30320.704581
LOS ANGELES CA	1595037	144132	9036.279409
CHICAGO IL	1955130	164468	8412.126048
SAN DIEGO CA	959307	69995	7296.412931
SEATTLE WA	671238	25063	3733.847011
NEW YORK NY	8405837	302149	3594.514145
ATLANTA GA	814885	24701	3031.225265
NASHVILLE TN	327225	9270	2832.913133
DALLAS TX	942908	22157	2349.858099
SILICON VALLEY	1177609	27247	2313.756094
AUSTIN TX	698371	14978	2144.705321
DENVER CO	754233	12421	1646.838576
MIAMI FL	1339155	17675	1319.862152
SACRAMENTO CA	545776	7044	1290.639383
ORANGE COUNTY	1030185	12994	1261.326849
TUCSON AZ	631442	5712	904.596147
PITTSBURGH PA	542085	3643	672.034828
PHOENIX AZ	943999	6133	649.682892

EDA - Hypothesis no. 2

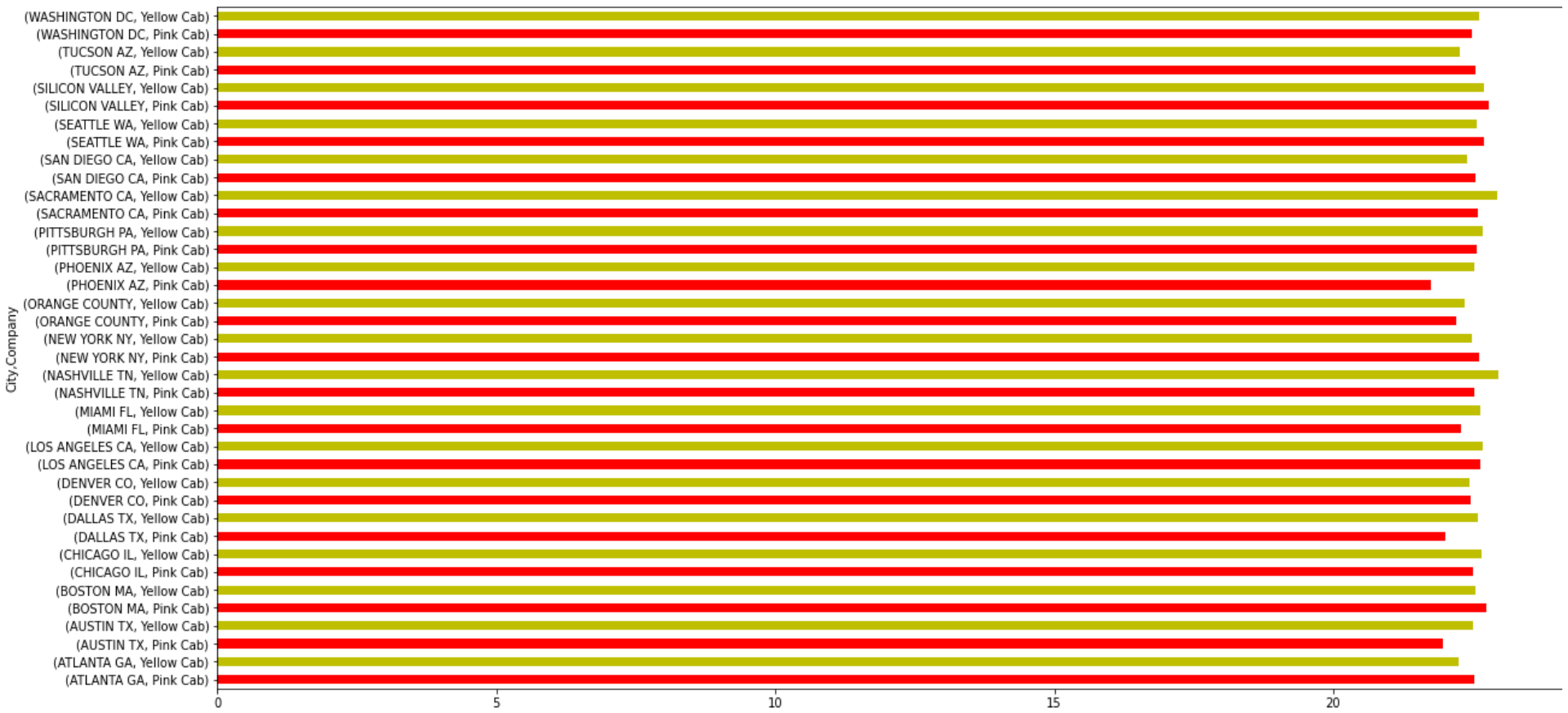
- Yellow Cub has superior market position in:
  - NYC
  - Washington D.C.
  - Miami
  - Los Angeles
  - Dallas
  - Chicago
  - Boston
  - Atlanta
- Pink Cab performs better only in Nashville.
- Equal market size is in Sacramento.
- Market value of 20 cities:
  - Total: 152 mln $ (100%)
  - Yellow Cab: 125 mln $ (82%)
  - Pink Cab: 27 mln $ (18%)

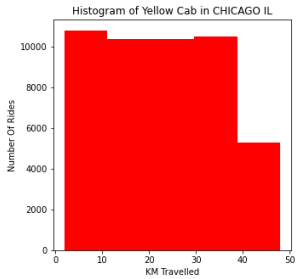


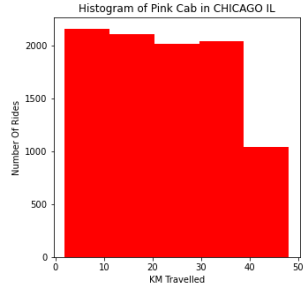
EDA - Hypothesis no. 3

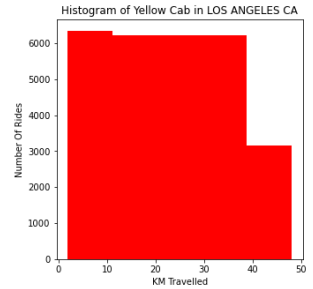
- Mean cost per trip (= all expenses like petrol, car amortisation, driver salary, dispatching, etc.):
  - Yellow Cab – 297.92 $
  - Pink Cab – 238.15 $
- Mean income per trip (= money earned on trip, excluding tip for driver):
  - Yellow Cab – 458.18 $
  - Pink Cab – 310.80 $
- Mean profit per trip:
  - Yellow Cab – 160.25 $ (35%)
  - Pink Cab – 72.65 $ (23%)

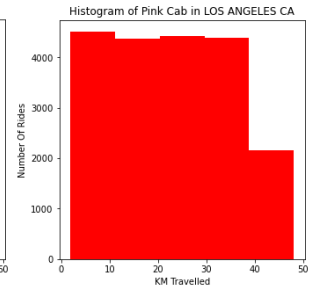
EDA - Hypothesis no. 4

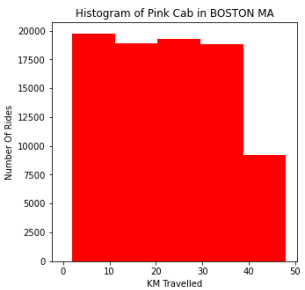


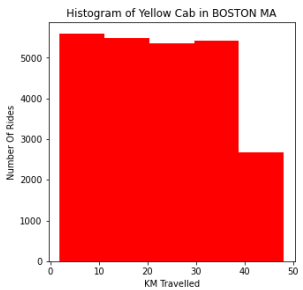


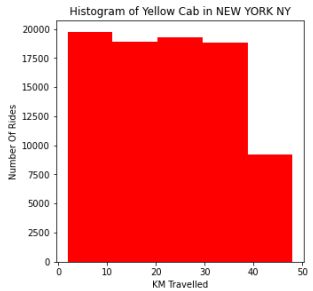


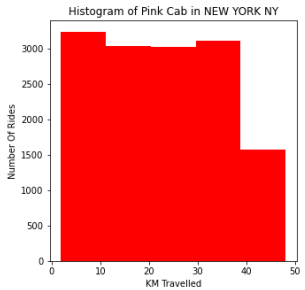


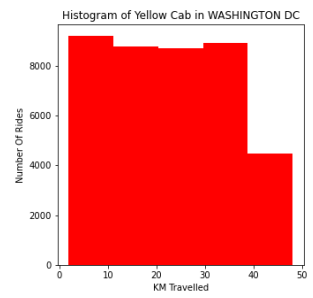


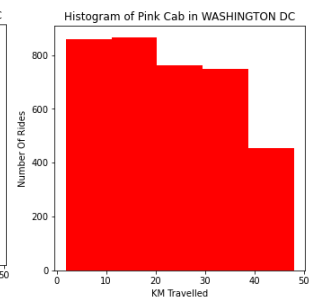






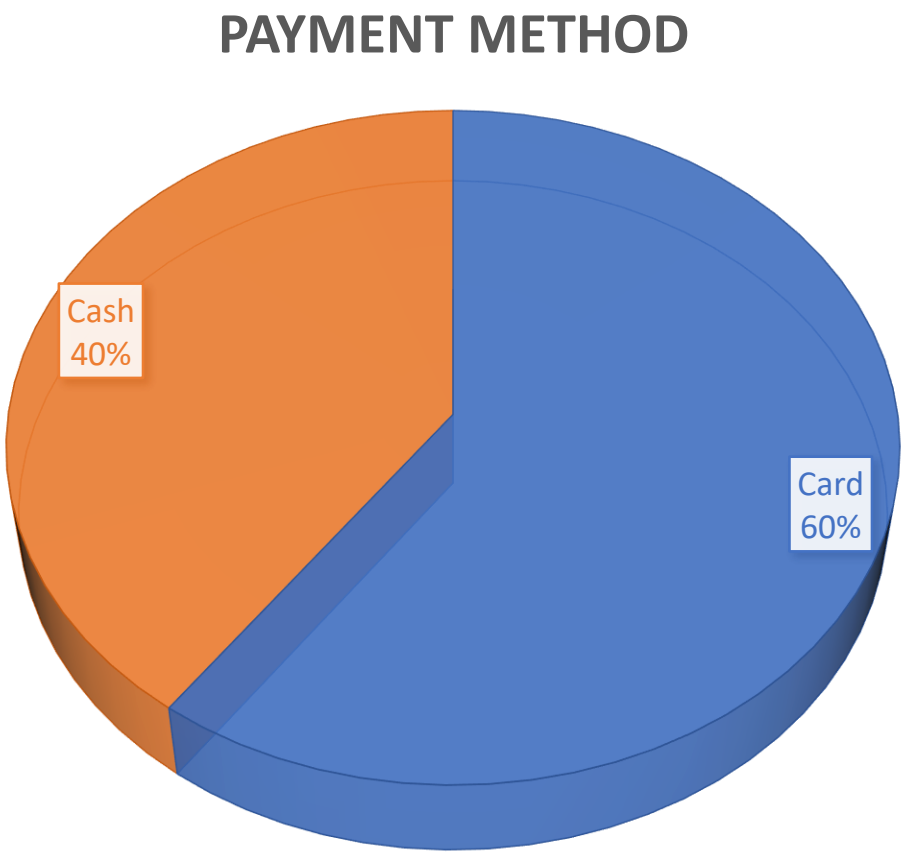




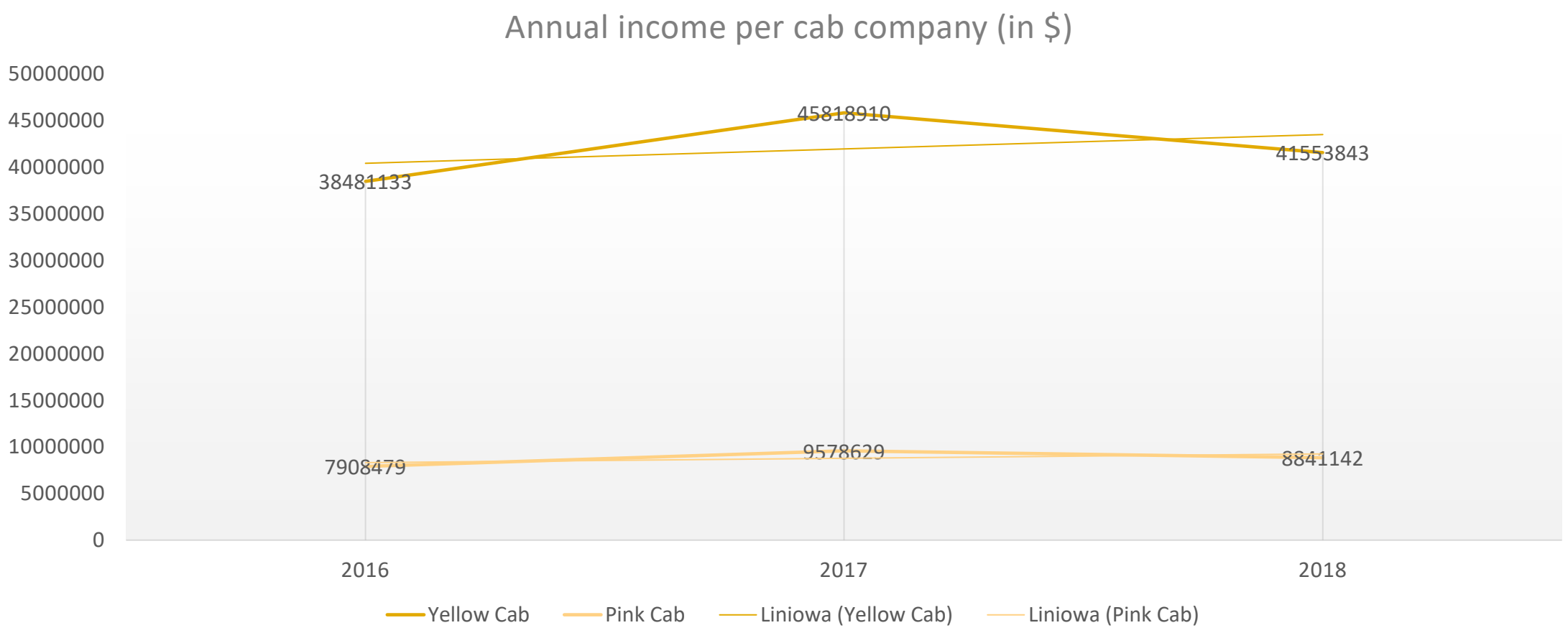


EDA - Hypothesis no. 5

- Nowadays customers likes to pay by cards.
- Quantity and value analysis indicate that card payment method scores 60%, against cash payment – 40%,
- Both companies must invest in card terminals in cabs since there is quite similar preference among their customer base.



EDA - Hypothesis no. 6



EDA Summary

- Provided data sets were verified for duplication and missing values. Most promising features were selected and few features added that broaden the expertise.
- Joint data frame was created for future modelling.
- 6 hypothesis were constructed and verified in correlation and contextual analysis.
- Final recommendation was provided based on outcome of analysis.

Recommendations (1)

- To choose between particular cab company we should understand the market first. Market situation in below 5 cities should be crucial to take investment decision. NYC provides the largest and outstanding market worth more than 56 million USD in analyzed period (2016-18). Cities that provided cab market bigger than 10 million USD in analyzed period (2016-18) are:
  - Chicago IL – 20 million USD
  - Los Angeles – 18 million USD
  - Washington D.C. – 16 million USD
  - Boston MA – 10 million USD
- Another important decision factor is number of users in particular city:
  - In global:
    - Boston MA – 80,021
    - Washington D.C. – 127,001
    - Los Angeles – 144,132
    - Chicago IL – 164,468
    - San Francisco – 213,609
    - NYC – 302,149
  - And per 100k citizens:
    - NYC – 3,595
    - Chicago IL – 8,412
    - Los Angeles – 9,036
    - Washington D.C. – 30,321
    - Boston MA – 32,141
    - San Francisco – 33,928

Recommendations (2)

- Therefore, investors should choose cab company based on data and metrics for above enumerated cities.
- Yellow Cab scores more than 75% market in terms of value in NY City, Chicago, Los Angeles, Washington and Boston.
- Still investors needs to produce strategy to lower cost of operation since Pink Cab has better metrics here.
- Both companies have similar profit trends within the year and seasonality in demand which grows bigger in second part of the year.
- Investing in Yellow Can require founds for equipping cabs with card terminals since card payments are the most popular among customers.

Final recomendation:

I would recommend to investors Yellow Cab as they can count on more return on investment.

Thank You