Pricing Exercise for THIS & THAT AEUs (Stray Kids) by Vineel Pentrala

Code is given in T&T_Kalshi_VineelP.ipynb

Approach

Album Equivalent Units(AEUs) are measured as Record sales + TEAs (Track equivalent albums) + SEAs (Streaming equivalent albums)

I got together some data of previous Stray Kids' releases in the US from charts.spotify.com, Hanteo (Korean media), Billboard and some from fan pages on X.com.

Physical sales historically made up ~95% of the AEU, across the KPop industry. This is our main focus. TEAs hovered between negligible and 1000 for the past releases and I used 500 as a fair estimate. SEAs make up 3-6% of AEUs.

Since Stray Kids had only 8 releases in the US before this, regression models were unstable. I used Leave one out testing (LOO) to check which factors were predictive, and derived 4 strategies(with weights):
1) Trend across all eight releases (15%)
2) Trend using releases from 2023 onward (35%)
3) A recency-weighted trend (30%)
4) The average of the two most recent releases (20%)

A blend of these strategies is used to produce an estimate of 309,924 sales.

For SEA, I deduced the US streams from global streams using the mean of historical ratios for the pre-release song. From there, I estimated SEA (previous US streams to SEA had a constant ratio).

Post 2026, Luminate Data (the source Kalshi will be using to decide the contract outcome) changed the definition of SEAs to have a different ratio of premium streams and ad supported streams. Analytically, I worked out that old SEA* 1.125 gives us the new definition of SEA (I assume that the ratio between premium streamers and ad supported streamers has not changed a lot in the US over the past few years)

Results so far

We get an SEA of 11,500, making a total estimated AEU of ~322,000.

The model's 10th to 90th percentile range is 229,000 to 454,000 AEU.

My fair prices for the middle of the market are:

Contract	Kalshi bid/ask	Model fair YES
Above 225K	53 / 60	91

Contract	Kalshi bid/ask	Model fair YES
Above 250K	48 / 54	83
Above 275K	40 / 46	72
Above 300K	33 / 40	61
Above 325K	30 / 36	49
Above 350K	25 / 32	38

The Kalshi snapshot was taken at 5:40 pm central time, Sunday.

The market-implied median was about 253,000 AEU, compared with my model median of about 322,000 AEU (Cell 11). My model therefore sees the market as too low, especially around the 225K to 300K thresholds.

This could mean my model is optimistic.

How I would check it

I ran a chronological walk forward test, but if there were more time I could run an LOO test with the blended model, among others.

The model overpredicted early albums by 25-40%, and the more recent albums were only off by 5-9%.

Before trading, I would recheck to see if there's any newer data that I can fit into the model, and how the past few days' of the orderbook looked like, to judge other traders' behaviors.

Productionizing it

To make a repeatable model across AEU contracts, it would be helpful to have data subscriptions such as Luminate Data, Chartmetric, Keepa, etc. which readily have relevant data available. A larger model can be built taking in consideration how the specific industry overall is doing, whether consumers' habits of buying CD/Records have changed, and measure wallet drain, new release fatigue, etc.

Furthermore, this pattern of majority of the AEUs being record sales is unique to the KPop industry, and other industries have different AEU composition patterns. Productionizing can be generalized across a specific industry, but across all artists globally may be an issue, since we may give more weights to factors that don't matter for certain industries.

The model would update continuously as new pre-order, retailer, streaming and news data becomes available. Major events such as scandals, collaborations or shipping delays could materially change the forecast. An LLM that measures hype across the internet could help standardize this.

I would not trust the model enough to quote both sides yet. I would first expand the dataset to include comparable artists, test whether the same features work across them, and track the model's forecasts as new releases settle.

I would also measure spread capture, fill rates and adverse selection, and widen or remove quotes when the available information is changing quickly.