



MEAT DELI **REVENUE OPTIMIZATION**

Exploratory Data Analysis & Model Engineering



Data collection

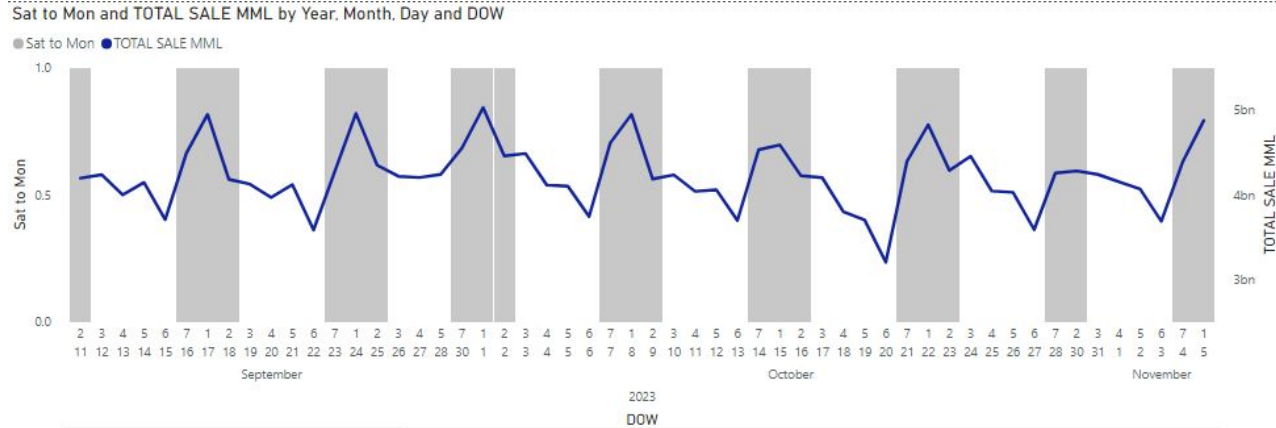
I collected historical sales data for MML SKUs from WCM stores for the period from 2022/01/01 - 2024/04/21.

The dataset encompassed information on sales, transactions, product categories, store locations, and dates.



PURCHASING BEHAVIORS

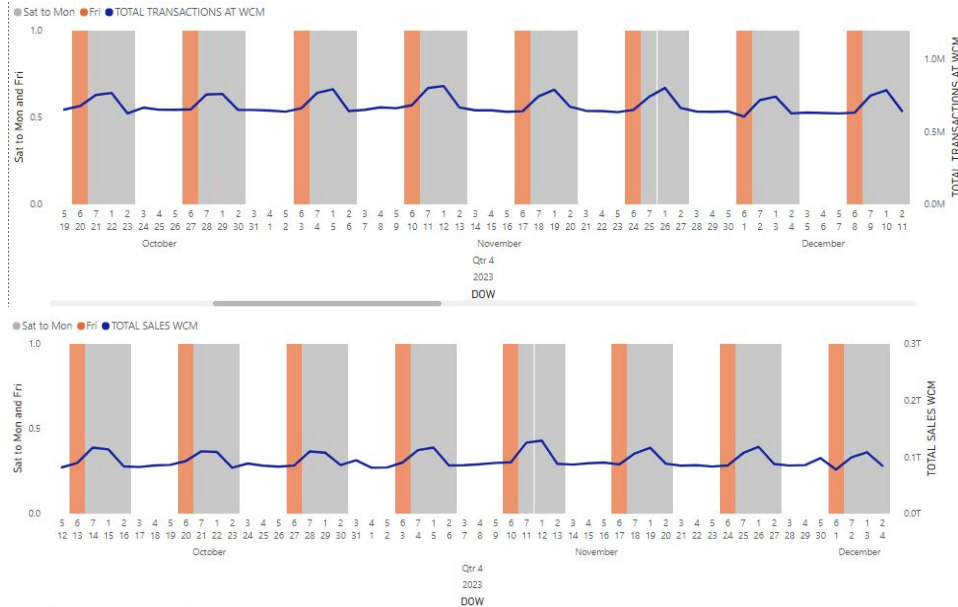
EXPLORATORY DATA ANALYSIS - MML products



Overall, It's easy to notice that sales of MML products is peak on weekend (more exactly from Sat to Mon), meanwhile it dropped on weekdays (most significantly on Friday).

However, it might be the reason that sales on weekend is the highest due to the fact that more ppl visit to WCM stores on the weekend and less on weekdays (Friday particularly since we see huge drop of sales on Friday).

EXPLORATORY DATA ANALYSIS - All stores



We can see that there are more visits to WCM stores on weekend (Sat and Sun), which correlates to sales of total products (incl. MML) => more visits on Sat and Sun result in higher sales of MML in Sat and Sun.

However, sales/visits on Fri and Monday seems stable, but the sales of MML on Fri/Mon are totally uncorrelated => there is some hidden patterns here and we want to dive deep into it.

EXPLORATORY DATA ANALYSIS - MML products

Sum of VALUE_SALE by PRODUCT_NAME



Top 6 MML products contribute to > 50% of total revenue, i focus on this group for deeper analysis.

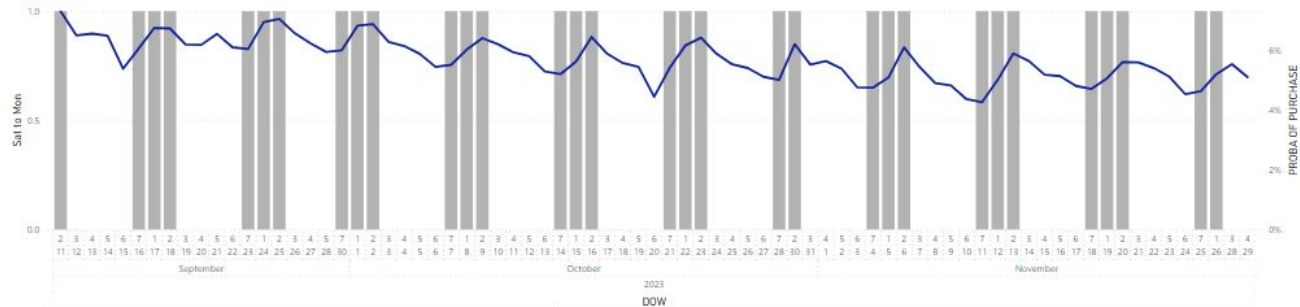
I define some metrics that may reflect the purchasing behavior of buyers.

1. **Proba_purchase** = total MML transactions / total store transactions
2. **Basket_Share_MML** = total MML sales/ total store sales
3. **Avg_Sales_per_transaction_MML** = total MML sales / total MML transactions
4. **Avg_Sales_per_store_visit_MML** = total MML sales / total store transactions

MEAT DELI Thịt heo xay chuẩn ngon (S) - HÀ NỘI

PROBA OF PURCHASE by DOW

● Sat to Mon ● PROBA OF PURCHASE



Probability of Purchase

PERIOD TAG	1	2	3	4	5	6	7
Monday, September 11, 2023	6.77%	7.32%	6.51%	6.57%	6.50%	5.39%	6.06%
Monday, September 18, 2023	6.96%	5.75%	6.21%	6.20%	6.57%	6.11%	6.09%
Monday, September 25, 2023	6.83%	7.06%	6.58%	6.25%	5.90%	5.08%	6.01%
Monday, October 02, 2023	6.03%	6.88%	6.29%	6.10%	5.89%	5.40%	5.51%
Monday, October 09, 2023	5.64%	6.42%	6.22%	5.94%	5.82%	5.31%	5.21%
Monday, October 16, 2023	6.17%	6.40%	5.89%	5.58%	5.40%	4.45%	5.43%
Monday, October 23, 2023	5.63%	6.43%	5.90%	5.54%	5.42%	5.12%	5.02%
Monday, October 30, 2023	5.10%	6.22%	5.53%	5.05%	5.40%	4.77%	4.75%
Monday, November 06, 2023	5.02%	6.11%	5.45%	4.81%	4.84%	4.37%	4.27%
Monday, November 13, 2023	5.07%	5.91%	5.65%	5.19%	5.14%	4.40%	4.72%
Total	5.73%	6.26%	5.82%	5.67%	5.50%	5.05%	5.20%

Avg BASE SALE_QTY of MML per Transaction

PERIOD TAG	1	2	3	4	5	6	7
Monday, September 11, 2023	0.44	0.42	0.43	0.42	0.43	0.43	0.43
Monday, September 18, 2023	0.43	0.41	0.43	0.42	0.42	0.42	0.42
Monday, September 25, 2023	0.43	0.42	0.43	0.42	0.42	0.42	0.42
Monday, October 02, 2023	0.43	0.43	0.43	0.42	0.43	0.42	0.43
Monday, October 09, 2023	0.43	0.42	0.42	0.42	0.43	0.43	0.43
Monday, October 16, 2023	0.43	0.42	0.43	0.42	0.43	0.43	0.43
Monday, October 23, 2023	0.43	0.42	0.43	0.42	0.42	0.42	0.43
Monday, October 30, 2023	0.43	0.43	0.43	0.43	0.43	0.42	0.43
Monday, November 06, 2023	0.43	0.42	0.43	0.42	0.43	0.42	0.43
Monday, November 13, 2023	0.43	0.42	0.43	0.42	0.42	0.42	0.43
Total	0.43	0.42	0.42	0.42	0.42	0.42	0.43

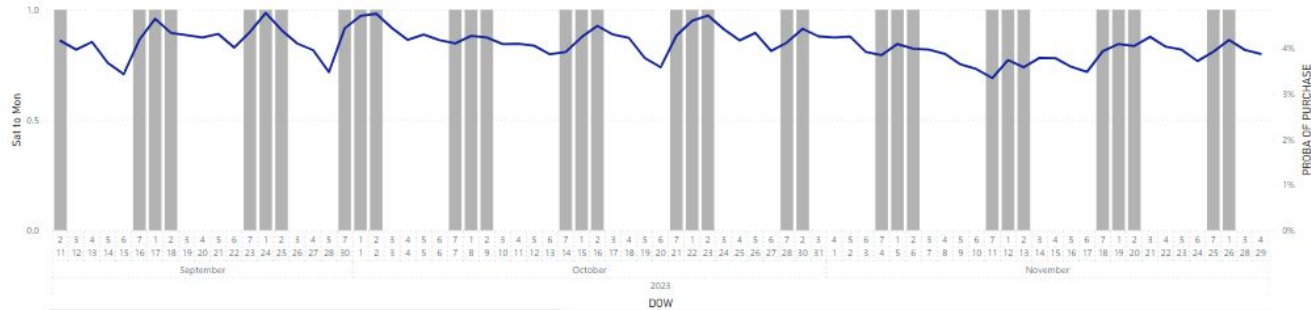
Avg Retail Price

PERIOD TAG	1	2	3	4	5	6	7
Monday, November 20, 2023	102,922	102,990	102,667	102,860	102,926	102,838	103,012
Monday, November 27, 2023	103,417	102,814	102,435	102,948	103,085	103,158	103,435
Monday, December 04, 2023	103,328	103,262	103,136	103,792	103,240	103,436	103,261
Monday, December 11, 2023	103,052	102,893	102,624	102,775	102,914	102,864	102,047
Monday, December 18, 2023	103,156	103,900	103,201	103,471	103,477	103,388	103,189
Monday, December 25, 2023	102,208	102,712	102,494	102,607	103,056	102,955	102,553
Monday, January 01, 2024	103,998	102,147	101,534	102,120	102,756	102,955	103,637
Monday, January 08, 2024	103,915	103,963	103,155	103,279	103,450	103,800	103,895
Monday, January 15, 2024	103,347	103,516	103,060	103,549	103,067	103,493	103,543
Monday, January 22, 2024	103,653	103,345	103,265	103,322	103,355	103,339	103,674
Total	103,475	103,354	103,244	103,380	103,387	102,741	103,498

MEAT DELI Ba rọi heo (S) - HCM

PROBA OF PURCHASE by DOW

● Sat to Mon ● PROBA OF PURCHASE



Probability of Purchase

PERIOD TAG	1	2	3	4	5	6	7
Monday, September 11, 2023	4.65%	4.16%	3.97%	4.14%	3.68%	3.41%	4.19%
Monday, September 18, 2023	4.78%	4.34%	4.29%	4.24%	4.31%	4.02%	4.36%
Monday, September 25, 2023	4.71%	4.40%	4.59%	3.96%	3.40%	3.29%	4.44%
Monday, October 02, 2023	4.27%	4.76%	4.44%	4.18%	4.30%	4.11%	4.11%
Monday, October 09, 2023	4.24%	4.24%	4.09%	4.10%	4.00%	3.87%	3.92%
Monday, October 16, 2023	4.60%	4.49%	4.30%	4.23%	3.79%	3.58%	4.28%
Monday, October 23, 2023	4.33%	4.72%	4.42%	4.17%	4.34%	3.94%	4.13%
Monday, October 30, 2023	4.09%	4.43%	4.26%	4.22%	4.20%	3.92%	3.85%
Monday, November 06, 2023	3.74%	3.99%	3.97%	3.68%	3.65%	3.54%	3.34%
Monday, November 13, 2023	4.09%	3.58%	3.79%	3.78%	3.59%	3.48%	3.93%
Total	4.05%	4.01%	3.80%	3.74%	3.66%	3.47%	3.78%

Avg BASE SALE_QTY of MML per Transaction

PERIOD TAG	1	2	3	4	5	6	7
Monday, September 11, 2023	0.45	0.46	0.45	0.44	0.44	0.47	0.47
Monday, September 18, 2023	0.44	0.45	0.44	0.45	0.44	0.46	0.46
Monday, September 25, 2023	0.44	0.45	0.45	0.44	0.44	0.46	0.46
Monday, October 02, 2023	0.46	0.44	0.44	0.44	0.45	0.46	0.46
Monday, October 09, 2023	0.44	0.44	0.44	0.44	0.45	0.44	0.46
Monday, October 16, 2023	0.44	0.45	0.44	0.45	0.44	0.46	0.46
Monday, October 23, 2023	0.44	0.45	0.45	0.44	0.45	0.44	0.46
Monday, October 30, 2023	0.44	0.44	0.45	0.44	0.44	0.45	0.46
Monday, November 06, 2023	0.46	0.44	0.44	0.44	0.45	0.45	0.45
Monday, November 13, 2023	0.47	0.45	0.45	0.45	0.45	0.45	0.45
Total	0.46	0.45	0.45	0.45	0.45	0.45	0.46

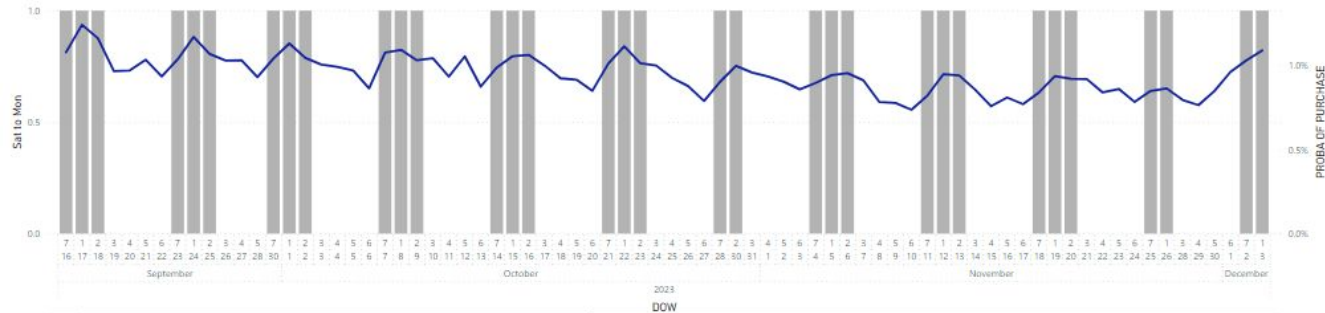
Avg Retail Price

PERIOD TAG	1	2	3	4	5	6	7
Monday, November 20, 2023	154,585	154,395	154,751	154,696	154,568	154,423	154,504
Monday, November 27, 2023	155,343	154,896	154,956	154,862	155,228	155,177	155,158
Monday, December 04, 2023	155,122	155,177	154,809	155,244	155,009	155,278	155,842
Monday, December 11, 2023	155,027	155,043	154,892	155,326	155,206	154,891	155,201
Monday, December 18, 2023	154,980	155,209	154,008	154,845	155,008	154,907	154,742
Monday, December 25, 2023	154,999	154,668	154,873	155,009	154,800	154,798	155,089
Monday, January 01, 2024	155,385	155,271	154,814	155,011	155,344	155,240	155,255
Monday, January 08, 2024	155,531	155,186	155,367	155,366	155,560	155,537	155,623
Monday, January 15, 2024	155,452	155,709	155,876	155,681	155,668	155,383	155,388
Monday, January 22, 2024	154,936	155,503	155,206	155,318	154,989	154,841	155,016
Total	155,300	155,299	155,308	155,355	155,282	154,250	155,313

MEAT DELI [PRE] Sườn Thăn (sườn non) (S) - HÀ NỘI

PROBA OF PURCHASE by DOW

● Sat to Mon ● PROBA OF PURCHASE



Probability of Purchase

PERIOD TAG	1	2	3	4	5	6	7
Monday, September 11, 2023	1.24%	1.27%	1.09%	1.13%	1.18%	0.93%	1.08%
Monday, September 18, 2023	1.17%	1.16%	0.96%	0.97%	1.02%	0.93%	1.04%
Monday, September 25, 2023	1.17%	1.07%	1.03%	1.03%	0.92%	0.81%	1.04%
Monday, October 02, 2023	1.09%	1.04%	1.00%	0.99%	0.97%	0.86%	1.07%
Monday, October 09, 2023	1.05%	1.01%	1.04%	0.93%	1.05%	0.87%	0.99%
Monday, October 16, 2023	1.11%	1.06%	1.00%	0.92%	0.91%	0.85%	1.01%
Monday, October 23, 2023	1.01%	1.01%	1.00%	0.92%	0.86%	0.79%	0.96%
Monday, October 30, 2023	0.94%	1.00%	0.96%	0.93%	0.90%	0.86%	0.90%
Monday, November 06, 2023	0.95%	0.95%	0.91%	0.78%	0.78%	0.74%	0.82%
Monday, November 13, 2023	0.94%	0.94%	0.93%	0.76%	0.81%	0.77%	0.84%
Total	1.05%	1.00%	0.97%	0.94%	0.95%	0.86%	0.96%

Avg BASE SALE_QTY of MML per Transaction

PERIOD TAG	1	2	3	4	5	6	7
Monday, September 11, 2023	0.43	0.38	0.39	0.40	0.40	0.40	0.42
Monday, September 18, 2023	0.42	0.38	0.38	0.39	0.40	0.40	0.42
Monday, September 25, 2023	0.42	0.40	0.40	0.40	0.40	0.40	0.42
Monday, October 02, 2023	0.42	0.40	0.41	0.41	0.40	0.39	0.42
Monday, October 09, 2023	0.41	0.38	0.39	0.41	0.42	0.41	0.42
Monday, October 16, 2023	0.43	0.40	0.40	0.39	0.40	0.43	0.42
Monday, October 23, 2023	0.43	0.40	0.40	0.40	0.40	0.40	0.42
Monday, October 30, 2023	0.42	0.39	0.39	0.40	0.39	0.40	0.43
Monday, November 06, 2023	0.42	0.41	0.39	0.40	0.40	0.40	0.42
Monday, November 13, 2023	0.42	0.40	0.40	0.40	0.41	0.42	0.42
Total	0.43	0.40	0.41	0.41	0.41	0.41	0.43

Avg Retail Price

PERIOD TAG	1	2	3	4	5	6	7
Monday, November 20, 2023	214,407	214,824	215,144	214,245	214,251	214,763	214,864
Monday, November 27, 2023	214,833	214,408	213,828	213,837	213,857	214,356	214,586
Monday, December 04, 2023	215,040	214,347	213,938	214,695	214,658	214,726	214,713
Monday, December 11, 2023	214,435	214,405	214,304	214,646	215,123	215,208	214,998
Monday, December 18, 2023	214,417	214,948	215,371	214,994	214,953	215,025	215,085
Monday, December 25, 2023	214,181	214,631	214,967	214,143	213,586	214,543	214,406
Monday, January 01, 2024	215,685	213,538	213,683	211,930	213,786	214,438	215,081
Monday, January 08, 2024	215,920	215,344	214,595	214,823	214,633	215,315	215,616
Monday, January 15, 2024	214,808	215,840	215,361	215,649	215,940	215,086	215,216
Monday, January 22, 2024	215,364	214,508	215,052	215,355	214,864	215,309	215,433
Total	215,050	214,992	214,878	214,873	214,777	213,797	215,137

MEAT DELI [PRE] Thịt heo xay đặc biệt - HCM

PROBA OF PURCHASE by DOW

● Sat to Mon ● PROBA OF PURCHASE



Probability of Purchase

PERIOD TAG	1	2	3	4	5	6	7
Monday, September 11, 2023	2.01%	2.02%	1.92%	1.74%	1.60%	1.46%	1.77%
Monday, September 18, 2023	1.91%	1.99%	1.90%	1.78%	1.77%	1.61%	1.72%
Monday, September 25, 2023	1.96%	1.96%	1.83%	1.72%	1.56%	1.69%	1.77%
Monday, October 02, 2023	1.70%	2.12%	1.91%	1.71%	1.60%	1.84%	1.68%
Monday, October 09, 2023	1.69%	1.82%	1.64%	1.81%	1.57%	1.45%	1.59%
Monday, October 16, 2023	1.89%	1.80%	1.57%	1.70%	1.62%	1.57%	1.56%
Monday, October 23, 2023	1.53%	1.91%	1.63%	1.69%	1.67%	1.46%	1.32%
Monday, October 30, 2023	1.50%	1.99%	1.67%	1.83%	1.61%	1.51%	1.59%
Monday, November 06, 2023	1.34%	1.65%	1.31%	1.48%	1.45%	1.32%	1.32%
Monday, November 13, 2023	1.56%	1.32%	1.52%	1.47%	1.45%	1.45%	1.42%
Total	1.57%	1.66%	1.58%	1.55%	1.48%	1.36%	1.45%

Avg BASE SALE_QTY of MML per Transaction

PERIOD TAG	1	2	3	4	5	6	7
Monday, September 11, 2023	0.44	0.44	0.43	0.44	0.44	0.43	0.44
Monday, September 18, 2023	0.45	0.44	0.43	0.44	0.44	0.45	0.44
Monday, September 25, 2023	0.43	0.43	0.44	0.44	0.44	0.44	0.44
Monday, October 02, 2023	0.44	0.44	0.44	0.42	0.42	0.44	0.44
Monday, October 09, 2023	0.44	0.44	0.44	0.44	0.44	0.45	0.44
Monday, October 16, 2023	0.45	0.43	0.43	0.43	0.44	0.45	0.44
Monday, October 23, 2023	0.45	0.45	0.45	0.45	0.45	0.45	0.45
Monday, October 30, 2023	0.44	0.44	0.44	0.44	0.44	0.45	0.45
Monday, November 06, 2023	0.44	0.44	0.44	0.44	0.44	0.44	0.43
Monday, November 13, 2023	0.44	0.44	0.44	0.44	0.44	0.44	0.45
Total	0.44	0.43	0.43	0.43	0.43	0.44	0.43

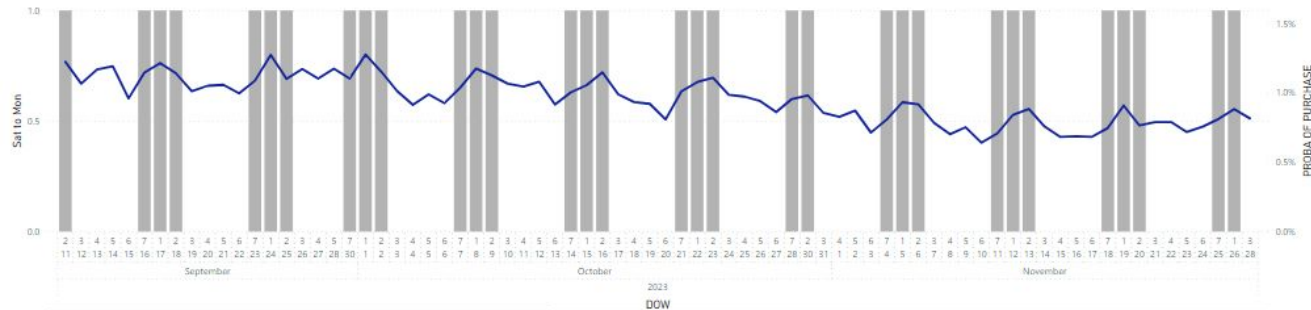
Avg Retail Price

PERIOD TAG	1	2	3	4	5	6	7
Monday, November 20, 2023	136,815	136,008	135,541	134,455	135,570	135,161	136,189
Monday, November 27, 2023	136,817	136,335	136,031	135,465	136,646	136,391	137,125
Monday, December 04, 2023	137,133	136,407	136,608	137,908	138,943	138,262	136,328
Monday, December 11, 2023	135,851	136,407	135,891	135,325	136,242	136,314	135,866
Monday, December 18, 2023	136,804	135,832	135,805	134,859	135,524	136,361	135,863
Monday, December 25, 2023	136,498	135,610	135,423	134,939	136,378	136,875	136,579
Monday, January 01, 2024	136,534	136,646	136,663	136,564	137,165	137,562	139,055
Monday, January 08, 2024	139,843	138,328	138,361	137,814	137,264	137,442	139,233
Monday, January 15, 2024	138,116	139,775	137,709	137,858	137,264	137,327	138,303
Monday, January 22, 2024	137,186	137,596	137,623	137,048	137,012	137,021	137,797
Total	137,893	137,780	137,528	137,495	137,728	136,909	138,006

MEAT DELI [PRE] Ba rọi đặc biệt (S) - HÀ NỘI

PROBA OF PURCHASE BY DOW

● Sat to Mon ● PROBA OF PURCHASE



Probability of Purchase

PERIOD TAG	1	2	3	4	5	6	7
Monday, September 11, 2023	1.21%	1.22%	1.07%	1.17%	1.19%	1.30%	1.15%
Monday, September 18, 2023	1.27%	1.14%	1.01%	1.05%	1.06%	1.00%	1.09%
Monday, September 25, 2023	1.28%	1.16%	1.17%	1.10%	1.17%	0.93%	1.10%
Monday, October 02, 2023	1.18%	1.15%	1.01%	0.91%	0.99%	0.93%	1.04%
Monday, October 09, 2023	1.06%	1.13%	1.07%	1.04%	1.08%	0.93%	1.00%
Monday, October 16, 2023	1.08%	1.15%	0.99%	0.93%	0.92%	0.81%	1.01%
Monday, October 23, 2023	1.02%	1.11%	0.99%	0.97%	0.94%	0.80%	0.96%
Monday, October 30, 2023	0.93%	0.98%	0.95%	0.81%	0.87%	0.73%	0.81%
Monday, November 06, 2023	0.94%	0.92%	0.98%	0.70%	0.71%	0.68%	0.71%
Monday, November 13, 2023	0.91%	0.88%	0.91%	0.80%	0.61%	0.60%	0.75%
Total	1.10%	1.07%	1.00%	0.97%	0.99%	0.91%	0.99%

Avg BASE SALE QTY of MML per Transaction

PERIOD TAG	1	2	3	4	5	6	7
Monday, September 11, 2023	0.42	0.40	0.40	0.41	0.40	0.40	0.40
Monday, September 18, 2023	0.43	0.40	0.41	0.40	0.40	0.40	0.40
Monday, September 25, 2023	0.40	0.40	0.40	0.40	0.40	0.40	0.40
Monday, October 02, 2023	0.41	0.40	0.38	0.40	0.40	0.40	0.40
Monday, October 09, 2023	0.40	0.40	0.40	0.38	0.40	0.40	0.40
Monday, October 16, 2023	0.42	0.40	0.38	0.40	0.40	0.41	0.40
Monday, October 23, 2023	0.40	0.40	0.40	0.40	0.40	0.40	0.42
Monday, October 30, 2023	0.42	0.41	0.41	0.42	0.41	0.42	0.43
Monday, November 06, 2023	0.43	0.42	0.41	0.42	0.41	0.41	0.41
Monday, November 13, 2023	0.42	0.42	0.44	0.43	0.43	0.43	0.45
Total	0.42	0.41	0.41	0.41	0.41	0.41	0.42

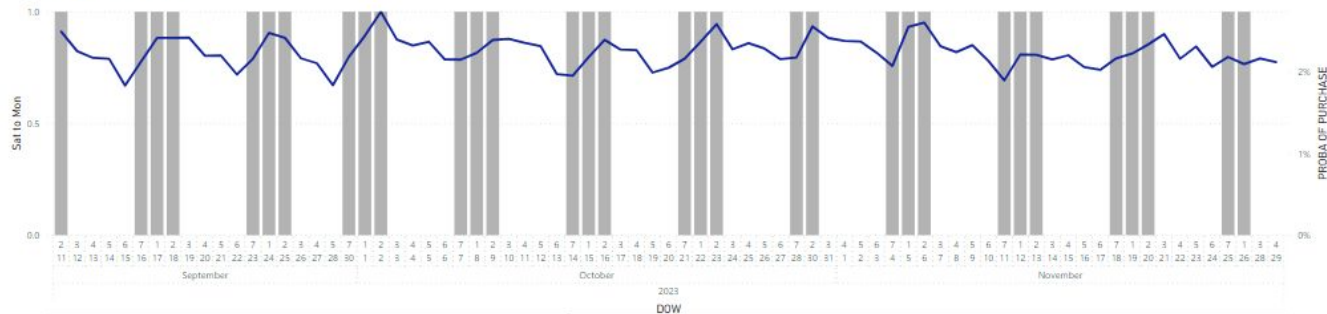
Avg Retail Price

PERIOD TAG	1	2	3	4	5	6	7
Monday, November 20, 2023	193.473	195.753	194.119	194.237	193.373	193.684	193.695
Monday, November 27, 2023	193.605	193.631	193.659	194.007	194.266	194.097	193.723
Monday, December 04, 2023	194.063	194.121	194.159	197.179	197.904	195.729	194.289
Monday, December 11, 2023	193.105	194.031	194.169	193.779	193.901	193.418	193.492
Monday, December 18, 2023	193.184	193.379	194.040	193.485	193.659	194.092	193.557
Monday, December 25, 2023	192.893	193.401	193.013	193.343	193.248	193.093	192.725
Monday, January 01, 2024	194.457	194.367	194.948	194.743	194.454	193.887	194.553
Monday, January 08, 2024	195.095	194.516	194.964	195.156	195.289	195.098	195.303
Monday, January 15, 2024	195.553	195.367	195.536	195.415	195.063	195.614	195.496
Monday, January 22, 2024	195.436	195.295	195.411	195.415	195.136	195.133	195.085
Total	194.935	195.074	195.102	195.186	195.009	193.747	194.999

MEAT DELI [PRE] Nạc dăm heo (nạc vai) (S) - HCM

PROBA OF PURCHASE by DOW

@ Sat to Mon ● PROBA OF PURCHASE



Probability of Purchase

PERIOD TAG	1	2	3	4	5	6	7
Monday, September 11, 2023	2.41%	2.48%	2.25%	2.17%	2.10%	1.81%	2.13%
Monday, September 18, 2023	2.48%	2.42%	2.42%	2.20%	2.20%	1.97%	2.16%
Monday, September 25, 2023	2.44%	2.42%	2.17%	2.10%	1.84%	1.65%	2.19%
Monday, October 02, 2023	2.23%	2.74%	2.40%	2.32%	2.37%	2.35%	2.15%
Monday, October 09, 2023	2.18%	2.39%	2.40%	2.35%	2.31%	1.97%	1.96%
Monday, October 16, 2023	2.37%	2.39%	2.27%	2.26%	1.99%	2.05%	2.19%
Monday, October 23, 2023	2.38%	2.56%	2.38%	2.35%	2.28%	2.16%	2.18%
Monday, October 30, 2023	2.55%	2.56%	2.41%	2.38%	2.37%	2.24%	2.07%
Monday, November 06, 2023	2.21%	2.60%	2.31%	2.24%	2.33%	2.31%	1.90%
Monday, November 13, 2023	2.22%	2.21%	2.31%	2.20%	2.06%	2.02%	2.16%
Total	2.11%	2.23%	2.08%	2.03%	2.04%	1.91%	1.92%

Avg BASE SALE QTY of MML per Transaction

PERIOD TAG	1	2	3	4	5	6	7
Monday, September 11, 2023	0.43	0.41	0.42	0.41	0.40	0.41	0.42
Monday, September 18, 2023	0.42	0.42	0.42	0.41	0.42	0.42	0.43
Monday, September 25, 2023	0.41	0.41	0.41	0.41	0.42	0.42	0.42
Monday, October 02, 2023	0.42	0.41	0.41	0.41	0.42	0.41	0.42
Monday, October 09, 2023	0.41	0.42	0.41	0.41	0.41	0.41	0.42
Monday, October 16, 2023	0.42	0.41	0.41	0.41	0.41	0.41	0.44
Monday, October 23, 2023	0.42	0.42	0.41	0.42	0.42	0.42	0.43
Monday, October 30, 2023	0.42	0.42	0.42	0.42	0.42	0.42	0.43
Monday, November 06, 2023	0.42	0.41	0.42	0.42	0.42	0.42	0.43
Monday, November 13, 2023	0.43	0.42	0.42	0.41	0.42	0.42	0.44
Total	0.42	0.41	0.41	0.41	0.41	0.42	0.42

Avg Retail Price

PERIOD TAG	1	2	3	4	5	6	7
Monday, November 20, 2023	136,474	136,808	136,543	136,269	137,931	136,219	136,164
Monday, November 27, 2023	136,071	136,838	136,611	136,930	136,311	136,076	136,420
Monday, December 04, 2023	136,826	136,350	136,533	136,334	136,949	136,808	136,630
Monday, December 11, 2023	136,258	136,809	136,001	136,944	136,033	136,145	136,701
Monday, December 18, 2023	126,224	126,728	126,631	126,581	126,532	126,316	126,242
Monday, December 25, 2023	126,236	126,691	126,281	126,430	126,596	126,574	126,342
Monday, January 01, 2024	136,202	136,244	136,586	136,178	136,152	136,706	136,920
Monday, January 08, 2024	136,515	136,514	136,363	136,379	136,387	136,445	136,425
Monday, January 15, 2024	136,285	136,379	136,368	136,241	136,863	136,026	136,154
Monday, January 22, 2024	136,378	136,961	136,416	136,626	136,366	136,190	136,296
Total	136,819	136,907	136,981	137,354	137,434	136,352	136,714



TREND ANALYSIS - DOW

We see that even in the weekend the purchase probability is consistently higher on Sat/Sun/Mon than in other weekdays (Friday particularly) => Ppl tend to buy and store fresh product on these days to consume for the whole week



PRICE ELASTICITY



PRICE ELASTICITY of DEMAND MODEL

As analysis from previous part, we discovered that shoppers have certain buying patterns for MML products (fresh meat) on specific days (Saturday/Sunday/Monday) and tend not to buy on Fridays. This suggests that price sensitivity varies throughout the week. Specifically, it is expected that price has less impact on demand on Sundays, while it has a greater impact on Fridays. This insight leads to the idea of increasing prices on Sundays without significantly affecting demand and reducing prices on Fridays to drive sales.

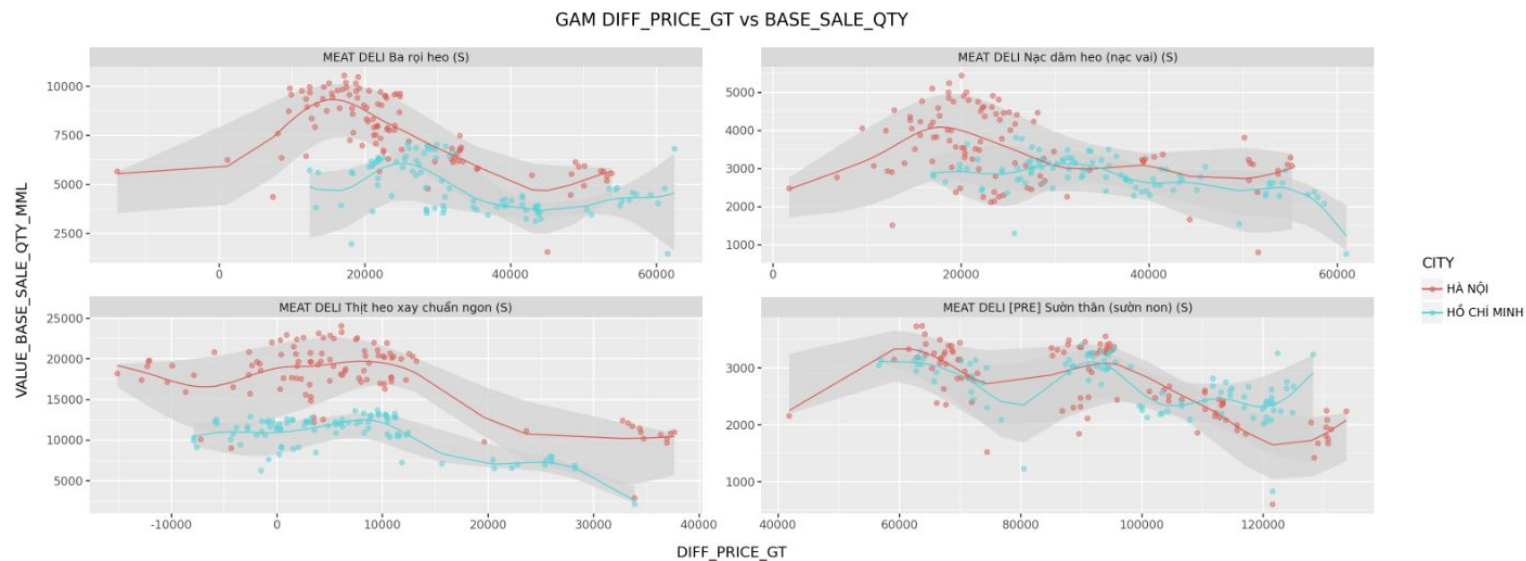
Additionally, I have a hypothesis that different store formats may exhibit varying price sensitivities due to different types of visitors. This effect is expected to be more prominent on weekends since shoppers tend to visit supermarkets more frequently during that time.

To measure the price elasticity of demand and simulate price optimization, you propose three different aggregation levels:

1. Aggregate at CITY/PRODUCT/WEEK level (since intraweek price is static)
2. Aggregate at CITY/PRODUCT/WEEK/BUSINESS_UNIT level
3. Aggregate at CITY/PRODUCT/WEEK/BUSINESS_UNIT/DOW level

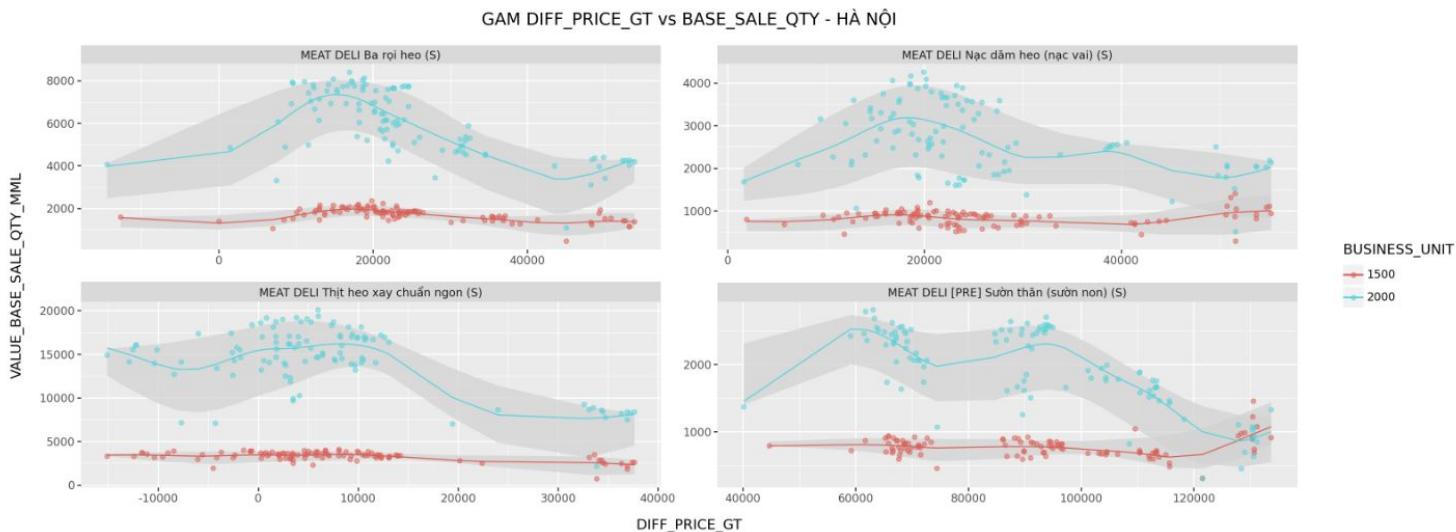
To simulate the price optimization, I will measure the incremental gain of revenue from each model. The price changes will be measured relative to the GT price (market price). The assumptions made are that shoppers are rational and make decisions based on their expectations. Shoppers are aware of the general market price and have an acceptance price based on that information.

CITY/PRODUCT/WEEK



Different products at different city have the different sensitivity of price. For example **MEAT DELI Ba rọi heo (S)** and **MEAT DELI [PRE] Sườn thăn (sườn non) (S)** are less sensitive with price in HCM than in HN. It can be explained due to preference and regional differences.

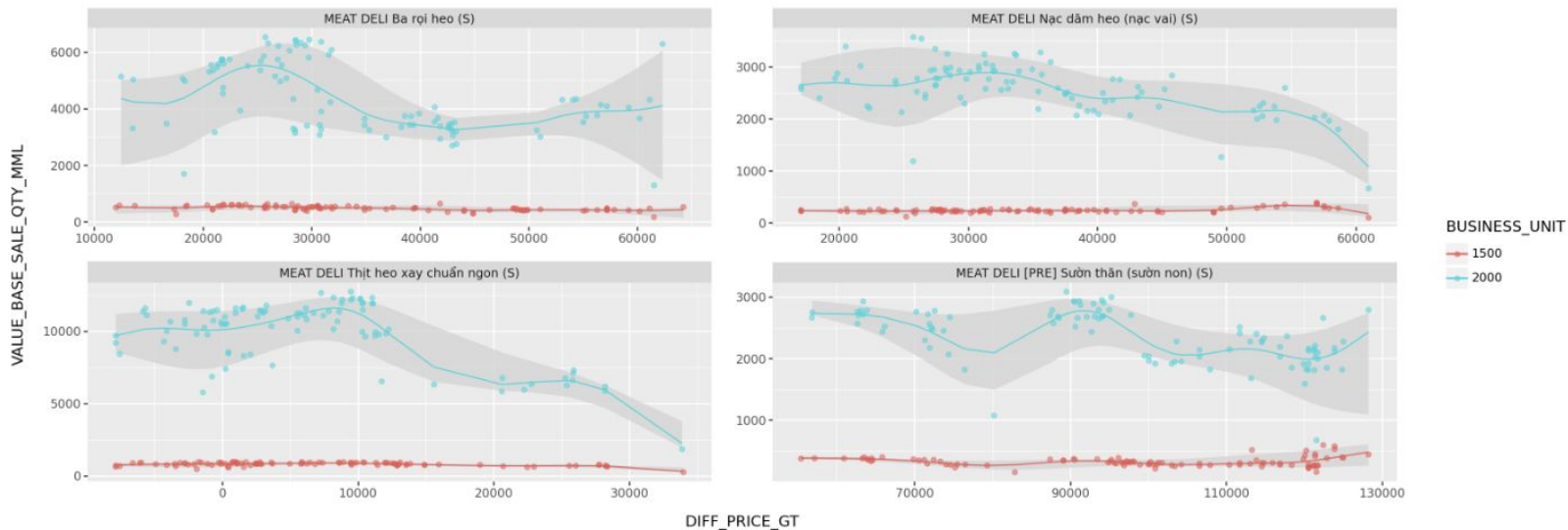
CITY/PRODUCT/WEEK/BUSINESS_UNIT



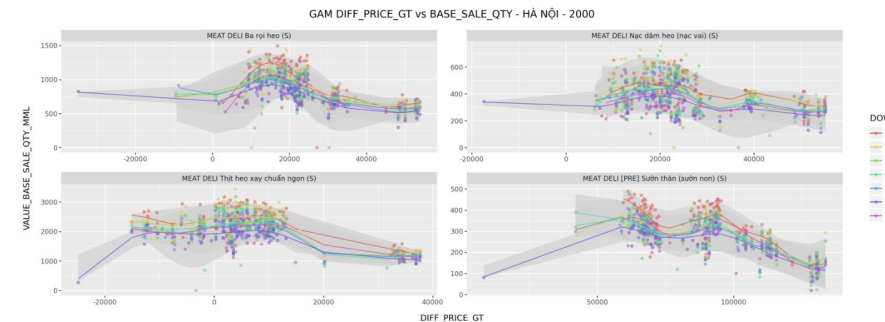
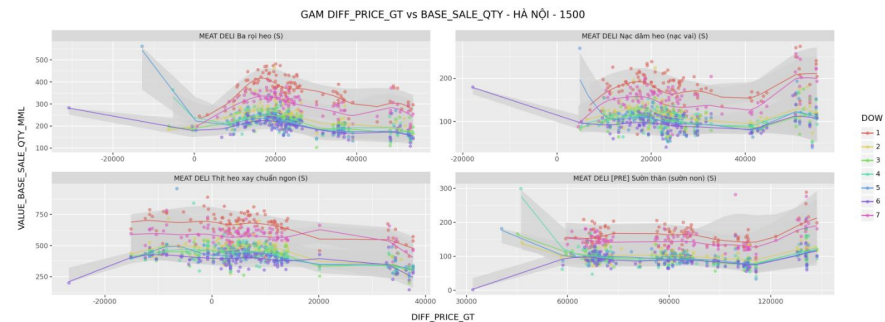
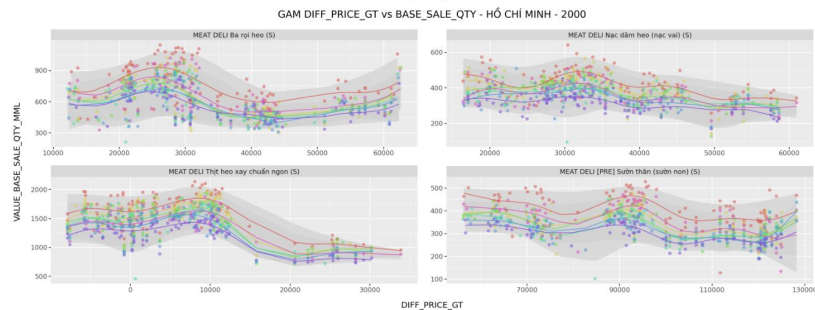
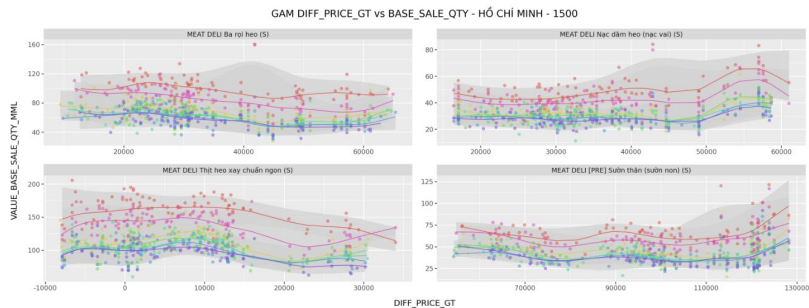
Demand is less sensitive with price at supermarket format (BUSINESS_UNIT = 1500) than in mini-mart/grocery store (BUSINESS_UNIT = 2000)

CITY/PRODUCT/WEEK/BUSINESS_UNIT

GAM DIFF_PRICE_GT vs BASE_SALE_QTY - HỒ CHÍ MINH



CITY/PRODUCT/WEEK/BUSINESS_UNIT/DOW



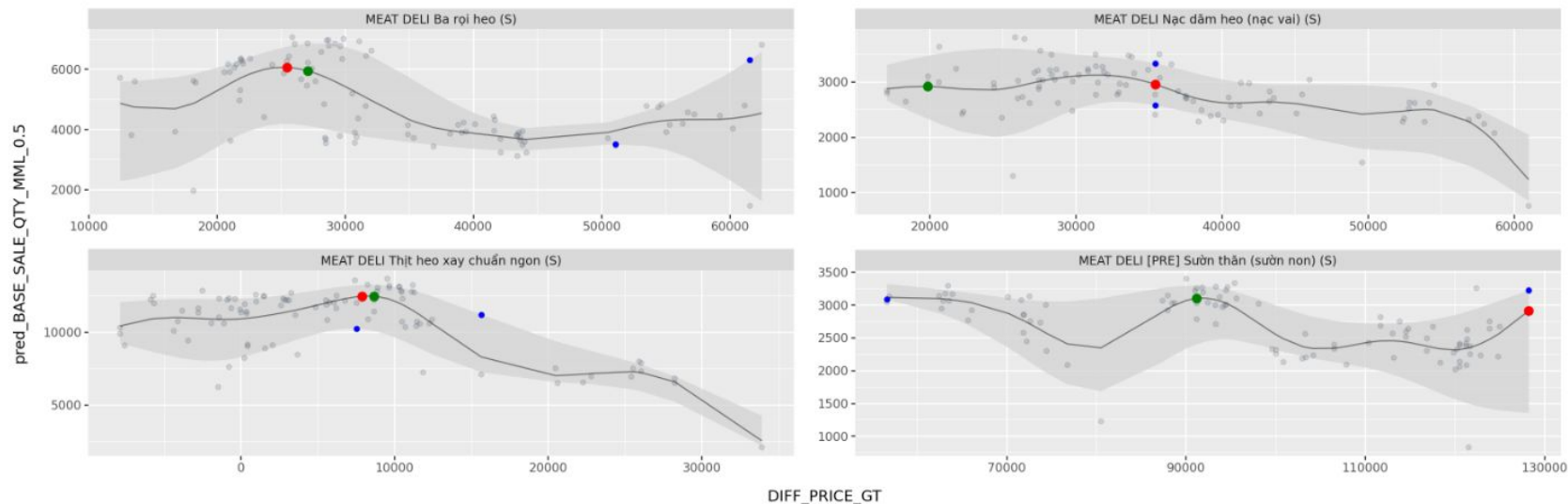


SIMULATION

CITY/PRODUCT/WEEK - Demand vs Price

MEAT DELI - PRICE OPTIMIZATION (GAP to GT PRICE) - HỒ CHÍ MINH

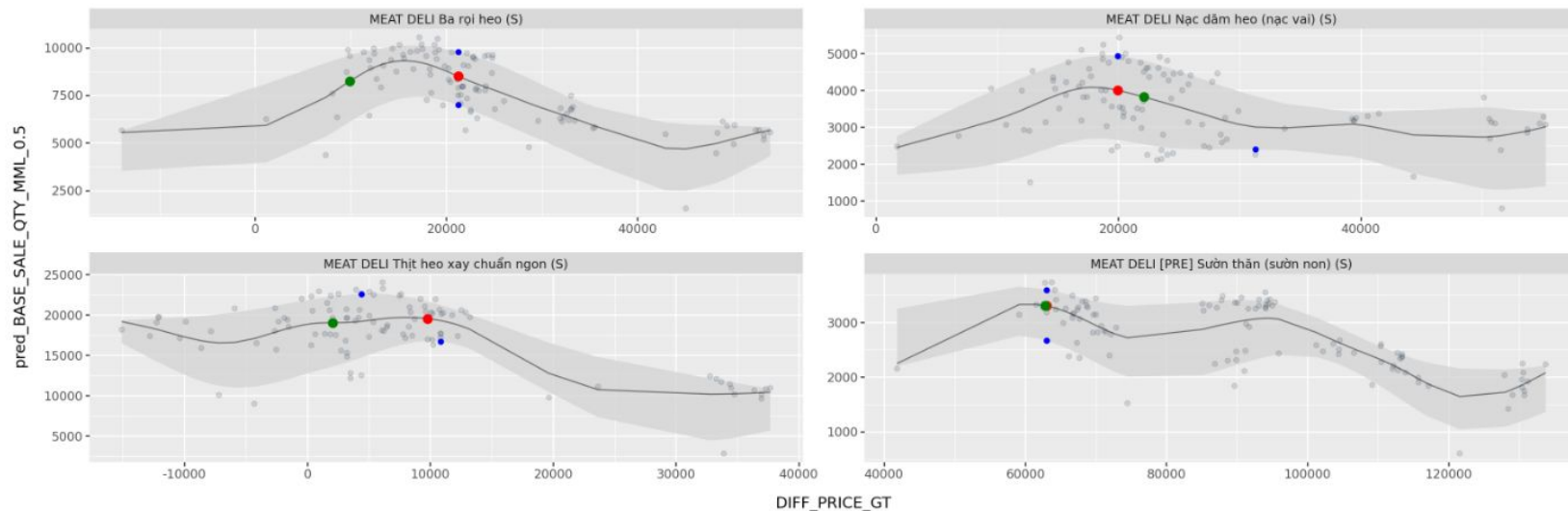
Optimal Median BASE_SALE_QTY (Red) - Current Pricing (Green) - 95% Maximum Confidence Interval (Blue)



CITY/PRODUCT/WEEK - Demand vs Price

MEAT DELI - PRICE OPTIMIZATION (GAP to GT PRICE) - HÀ NỘI

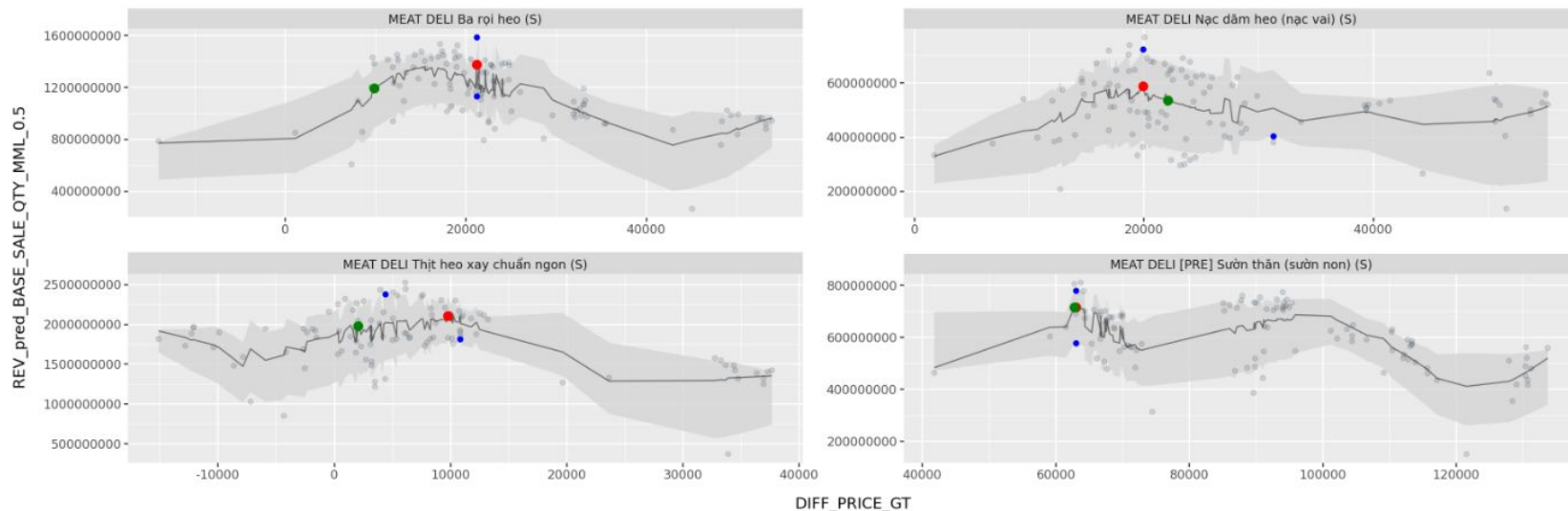
Optimal Median BASE_SALE_QTY (Red) - Current Pricing (Green) - 95% Maximum Confidence Interval (Blue)



CITY/PRODUCT/WEEK - Rev vs Price

MEAT DELI - PRICE OPTIMIZATION (GAP to GT PRICE) - HÀ NỘI

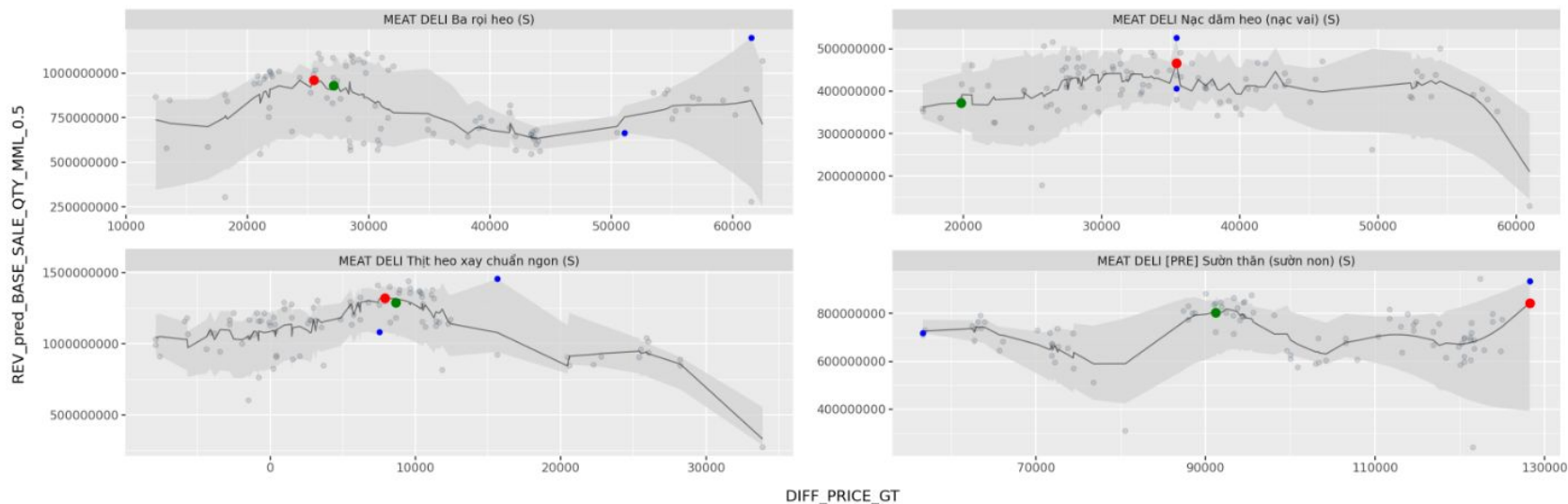
Maximum Median Revenue (Red) - Current Pricing (Green) - 95% Maximum Confidence Interval (Blue)



CITY/PRODUCT/WEEK - Rev vs Price

MEAT DELI - PRICE OPTIMIZATION (GAP to GT PRICE) - HỒ CHÍ MINH

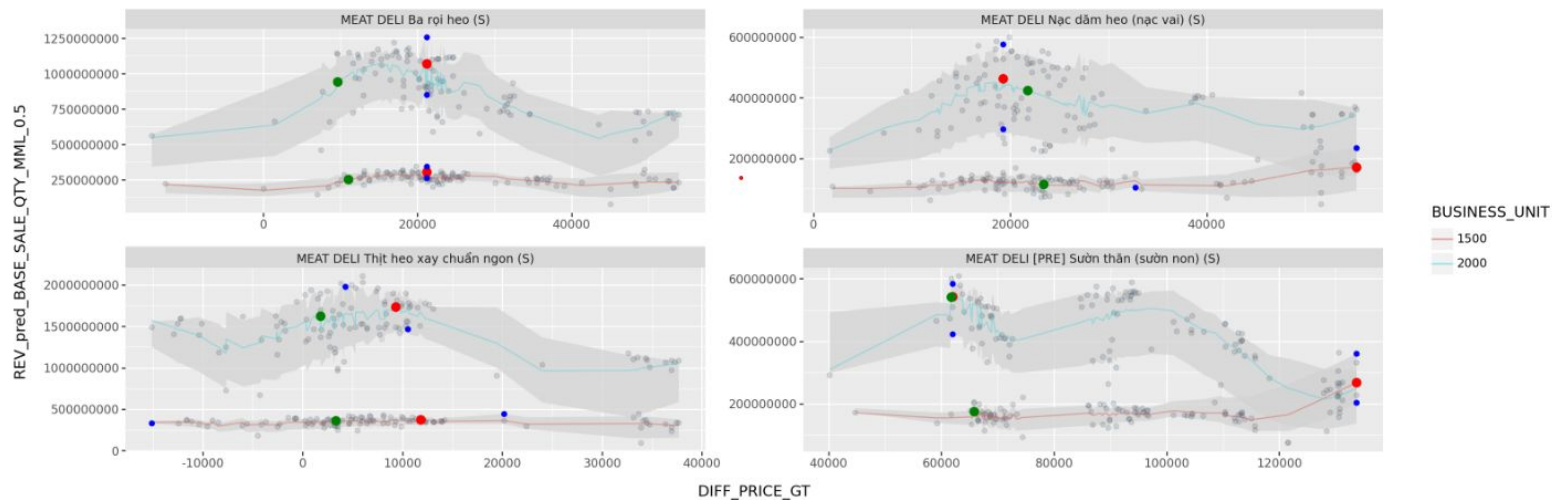
Maximum Median Revenue (Red) - Current Pricing (Green) - 95% Maximum Confidence Interval (Blue)



CITY/PRODUCT/WEEK/BUSINESS_UNIT - Rev vs Price

MEAT DELI - PRICE OPTIMIZATION (GAP to GT PRICE) - HÀ NỘI

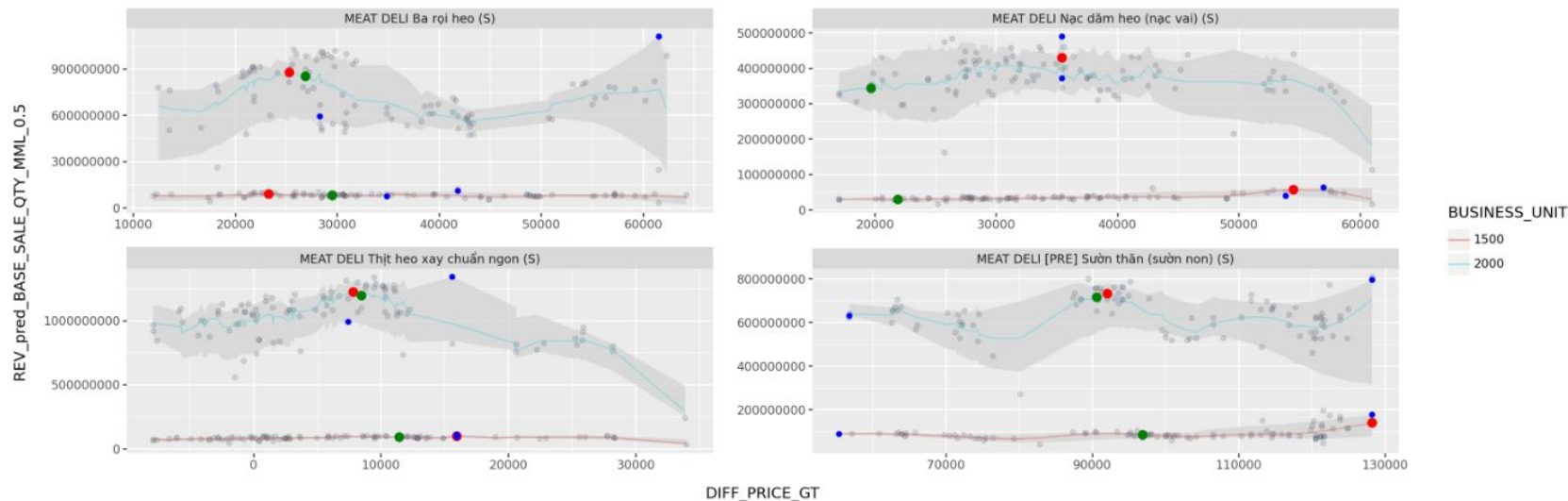
Maximum Median Revenue (Red) - Current Pricing (Green) - 95% Maximum Confidence Interval (Blue)



CITY/PRODUCT/WEEK/BUSINESS_UNIT - Rev vs Price

MEAT DELI - PRICE OPTIMIZATION (GAP to GT PRICE) - HỒ CHÍ MINH

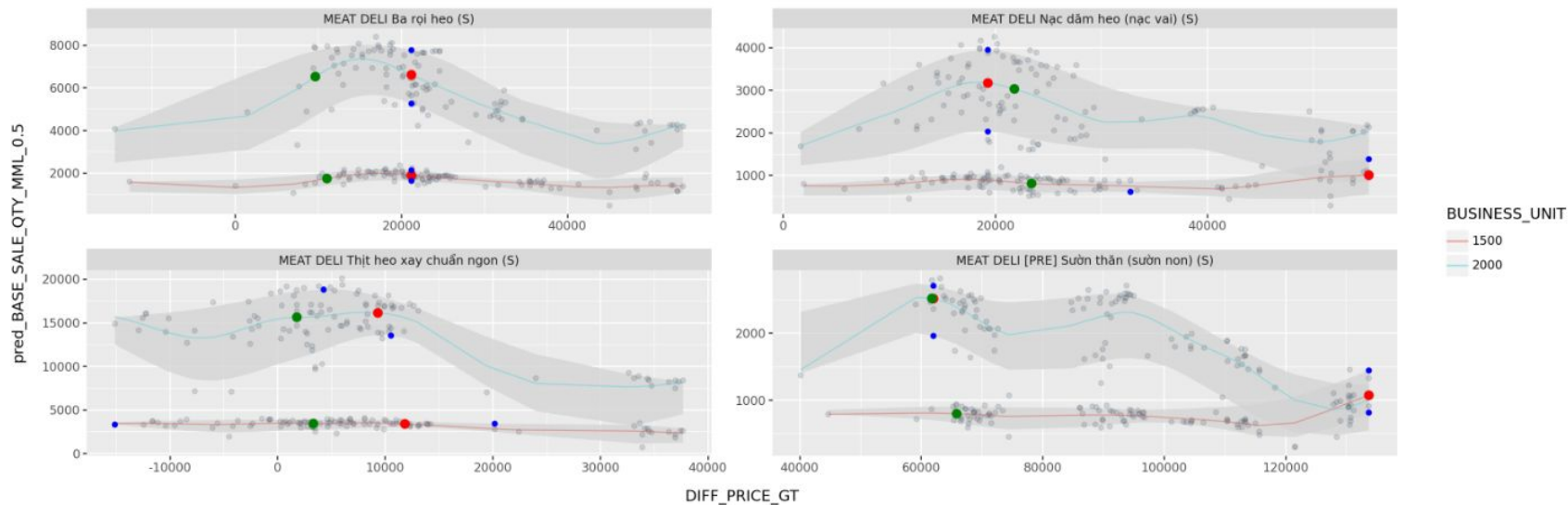
Maximum Median Revenue (Red) - Current Pricing (Green) - 95% Maximum Confidence Interval (Blue)



CITY/PRODUCT/WEEK/BUSINESS_UNIT - Demand vs Price

MEAT DELI - PRICE OPTIMIZATION (GAP to GT PRICE) - HÀ NỘI

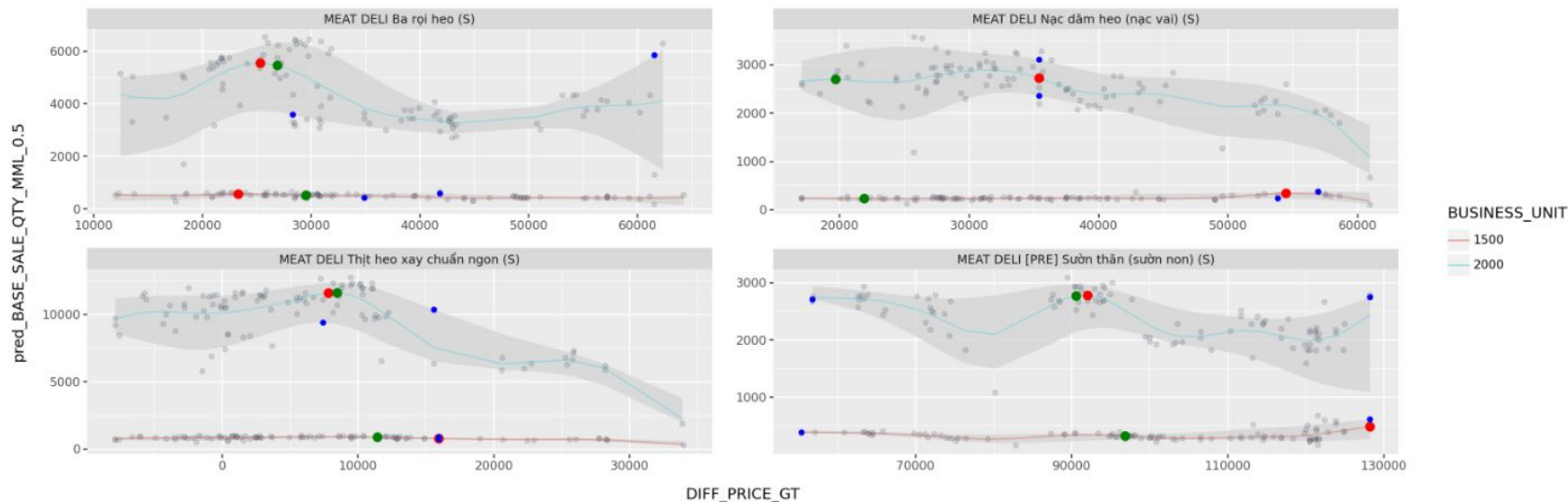
Optimal Median BASE_SALE_QTY (Red) - Current Pricing (Green) - 95% Maximum Confidence Interval (Blue)



CITY/PRODUCT/WEEK/BUSINESS_UNIT - Demand vs Price

MEAT DELI - PRICE OPTIMIZATION (GAP to GT PRICE) - HỒ CHÍ MINH

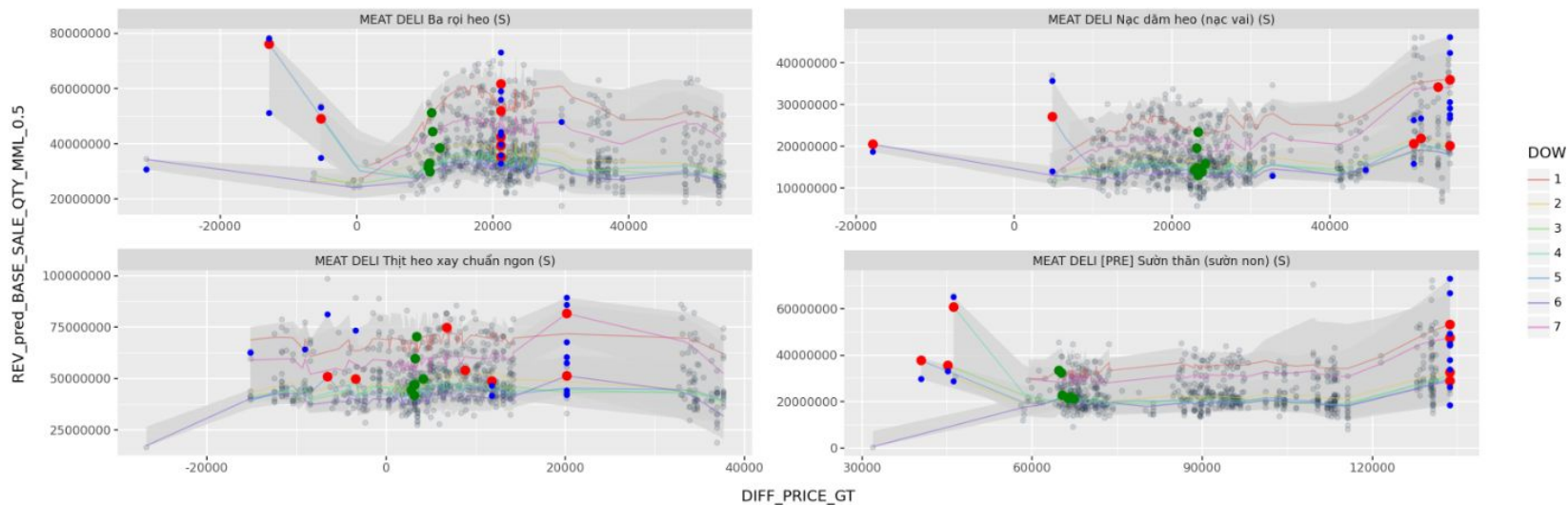
Optimal Median BASE_SALE_QTY (Red) - Current Pricing (Green) - 95% Maximum Confidence Interval (Blue)



CITY/PRODUCT/WEEK/BUSINESS_UNIT/DOW

MEAT DELI - PRICE OPTIMIZATION (GAP to GT PRICE) - HÀ NỘI - 1500

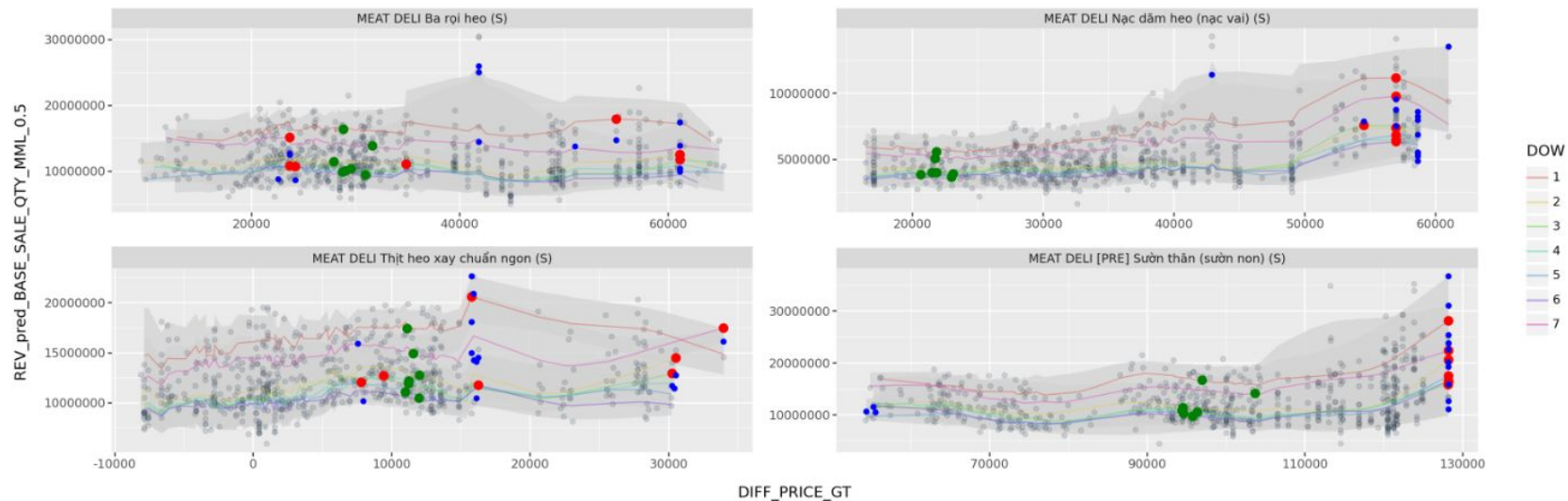
Maximum Median Revenue (Red) - Current Pricing (Green) - 95% Maximum Confidence Interval (Blue)



CITY/PRODUCT/WEEK/BUSINESS_UNIT/DOW

MEAT DELI - PRICE OPTIMIZATION (GAP to GT PRICE) - HỒ CHÍ MINH - 1500

Maximum Median Revenue (Red) - Current Pricing (Green) - 95% Maximum Confidence Interval (Blue)



SUMMARY SIMULATION

CITY	PRODUCT_NAME	OPTIMAL_FORECAST_RE	OPTIMAL_FORECAST_RE	OPTIMAL_FORECAST_RE	CURRENT_FORECAST_RE	%_gain_OPTIMAL	%_gain_OPTIMAL_BUSINESS_UNIT	%_gain_OPTIMAL_BUSINESS_UNIT_DOW
HÀ NỘI	MEAT DELI Ba rọi heo (S)	1,375,716,879	1,374,590,874	1,442,276,514	1,192,496,622	15.4%	15.3%	20.9%
HÀ NỘI	MEAT DELI Nạc dăm heo (nạc vai) (S)	587,026,143	632,586,826	628,692,215	535,618,021	9.6%	18.1%	17.4%
HÀ NỘI	MEAT DELI Thịt heo xay chuẩn ngon (S)	2,106,605,392	2,102,526,810	2,135,956,947	1,980,184,530	6.4%	6.2%	7.9%
HÀ NỘI	MEAT DELI [PRE] Sườn thần (sườn non) (S)	715,999,213	809,472,487	851,198,678	714,704,737	0.2%	13.3%	19.1%
HỒ CHÍ MINH	MEAT DELI Ba rọi heo (S)	960,134,773	965,212,828	965,960,025	929,415,175	3.3%	3.9%	3.9%
HỒ CHÍ MINH	MEAT DELI Nạc dăm heo (nạc vai) (S)	466,276,541	485,815,524	489,122,051	372,292,408	25.2%	30.5%	31.4%
HỒ CHÍ MINH	MEAT DELI Thịt heo xay chuẩn ngon (S)	1,317,222,040	1,320,285,056	1,336,646,503	1,288,207,553	2.3%	2.5%	3.8%
HỒ CHÍ MINH	MEAT DELI [PRE] Sườn thần (sườn non) (S)	842,841,410	870,259,399	892,915,208	803,611,067	4.9%	8.3%	11.1%
TOTAL		8,371,822,393	8,560,749,803	8,742,768,142	7,816,530,111	7.1%	9.5%	11.8%


I used GAM model to measure the price elasticity of demand and simulate the REVENUE by median forecasted BASE_SALE_QTY for the period from 2022jan - 2024mar.

It suggests that GAM optimal price may uplift revenue by **7%**, and if we adjust the price dynamically by BUSINESS_UNIT / BUSINESS_UNIT & DOW we gain **9.5%** and **11.8%** respectively of the revenue.

Please note that the forecast sale volume and revenue is simulated and take the median out of it.

For more details please check the following link:

https://docs.google.com/spreadsheets/d/1NbGe_sgsk3S0Hqbbs93sajistms5Bj2A/edit?usp=drive_link&oid=112118046433686324010&rtpof=true&sd=true



REVENUE OPTIMIZATION ALGORITHM WITH ML-BASED PRICE ELASTICITY MODEL

Including 2 models:

- (1) Price Elasticity price with sale qty as dependent variables, and selling price, competitor price, pig price etc. as independent variables at weekly level
- (2) Revenue optimization model considering both B2C and B2B revenues