SMU COX SCHOOL OF BUSINESS

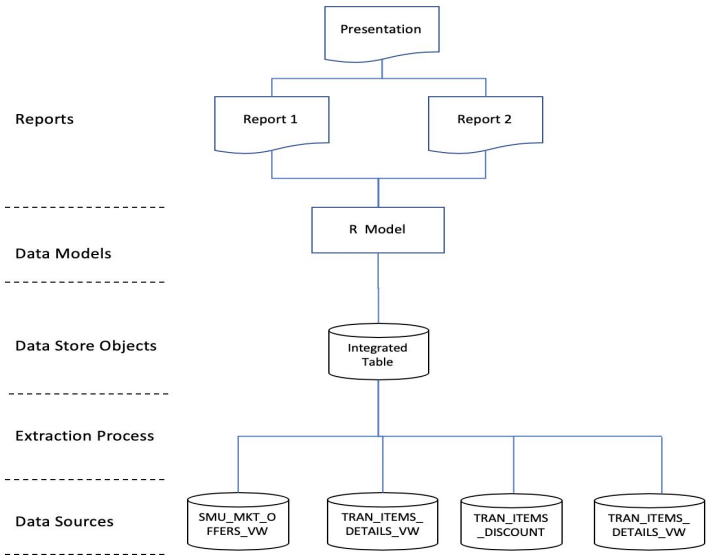
MSBA Capstone Project Executive Summary

EXECUTIVE SUMMARY

JCPenney would like to better understand the effect of coupons on business in-store, specifically whether the coupon promotional approach is accretive for sales and margin. JCP would like to partner with the SMU team to develop a model to determine the effect of coupons on JCPenney sales and margin.

The analysis include: 1) a review of dollar sales and margin rate by coupon types and a model about how the coupon affect weekly sales units; 2) profitability analysis of detail percent off coupons between reward customers and non-reward customers for all divisions; 3) coupon effectiveness analysis on store level and modeling the relationship between coupon penetration rate and margin for each store.

CONCEPTUAL DESIGN



OVERVIEW OF DASHBOARD

The following questions were considered when building the queries and dashboards.
Coupon Influence:

- Does the percentage of transactions with coupons influence the overall sales?
- What is the margin rate across transactions between no coupon usage and with coupon?
- How does the coupon affect the product demand, specifically weekly sales units?
- Which division is more sensitive to coupon promotion?

Coupon Type:

- Which coupon type has a higher margin percentage or margin?
- Does min purchase requirement increase margin or sales compared to non min purchase requirement?
- Does percentage off coupon increase margin by increase percentage off?
- Does dollar off coupon increase margin percentage more than percent off?

Reward Customer vs.Non-reward Customer

- Do loyalty program customers have a higher margin percentage than normal customers?
- Does additional coupons trigger more sales for loyalty/reward program customers?
- Which coupon performs better for loyalty program customers?
- Do loyalty program customers have a bigger basket size than normal customers?

Coupon Penetration and Effectiveness:

- Which states or stores have lower penetration rates?
- What are the coupon penetration rates of different coupon types in the state and store level?
- Which states or stores have better coupon performance?
- What are the coupon performance of different coupon types in the state and store level?
- Do high coupon penetration rates lead to high margin in each store?

Dashboards were created to assist in answering these questions

- Dollar Sales and Percentage of Coupon Transaction Overview by Fiscal Year
- Sales and Margin Rate Overview by Buckets
- Weekly Sales Units Forecast and Sales Lifts by Division
- With Reward and Without Reward Performance Dashboard 1&2&3&4
- Coupon Penetration Dashboard 1&2
- Coupon Effectiveness Dashboard 1&2&3&4

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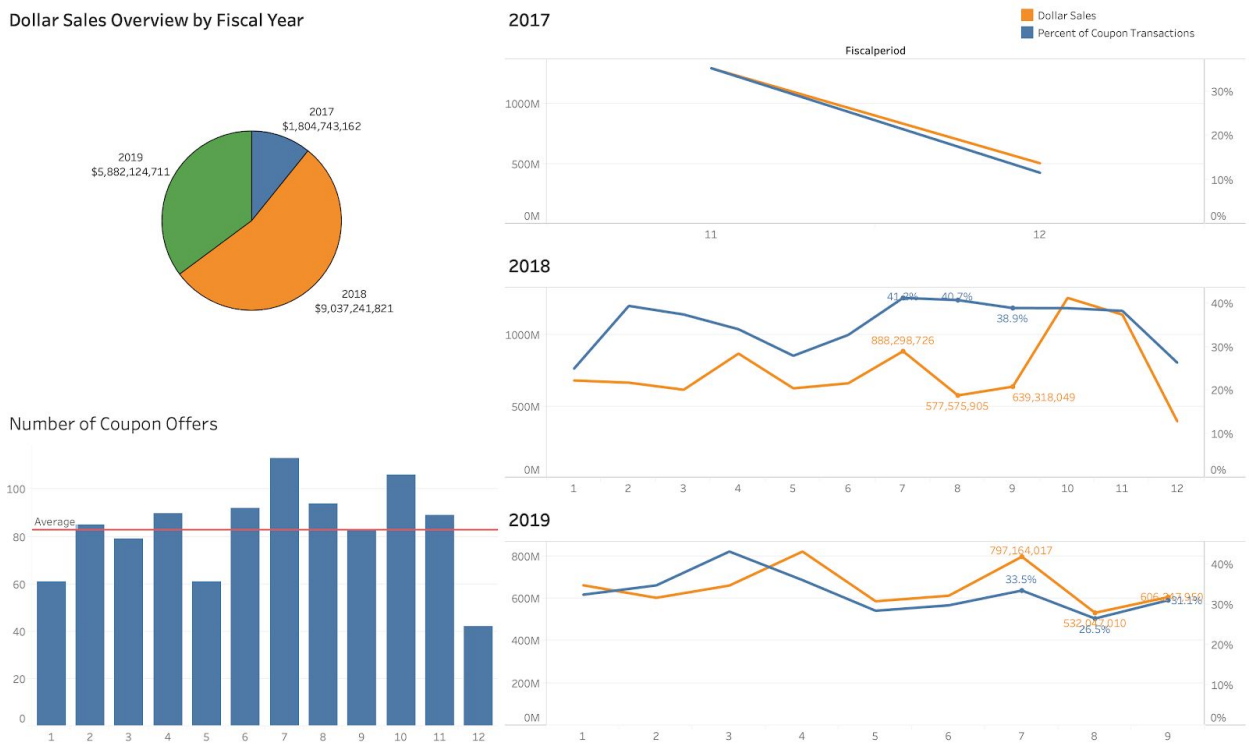
DOLLAR SALES OVERVIEW BY FISCAL YEAR



This dashboard shows the dollar sales overview by fiscal year. There is a sharp decrease in sales from period 11 to period 12 in 2017. The same pattern also shows in the same period of 2018. We assume the reason was intense coupon promotion in period 11 while the coupon promotion in fiscal period 12 came down, which drops down the dollar sales. In addition, the bar chart on the bottom left shows coupons launched in fiscal period 11 is much more than fiscal period 12. So we concluded in last quarter coupon offers are strongly promoting sales. For the third quarter, period 7 to period 9, the average percentage of transactions with coupons is around 30% in 2019, which is 10% less than 2018's. The dollar sales is around 9% less than 2018's, which indicates the sales lost in this quarter of 2019 is caused by lower coupon usage in transaction level.

Business Insights:

The overall trend shows JCP's sales growth is heavily relying on coupon offers. Increasing coupon redemption rate to encourage more coupon usage in transactions to drive sales growth.

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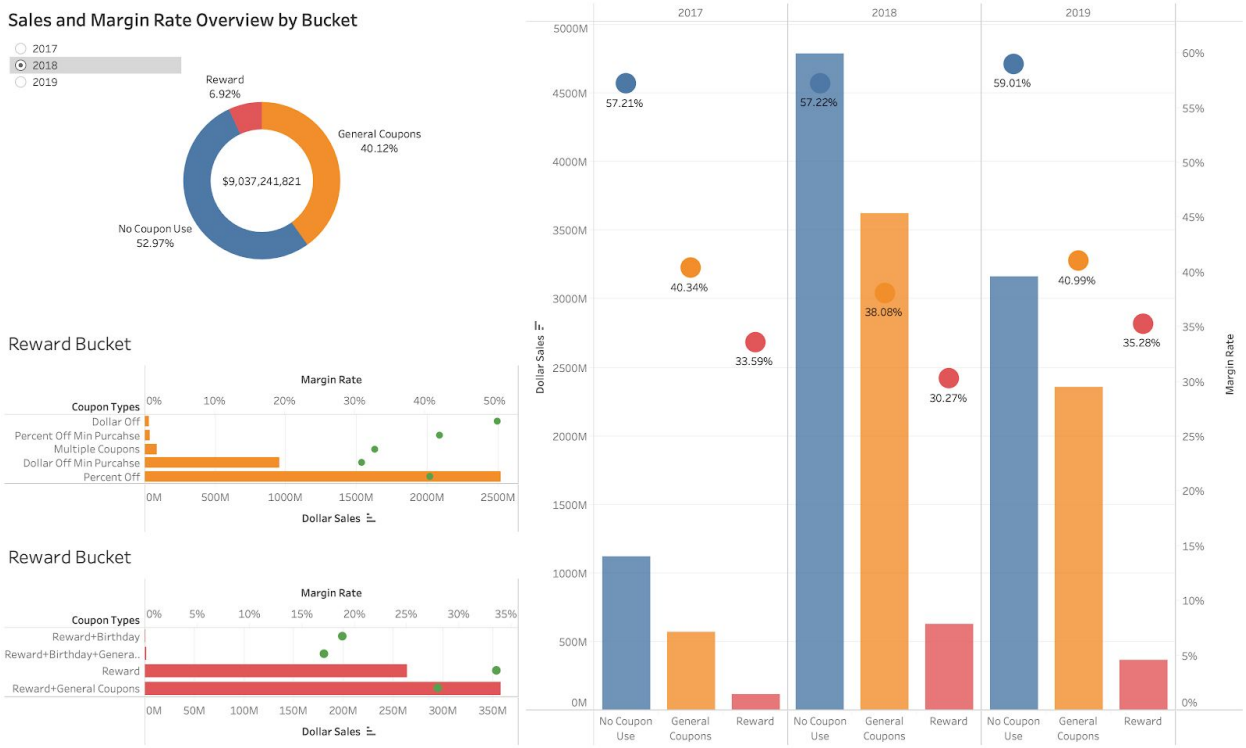
DOLLAR SALES AND MARGIN RATE OVERVIEW BY BUCKETS



This dashboard shows the dollar sales and margin rate for three buckets. Totally almost 47% of sales amount is contributed by transactions with coupons. No coupon usage transactions contribute the most sales and the highest margin rate with a constant margin rate of almost 60% for each fiscal year. Within the reward bucket transaction using both reward and general coupons has the most dollar sales. We think additional coupons can encourage more purchases thus generating more sales from reward customers since the basket size is 6.0, which is higher than the basket size of 3.3 of transactions only with reward.

Business Insights:

More coupon offers targeting reward customers to encourage more purchase.

WEEKLY SALES UNITS FORECAST AND SALES LIFT BY DIVISION

This dashboard shows the weekly sales units and sales lifts forecast of 2020 for all divisions. We used a regression model to determine the effect of price and coupon usage on demand. We test the model with 2019 data as the validation dataset and it shows the model is valid. The model performs well in some divisions while has poor performance in others in terms of R square. Sales units change is predicted between with coupon and without coupon for all divisions, which can be seen from the sales lift table.

Business Insights:

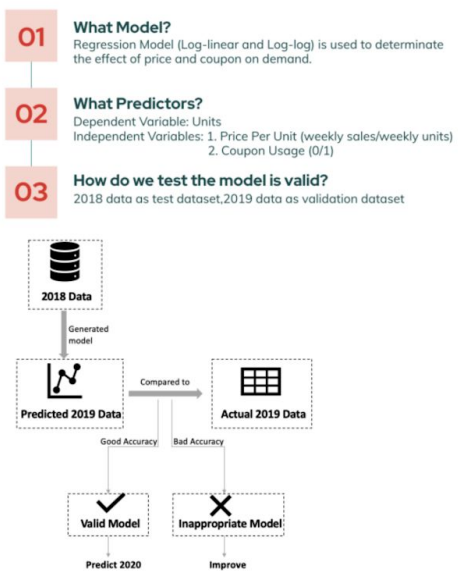
There are obvious sales lifts in Home Furn Leisure, Jewelry and Watches, Woman Apparel and Woman Specialty division, which indicates they are sensitive to coupon offers. More coupon promotion can be targeted to these

divisions. While the coupon offer in Footwear, Misc Promotions, Mens, Special Business and Sephora would not obviously affect sales units or demand.

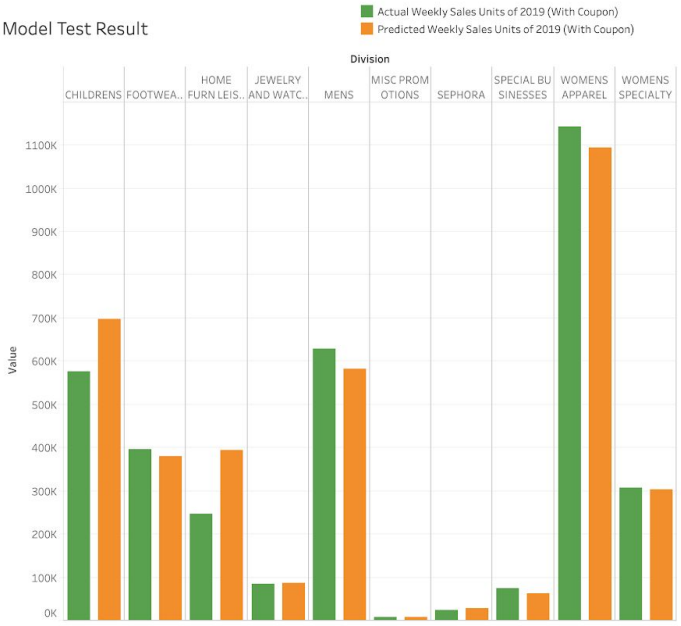
Demand Model

Modleing Goal: Forecast weekly sales units with coupon and without coupon to compute sales lifts of 2020 for all divisions

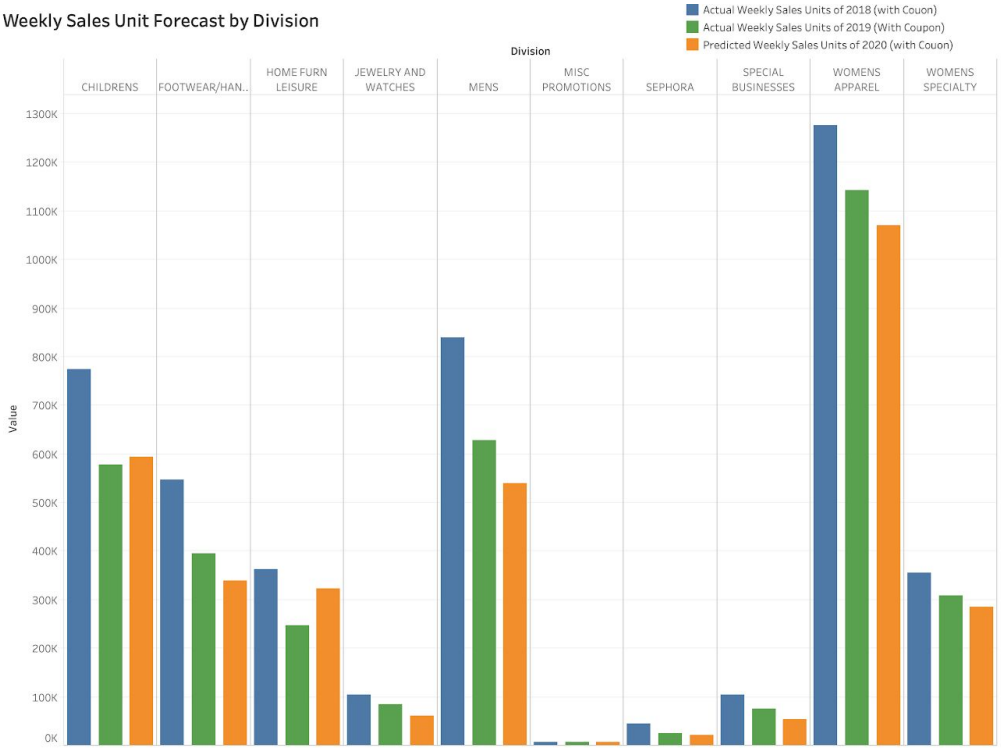
Modeling Methodology



Model Test Result



Weekly Sales Unit Forecast by Division



R Square

Division	R Square
SPECIAL BUSINESSES	0.85
SEPHORA	0.83
MISC PROMOTIONS	0.50
JEWELRY AND WATCHES	0.38
WOMENS APPAREL	0.34
WOMENS SPECIALTY	0.25
FOOTWEAR/HANDBAGS/..	0.22
MENS	0.21
HOME FURN LEISURE	0.18
CHILDRENS	0.09

Predicted Sales Lifts

Division	Predicted Sales Lifts
HOME FURN LEISURE	77.5%
JEWELRY AND WATCHES	72.6%
WOMENS APPAREL	38.0%
WOMENS SPECIALTY	12.3%
CHILDRENS	2.6%
FOOTWEAR/HAN..	-33.8%
MISC PROMOTIONS	-40.7%
MENS	-44.3%
SPECIAL BUSINESSES	-88.4%
SEPHORA	-97.4%

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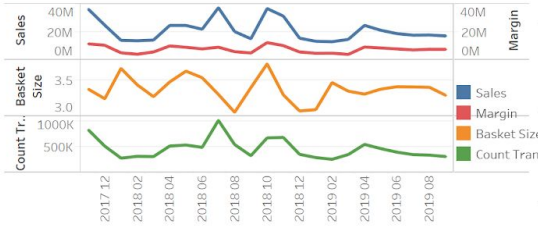
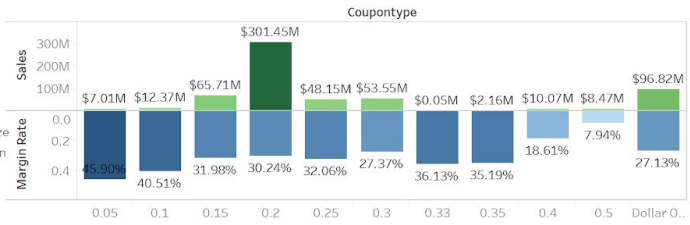
WITH REWARD AND WITHOUT REWARD PERFORMANCE DASHBOARD 1&2&3&4

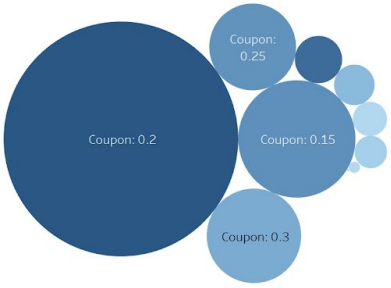
Transactions Only with Reward



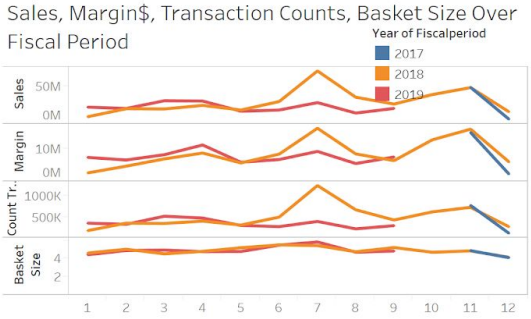
Transaction With Reward: Sales and Margin Rate



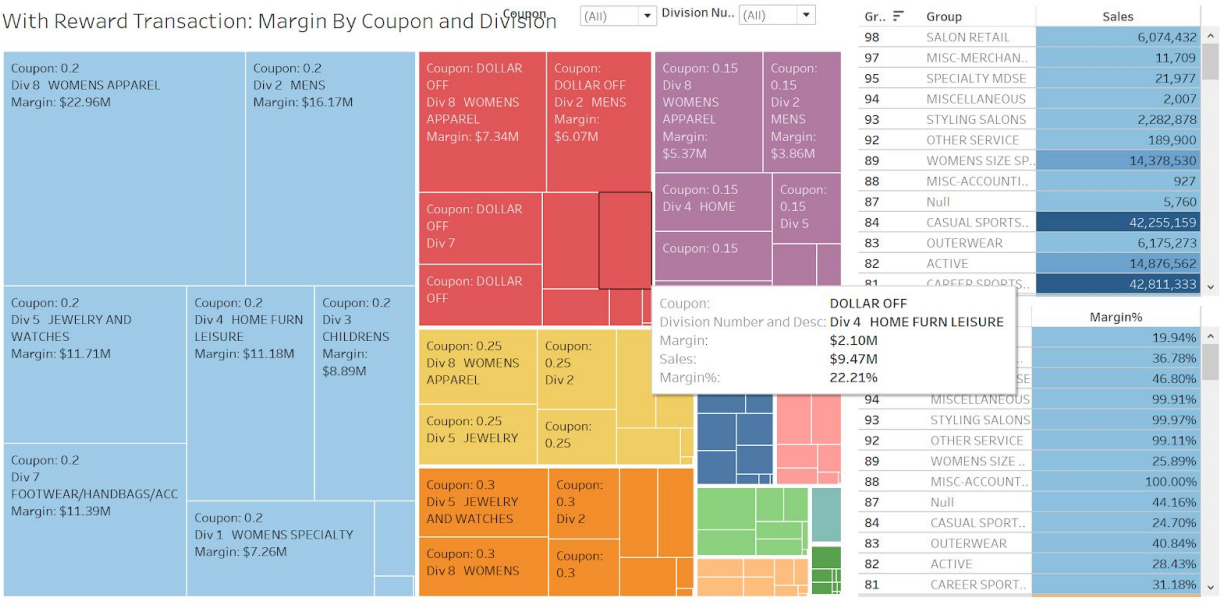
With Reward Transaction: Transaction Count



Sales, Margin$, Transaction Counts, Basket Size Over Fiscal Period



With Reward Transaction: Margin By Coupon and Division



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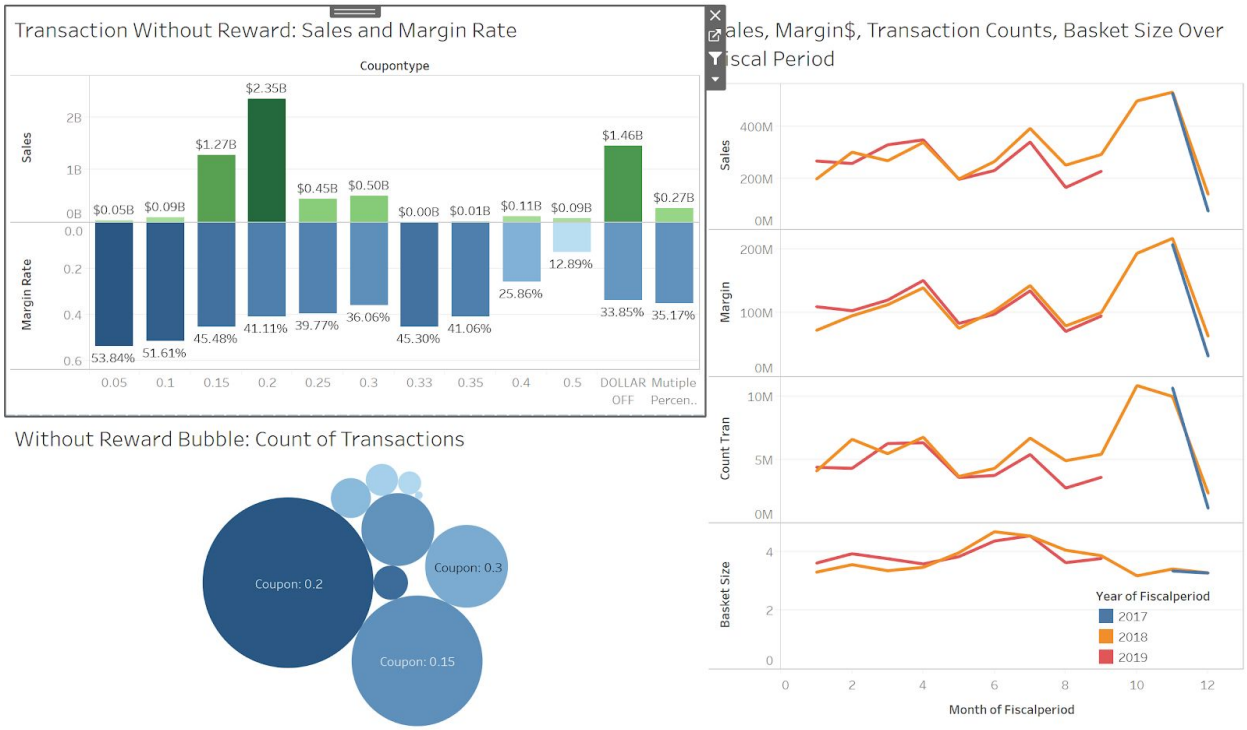
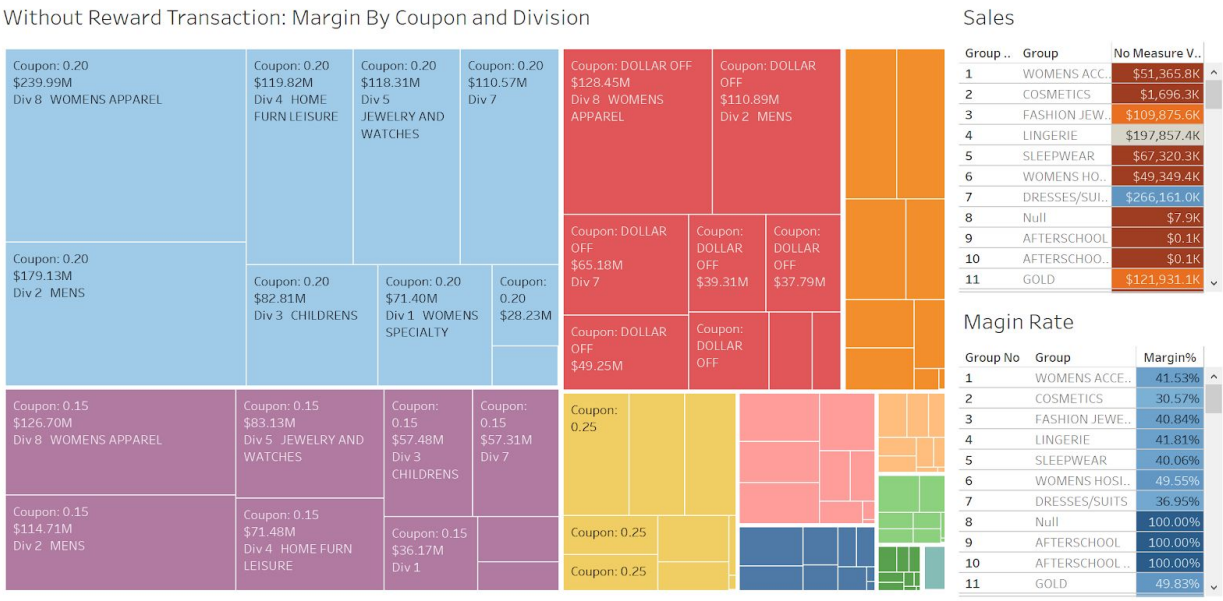




These four dashboards can illustrate how coupons perform when consumers use coupons with reward and without reward. Since we cannot find all the transactions that were purchased by royalty program customers, the transactions with reward usage are definitely purchased by royalty program customers. The last two dashboards in

this part have similar structure as the first two dashboards. The first two dashboards talk about the transactions with reward usage. The last two dashboards talk about the transactions without reward usage.

The first dashboard has a bar chart showing the comparison between sales and margin rate for different coupon types, a bubble chart shows percent-off and dollar-off coupons' transaction count distribution among all the transactions with reward usage, a line chart shows sales, margin, basket size, and count transaction of transaction that only has reward usage over the fiscal periods, and a line chart shows sales margin, count transaction, basket size of coupons with reward over the fiscal periods.

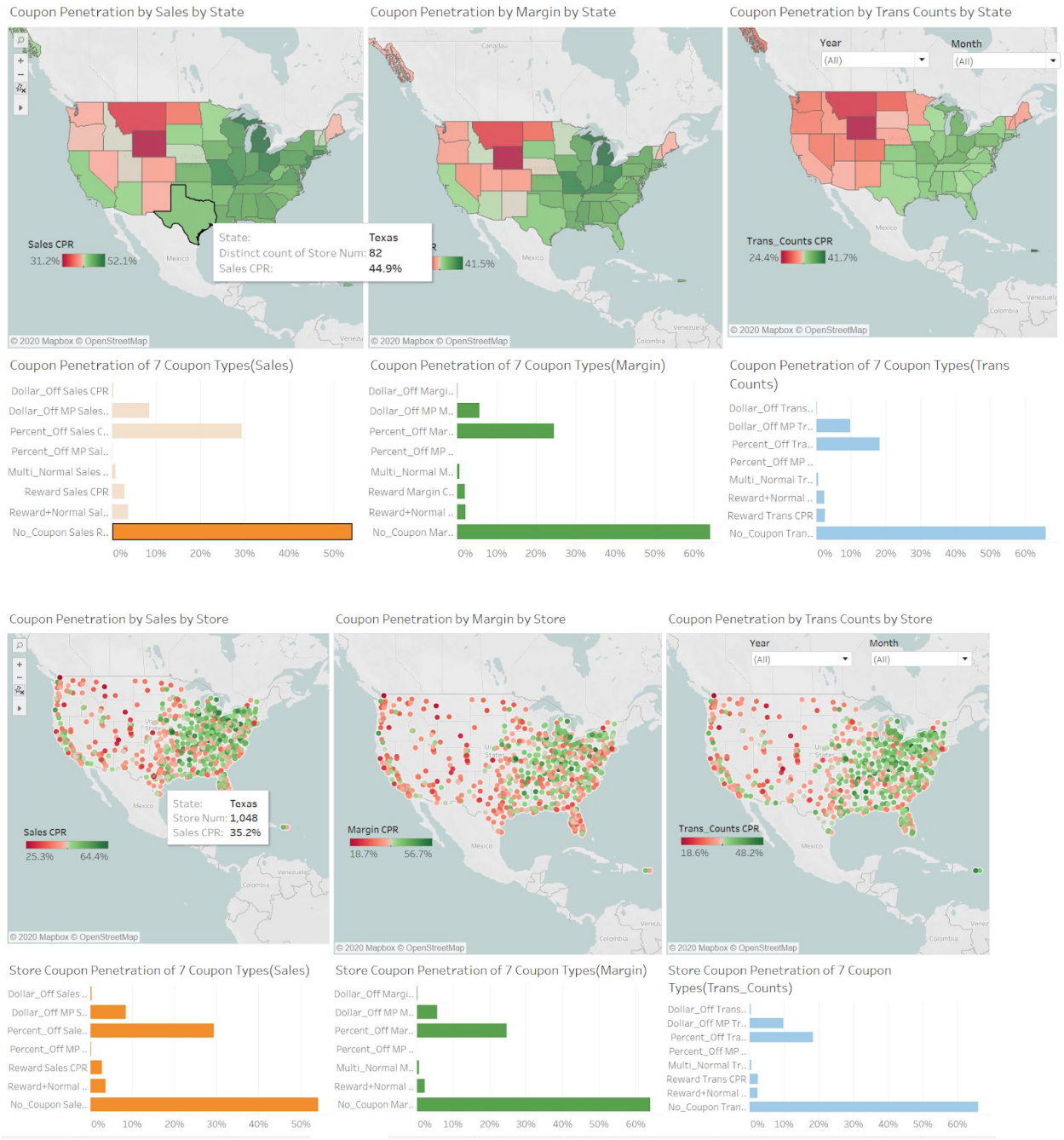
The second dashboard has a tree map showing the margin of different coupons and divisions by the size of each area, and two highlight tables showing the sales and margin rate of each group under the selected division and coupon.

The last two dashboards have almost the same chart, except the last two dashboards are talking about the transaction without coupon usage. Therefore, there is no reward only line chart at the third dashboard.

Business Insights:

- Encourage loyalty program customers buy more items at one transaction to increase the margin.
- Royalty customers buy more items for 25% off leads to a higher margin rate for 25% off than 20% and 15% off.
- Launch A/B test for a 35% off coupon, and check whether it can increase margin when there are more campaigns about this 35% off coupon in division jewelry and watch.
- There is a big gap between the fiscal 2018 and 2019 7th period, and it is caused by the huge gap at 15% off and 20% off with reward transactions. In August, which is fiscal period 7, 2018 has more 20% off JCP coupons, and bonus buck$. The 25% off with min $100 may simulate some JCP customer's purchase behavior, but it also limits the sales because of customers' purchasing ability.
- There are 392 offers that are about 10% off, but it does not bring a lot of sales, and there are 171 offers that are about 30% off, but it brings a lot of sales. Instead of 10% off, we may run more 30% off coupons.

Coupon Penetration Dashboard 1&2



These two dashboards focus on the coupon penetration rate in state(dashboard 1) and store(dashboard 2) level. We adopted three methods to calculate coupon penetration rate as it can be understood in three aspects:sales, margin and the number of transactions. The ways we calculated them are listed as follows:

1. total sales of transactions using coupon/ total sales of all transactions
2. total margin of transactions using coupon/total margin of all transactions

3. number of transactions using coupon/number of all transactions

Regarding the three bar charts on the bottom, If you do not click on one state on any map, it shows the overall penetration rate of 7 coupon types in the whole country. These two dashboards can be utilized to monitor the penetration rate of different stores and states and give more attention to low-penetrated area.

Business Insights:

- Most red states are in western part in terms of transaction number, while some of them turn green when we use sales and margin as our metric, such as California and Idaho. It indicates that in these states even though the total number of transactions using coupon may not be as high as other states, coupon still did a good job in bringing higher sales and margin.
- Red areas in the sales and margin maps, such as Wyoming and Montana, need to be paid more attention to figure out why it has lower coupon penetration when it is compared to other states. And we suggest JCPenney take measures such as emails to remind customers in those areas of the coupon events to encourage more customers to use coupon when purchasing items.
- The sales map and margin map basically looks the same. It means the average margin rate of goods using coupon doesn't vary a lot among states.
- None of the green areas in the third map turn red in the first two maps, which is a good sign since it means more transactions using coupon also bring more sales and margin and it also indicates that the average sales or margin of transactions using coupon is higher than the average of all transactions, which will also be proven in following dashboards.
- For all states, the coupon usage accounts for 46%, 36% and 34% of all transactions in terms of sales, margin and the transaction number respectively. And among all coupon types, percent_off coupon accounts for the highest share, followed by dollar_off min purchase.
- The dollar_off min purchase coupon didn't perform as well as percent_off since the bar is relatively shorter compared to others in sales and margin than in transaction counts. Same thing happened for reward. But for percent_off and percent_off min purchase it's converse. This pattern is consistent in every state.
- The overall coupon penetration rate slightly decreases from 2018 to 2019. The share of dollar_off min purchase coupon decrease and the share of percent_off coupon increase from 2018 to 2019 for all states.
- The coupon penetration distribution of stores is basically the same as the state map, however, the rate varies a lot among stores in sales or in margin or in transaction number.
- Less than 1% of transactions use multiple normal coupons which indicates potential coupon abuse problems. And this number increases from 2018 to 2019. It is worth further investigation about the reason behind.

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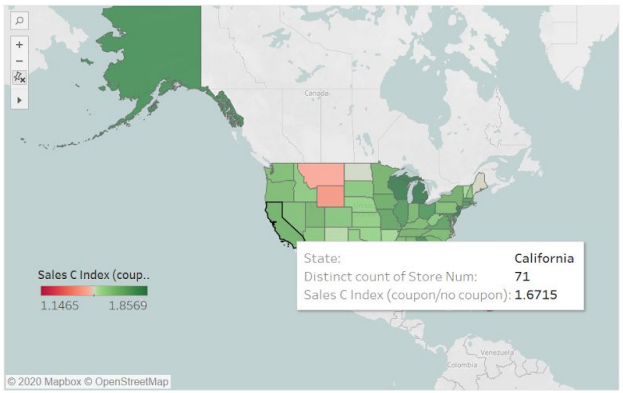
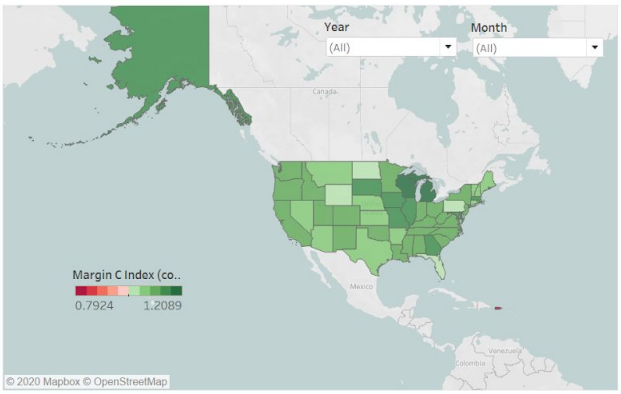
COUPON PERFORMANCE DASHBOARD 1&2&3&4

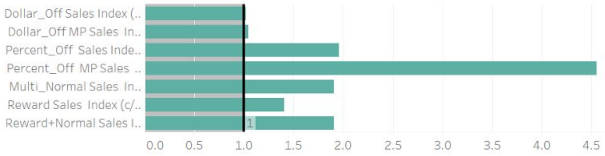
Sales Index by State (Coupon/No Coupon)



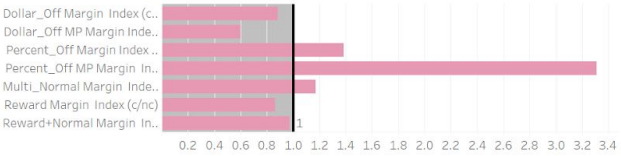
Margin Index by State (Coupon/No Coupon)



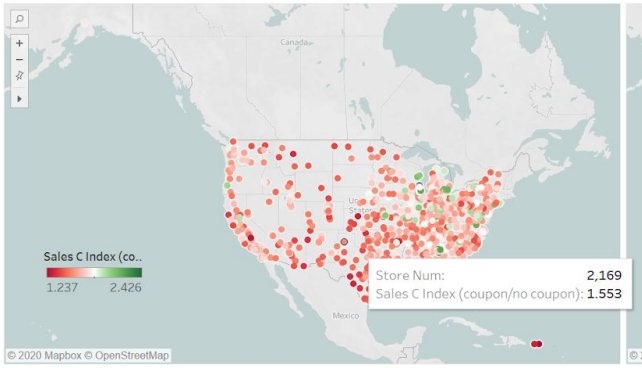
Sales Index By CouponType (Coupon/No Coupon)



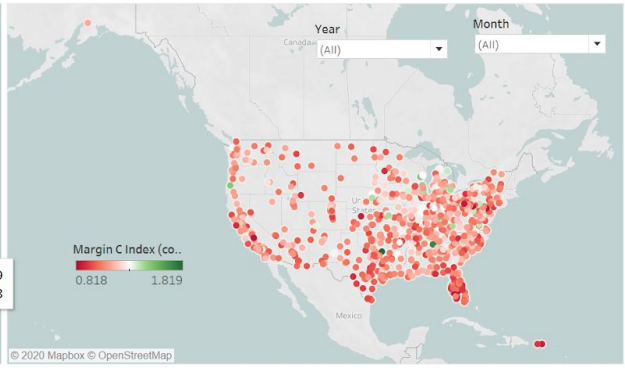
Margin Index By CouponType(Coupon/No Coupon)



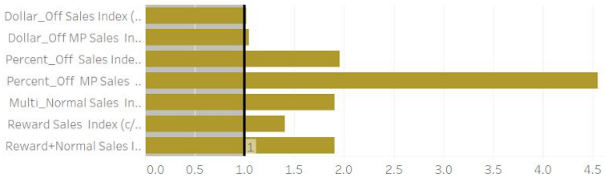
Sales Index by Store (Coupon/No Coupon)



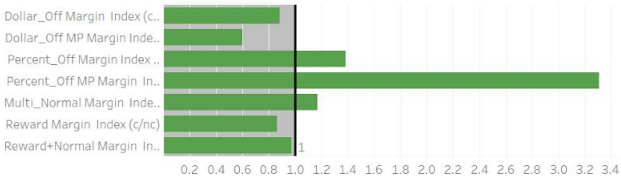
Margin Index by Store (Coupon/No Coupon)



Sales Index By CouponType Store (Coupon/No Coupon)



Margin Index By CouponType Store(Coupon/No Coupon)



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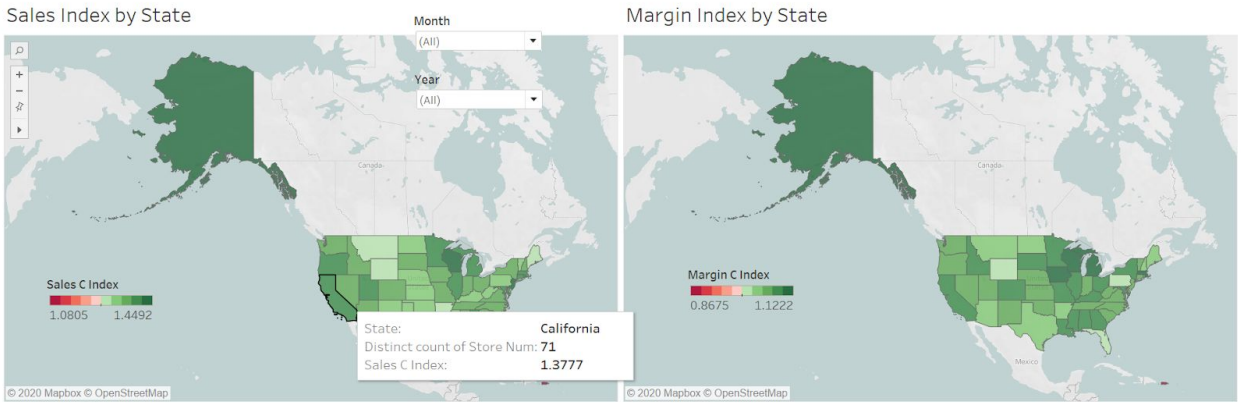

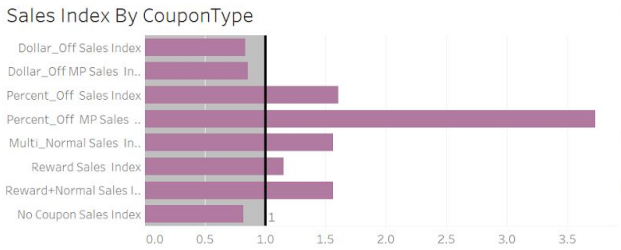

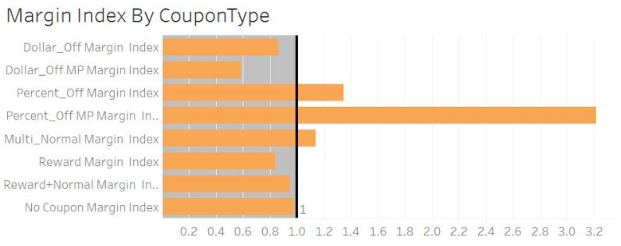

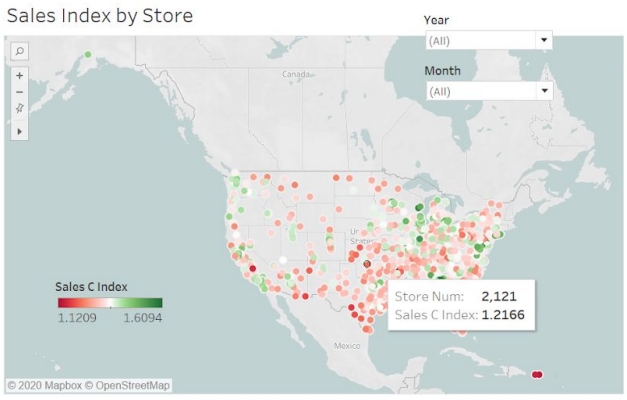

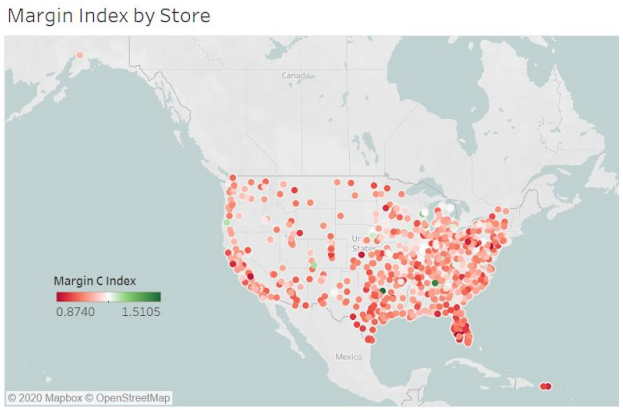

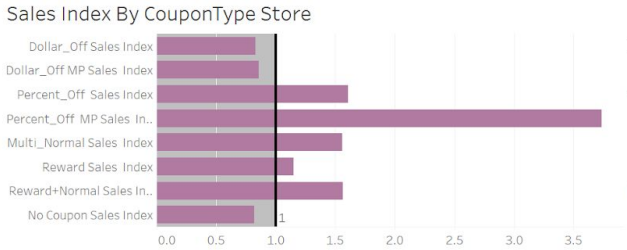

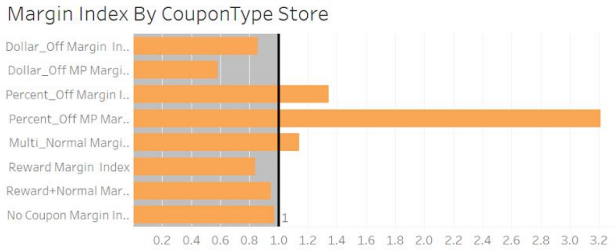

Sales index is calculated to measure the performance of coupons at state and store level.
1. average sales per transaction of transactions using coupon/average sales of transactions not using coupon
2. average sales per transaction of transactions using coupon/average sales of all transactions

Margin index is calculated to measure the performance of coupons at state and store level
1.average margin per transaction of transactions using coupon/average margin of transactions not using coupon
2.average margin per transaction of transactions using coupon/average margin of all transactions

The higher the index value the better the coupon performance is. If the index value is higher than 1, it indicates that the average of transactions using coupon is higher than the average of transactions not using coupon or all transactions.

Business Insights:

- In terms of sales, all states have index values higher than 1, when it comes to margin, all regions have index values higher than 1 except for Puerto Rico, which shows our coupons are effective in all states.
- When comparing index map to penetration map we can find that areas with high penetration rate usually have high index values(most eastern states are greener in this map), which indicates that coupons are effective in most high penetrated areas. And in relatively low penetrated areas, the index value varies, so we can't say that coupons didn't perform well in low penetrated areas.
- For most states, the coupon types which have index values higher than 1 are percent_off, percent_off min purchase and multi-normal. Among them, the percent-off min purchase coupons have significantly high index value. And in most states the index value of dollar-off and dollar-off min purchase is lower than 1, which indicates they are not effective in increasing margin and percent_off coupons have better performance in most states than dollar_off coupons and rewards. And since very few transactions use percent-off min purchase coupons and their thresholds are relatively high, the percent_off coupons are the main contributor of sales and margin growth.
- In North Dakota,Minnisota,Wisconsin,Nebraska and Wyoming, the value of margin index1 of dollar_off is higher than 1, which indicates that dollar-off coupon is effective in these areas and it is worth further investigation.

Margin Model Information

We also built a model which investigates the correlation between coupon penetration rate and margin of each store. Since we assume that each store is heterogeneous, so they all have different responses to different kinds of coupons. In the result, if a coefficient is positive then it means that increasing the use of that kind of coupon will increase the margin of that store. The output of model is listed below:

Store Number	Intercept	Dollar_Off	Dollar_Off_Min_P	Percent_Off	Reward	Reward+Normal	Multiple_Normal	Percent_Off_Min_Purchase
1	-453150.73	-9273280.60	-1022184.16	506181.13	3206018.14	-1984177.53	-905178.70	-3573083.16
4	-369917.57	-7569840.72	-834436.46	413206.15	2617164.14	-1619738.11	-738930.86	-2916898.79
5	-26054.13	-384900.78	-60562.52	28268.62	178405.86	-110137.05	-52800.83	-207862.55
7	-350279.11	-7177604.85	-790010.07	391327.03	2478637.21	-1534005.86	-699593.67	-2761583.93
27	256553.69	5183706.92	579530.34	-286199.45	-1812391.73	1121571.78	512878.49	2024380.61
30	201124.30	4019345.49	454827.47	-224124.03	-1419068.25	878032.76	402118.90	1586888.27
55	-280975.90	-5668543.81	-634788.94	313399.15	1984598.92	-1228096.29	-561667.72	-2216748.71
58	326387.74	6290102.37	740985.20	-362380.85	-2292901.22	1418387.42	654055.74	2580717.78
67	258074.59	5351933.44	581290.50	-288674.20	-1828753.86	1131927.55	515153.02	2033850.96
89	-275379.43	-5541445.99	-622308.95	307079.33	1944517.35	-1203257.55	-550512.13	-2172650.41
90	213552.30	4277888.17	482817.06	-238028.24	-1507187.57	932569.56	426955.43	1685132.32
99	300511.17	6166139.93	677678.49	-335769.53	-2126908.72	1316377.54	600273.01	2369441.46
113	-266162.37	-5472597.62	-600087.28	297452.72	1884175.06	-1166140.65	-531588.46	-2098536.35
116	125110.92	2522452.55	282672.85	-139539.34	-883604.82	546770.76	250086.49	987086.53
120	-290169.30	-5930863.73	-654612.80	324091.26	2052728.33	-1270367.03	-579568.77	-2287761.83
130	-49902.48	-1029041.54	-112462.78	55789.16	353378.12	-218695.40	-99583.77	-393056.46
133	-358220.00	-7356894.55	-807721.62	400291.13	2535497.26	-1569228.81	-715381.63	-2823976.83
135	-24671.75	-458945.33	-56211.97	27299.17	172679.73	-106792.99	-49536.60	-195418.57
141	-321618.81	-6605353.42	-725180.02	359395.38	2276464.02	-1408900.46	-642231.70	-2535249.16
157	33754.08	764422.30	75233.90	-38123.65	-241669.03	149652.67	66915.16	264304.56
161	21339.31	680678.44	45151.29	-25220.76	-160993.65	100005.85	41191.28	163482.00
168	61923.72	1265517.23	139685.70	-69166.24	-438120.63	271105.96	123604.90	488029.17
170	-314774.93	-6497172.51	-709383.75	351921.90	2229236.79	-1379776.29	-628543.95	-2481413.06
171	-4623.34	-116811.25	-10198.10	5278.06	33546.75	-20868.07	-9339.87	-37121.29
174	1118823.43	22431425.50	2529354.20	-1247146.52	-7896744.32	4886374.88	2237124.93	8828908.36