

CFPB Case Study Report

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Introduction

This report is for 2nd Order Solutions' case study on the consumer complaint database of Consumer Financial Protection Bureau (CFPB). In addition to the dataset, the results in this report are generated from/ with the following materials (all in the zip folder attached):

- consumer_complaint.R
- customer_estimate_source.xlsx
- top10_asset.xlsx

Oddities in data

1. Interrelated categorical variables

- Explanation:

According to the codebook (dictionary) for the CFPB dataset, many categorical variables are dependent on each other. For example, 'Sub-Product' is dependent on 'Product' and not all 'Product' have 'Sub-Product'. This is resulted from the data collection mechanism (i.e. the procedure of filing a complaint) which involved a 'display logic' among categorical variables: choose product from a set list of options, then choose the sub-product from a list of options based on the product selected etc.

- Solution:

This is not an oddity that needs to be cleaned, but rather a structure that needs to be taken into account when analyzing the dataset. More specifically, it would be appropriate to include 'parent' categorical variables when performing analysis on 'child' variable.

- Example:

Categorical value 'Issue' has two similar value of 'Customer service/Customer relations' and 'Customer service / Customer relations'. This is because the two values are associated with different products (output from R script [1].(1)):

Product	Issue	count
Credit card	Customer service / Customer relations	1886
Other financial service	Customer service/Customer relations	131

2. Irregular value in 'Zip code'

- Explanation: negative or invalid values (output from code [1].(2) on right)

- Solution:

- Zip codes are usually used for geographical analysis, and since the 'State' abbreviations in the dataset has been validated, we can use the 'State' variable for potential geographical analysis
- If needed, some of values here, eg. Negative zip codes can be recovered given State, assuming correct correspondence between zip code and State

State	ZIP code
<chr>	<chr>
1 VA	2285
2 FL	3220
3 CA	9507
4 FL	3290
5 NC	2754
6 TX	7864
7 RI	-2914
8 SC	-29XX
9 TX	7864
10 TX	7864
11 NJ	-1631
12 CA	9507
13 NJ	0 7XX
14 AL	36XX
15 CO	*0104
16 CO	*1212
17 SC	29XX
18 TX	7864

Complaints per number of customers

- Source used to estimate number of customers:
Given the time frame of the data, I estimated the number of US customers for the 6 banking institutions as of 2015 based on the combination of the following sources:
(specific sources, method, and reasoning for each company in customer_estimate_source.xlsx)
 - Company website, LinkedIn page, investor page
 - Nielsen Scarborough survey data (through Statista)
 - Relative company size as a proxy
- Result: (output from R script [2])

	Company	complaint_count	million.US.customers	Comp_per_million
1	Bank of America	36579	47	778.2766
2	U.S. Bancorp	7269	14	519.2143
3	Citibank	17848	42	424.9524
4	SunTrust Banks, Inc.	3347	11	304.2727
5	BB&T Financial	1893	10	189.3000
6	Discover	3393	40	84.8250

- Conclusion:
Assuming proper estimate for number of customers, Discover has the least complaints (84.8) per million customers, Bank of America has the most (778.3) complaints per million customers.

Performance of four largest banking institutions

- Method
 - By assets under management, I picked Bank of America, Citibank, U.S. Bank, and BB&T as the four largest institutions among the six in previous question.
 - Metrics used:
 - 'well-perc': percentage of well-responded (both timely and not disputed response) complaints
 - 'issue_most', 'issue_perc': most-complained-about issue for each company and the percentage of complaints on this issue among all complaints it received
 - Also looked at the number of complaints and the 'well-perc' for each company by issue (with corresponding product)
- Result, findings, and potential explanations

	Company	total	disputed	response	well_perc	issue_most	issue_perc
1	Citibank	17848	0.2082026	0.9989915	0.7902846	Loan modification, collection, foreclosure	0.1723442
2	Bank of America	36579	0.2199076	0.9959813	0.7765111	Loan modification, collection, foreclosure	0.4043577
3	U.S. Bancorp	7269	0.2235521	0.9914706	0.7692943	Loan modification, collection, foreclosure	0.2126840
4	BB&T Financial	1893	0.2482831	0.9941891	0.7474908	Account opening, closing, or management	0.2049657

Output from [3]. Company with total complaints, percentage of disputed complaints, percentage of timely-responded complaints, percentage of well-responded (both timely and not disputed response) complaints, most-complained-about issue and the percentage of complaints on this issue among all complaints received by the company.

(1) Overall performance

- Citibank has the best overall performance on getting back to dissatisfied customers: the company provided timely and satisfying responses on 80% of the complaints filed. Citibank gave timely responses on 99.9% of the complaints and less than 21% of all responses were disputed, the least percentage among the four institutions.
- Bank of America and U.S. Bancorp also have decent performance. Both have about 22% of responses disputed by customers, though U.S. Bancorp is slightly behind on giving timely responses (only 99.1%), especially since its total number of complaints is less than half of Citi's and less than 1/5 of Bank of America's, which may be a good indicator in terms of service quality, but not a good indicator when accessing performance on getting back to dissatisfied customers.
- BB&T has decent performance on giving timely responses but have the highest dispute rate (25%) among the four, and similar to U.S. Bancorp, given less total complaints, these metrics reveals a stronger need for improving response quality on complaints.

(2) Most-complained-about issue

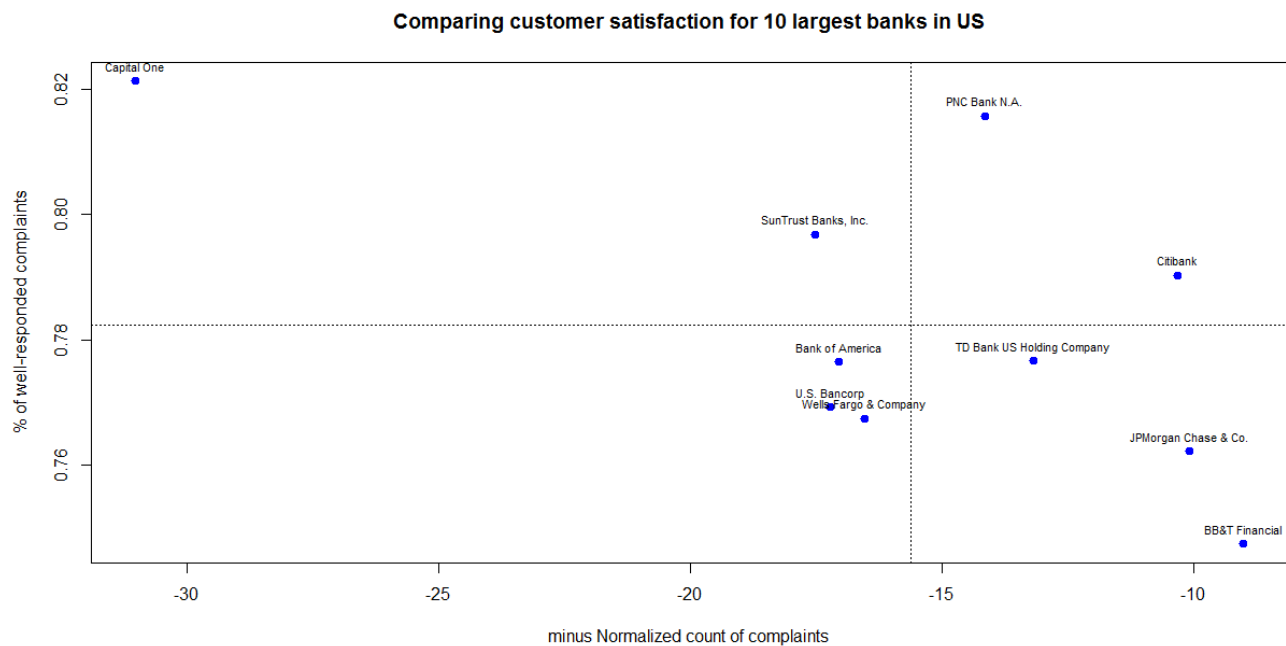
- For 3 out of the 4 companies, Bank of America, Citibank, U.S. Bancorp, 'Loan modification, collection, foreclosure' for Mortgage (product) was their most-complained-about issue, while for BB&T it was 'Account opening, closing, or management' for Bank account or service (product).
- However, complaints on 'Loan modification, collection, foreclosure' was actually 40% of the total complaints received by Bank of America, while for the other 3 companies, the ratio of most-complained issue were all around 20%, indicating a relatively flat distribution of complaints by issue.
 - Bank of America's extremely concentrated complaints on 'Loan modification, collection, foreclosure' may be an indicator of bad service quality or cumbersome procedure on this specific issue for Mortgage product that resulted in highly concentrated complaints; it could also be related to the banking institution's product/service focus on Mortgage, which would give some explanation on why the high-peak of dissatisfaction has consistently been focused on this one issue throughout the timespan of our inspection (especially from 1/2013 to 12/2014, in 2015 the percentage of complaints on this issue became less concentrated).

* can also check each company's performance (based on 'well-perc', the percentage of both timely and satisfying responses) on each issue with code provided in R script [3]

Performance metric and evaluation

- The metric to be constructed should reflect both:
 1. Customer satisfaction on service quality
 2. Response quality on complaints from dissatisfied customers
 - 1-Normalization of total complaint counts
 - For proxy I considered 1) number of customer accounts, 2) number of transactions, 3) asset size of the institution

- Most commonly used proxy for normalization is the number of US customers, however, it is hard to collect accurate and reliable data for most banks; it would also make sense to use number of transactions, but given that the complaints span across different products and services, it would also be hard to collect or estimate that information.
 - Thus I chose the asset size of the institution as the proxy for normalization for the scope of this case study. Data was collected for the top 10 largest banks by assets under management as of 2015 from Statista. See top10_assets.xlsx for the data, unit for the normalized count would be (complaints per \$billion asset).
 - 2-Comparing performance on getting back to dissatisfied customers
 - As in the previous question, I have used 'well-perc', the percentage of both timely and satisfying responses to complaints, as the metric for comparison among companies.
- Leaderboard (Output from R script [4])



Plot from [4]. Negative normalized count of complaints (by asset size) as x-axis to penalize large value, % of well-responded complaints as y-axis. Mean of x-axis and y-axis values (within the 10 institutions) are also given in lines.

- Based on the metric-combination, the companies with best customer satisfaction were PNC Bank N.A. and Citibank. PNC has the best performance on responding to customer complaints and a less-than-average normalized complaint count; Citi has the best combination of both.
- Among the 10 institutions, U.S. Bancorp and Wells Fargo have the least desirable customer satisfaction. Both have more-than-average normalized complaint count and below-average performance on response to complaints.

- Evaluation of metric

1. Strengths

- a. Took into account both the service quality (indicated by negative normalized count of complaints) and response quality on complaints (indicated by well-responded percentage).
- b. Although only 10 institutions are shown here, more can be included without modifying the code (i.e. the code for calculating metric and visualizing performance is highly reproducible) by adding asset size data in the spreadsheet, which is also more obtainable compared to other proxies for normalization.
- c. The setup of the visualization gives a straightforward representation and assessment of institutions' performance on customer satisfaction by 'clustering' them into quadrants that evaluates the 'compound' performance on two metrics.

2. Weaknesses and potential improvement that can be made

- a. In terms of normalization, a single proxy may not be sufficient to represent the true service quality, or to derive a most objective metric for comparison among companies that differ in institution size, offering of product/service, customer demographics etc.
 - i. normalize on a single product or service instead of on the full range of products and services
 - ii. use combination of proxies instead of a single one for normalization
- b. For the inspection scope of 10 institutions as shown above, using the mean for dividing quadrants works fine. However, with more companies, mean of performance metrics on x and y axis would not be informative or appropriate for assessment.
 - i. with more companies, use quantiles to identify the area of best and worst performance
 - ii. valid normalization is again crucial to account for differences in companies mentioned in (a)
- c. Since we have data for at least 3 years, the metric should ideally take into account the trend in number of complaints over time. The trend for the 10 largest banking institutions are shown below:

→ We can see that Bank of America has a largely reduced total number of complaints in 2015 compared to 2013, while BB&T has the same rate only in increase. The most ideal metric should penalize significant growth in total number of complaints and reward major reduction.

	Company	2013	2014	2015	more
1	Bank of America	16459	10287	9833	-0.402576098
2	BB&T Financial	555	577	761	0.371171171
3	Capital One	3328	3343	3690	0.108774038
4	Citibank	5878	5768	6202	0.055120789
5	JPMorgan Chase & Co.	7990	7735	7968	-0.002753442
6	PNC Bank N.A.	1636	1833	1594	-0.025672372
7	SunTrust Banks, Inc.	1125	1060	1162	0.032888889
8	TD Bank US Holding Company	1009	1157	1273	0.261645193
9	U.S. Bancorp	2029	2533	2707	0.334154756
10	Wells Fargo & Company	11127	9168	9282	-0.165812888

Output from R script (last section): trend of total number of complaints over time, and 'more', the derived growth rate in 2015 compared to 2013