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Homework #9
Due July 18, 2018

Describe analytics models and data that could be used to make good recommendations to the retailer. How much shelf space should the company have, to maximize their sales or their profit?

Constraints:

- for each product type, the retailer imposed a minimum amount of shelf space required, and a maximum amount that can be devoted
- the physical size of each store means there's a total amount of shelf space that has to be used

As part of your answer, I'd like you to think about how to measure the effects. How will you estimate the extra sales the company might get with different amounts of shelf space – and, for that matter, how will you determine whether the effect really exists at all? Maybe the retailer's hypotheses are not all true – can you use analytics to check?

My biggest and first concern, is how do we get baseline data?? I think I'd really need a year's worth of data of prior sales before I'd be willing to even tackle this problem for them. More, if available, but I could probably make due with that.

Data concerns:

- seasonality: I'm betting the month of November, you sell more canned cranberry sauce than you sell the rest of the year combined.
- Complementary-ness of the products: a lot of stores I've been to will put the chips either on the same aisle as, or near, the chips, and or the frozen pizza. But the Wal-Mart nearest my house, actually puts cleaning products between them. Does that affect their bottom line? Maybe, maybe not, I live near a lake so maybe they're already sure they're going to sell tons of those anyway.
- Product dimensions: bags of chips are huge, and you can't really minimize them at all - so do you keep more in the back?
- Employee's time restocking - If you keep most of your product in the back and only have say 5 of an item in the front at a time but you have a run on say chips (I really like chips, in case you didn't get that already) are you going to already have someone available to see the need for a mid-day restock?

So my partner actually used to work for Amazon and you may or may not be surprised to hear that this is several people at each locations' entire job: maximizing storage based on complementariness, on maximizing workers' ability to pick the orders quickly, on how much to keep on hand for whichever snippet of time. Side note but actually relevant.

Okay so assume we have the baseline data I'm concerned about, going back 5 years. I think it's only ever really appropriate to compare that week to the week in the previous years: it just doesn't make sense to look at cranberry sauce sales as your big money maker in March. You'll get your weirdos (like me, I love it all year round) who will be buying it, but you're not going to

want to devote a quarter of an aisle to it in March. So that takes the seasonality portion into account that I was concerned about.

What else? Ah yes we need a location system: aisle, row, column, a/b to indicate left right should do the trick - so we need 4 coordinates for each item.

We need a categorization system: We don't want to split the potato chips into three different aisles if there's room for them all on one, so we need a variable for food category, and another to tell us whether it's imperative that they all be together. I've seen stores that categorize eggs as part of dairy, but geographically within the store, they're not really close to the cheese or on another aisle entirely.

We need a categorical variable for whether the item needs refrigerator storage, freezer storage, or counter top acceptable.

Okay so I think that's all the under-thought variables, what else do we need to be able to think about this? Well we need to know the amount of shelf space these items had, and proximity to related items, before.

Now that we set it all up, we've got to collect a year's worth of data with all our variables in place, without changing anything substantial, to see if what they think is true, is true.

We're going to for sure be running CUSUM to see if there's any substantial change in sales over that period of time. Can it be attributed to seasonality again? Is it hot dogs in July? If yes, then likely yes, it wouldn't matter how much space you gave to hot dog buns, you're probably going to sell out of them.

We're going to be running some type of a regression to see if you're able to correlate shelf frontage to sales - does more space lead to more sales?

How much of this is stuff that can't be explained by the data we're collecting? I live in a pretty rural area, I've NEVER met a vegetarian who lives within 50 miles of here. But a local grocery store in town knows that I used to be one, and started carrying just a couple things I really like, and some veggie pastas etc, and you know what? After a few months of thinking I was the only one buying them, maybe, they expanded their selection A LOT and now they sell out of things like chick'n nuggets (a soy protein nugget) REGULARLY. How many people were like oh I don't want to try this weirdo vegetarian food when there's perfectly good actual chicken nuggets, until they saw how many of these products that the grocery store was keeping in stock, and then were like well how bad can it be? Then ended up loving it and adding it to their rotation? That's not going to be able to be found out from the model, unless we know to look for it.

I guess my whole thing is (and this is definitely something Dr. Sokol has said a lot more than once) that any model is only as good as the data you're putting into it. Garbage in, garbage out.

But another way to take that same vein of thought is this: If you don't think to ask the questions, you can't get the insights. If you don't think to look for vegetarian items going on sale, you don't get that that's why the frozen foods saw a spike.

You need to make sure you are asking the right questions, not just the expected questions. This client (the retailer) is coming to you for advice, but you need to be sure that you're asking the right questions! Don't go too far down the wrong path. Don't put the chips and the ice cream together (even if the model suggests it) if there's not counter storage in the frozen foods aisle!

That's my 10 cents on this week's case study, anyway.