 Metrics for Managing Wine Inventories

**Research Question**

The challenge of wine inventories is aging wine, but not so much that it passes its peak. We present several metrics for managing inventory health.

**Methods**

case study, simulation, analytics

**Results**

Better management of wine inventories, through the use of metrics.

**Abstract**

In this paper we present and evaluate a number of metrics for monitoring and managing wine inventories. These metrics, which vary in complexity, would be of use for retailers, restaurants, and owners of personal wine cellars. Before describing the metrics, we provide some rationale for holding an inventory of wine. First, better wine is available on the market only for a limited period in the original retail market. Granted, there is a secondary market for wines, but sometimes it can be difficult to establish the provenance of wines in this market. Second, wine develops over time, a result of the changes in the organic compounds that comprise wine. This aging can soften tannins, for example, making for a more approachable wine. However, beyond a certain age, wine will decline in its appeal, even if it was cellared correctly, because of the degradation of the organic compounds. Third, and related to the second point, wines have “drink windows” when they are best consumed. These windows are a function of the type of grapes, the terroir where the grape are grown, and decisions made by winemakers. For example, Bordeaux wines would typically have a much longer drink window than would Beaujolais Nouveau. Estimates of the drink windows are often provided by the wine maker or rating sources, or they can be estimated by knowledgeable persons, including by sampling the wine over time.

The challenge, then, is having wine age, but not to the point where it passes its peak. In the paper we present several metrics that can be used to give an indication of the “health” of the inventory, but list three here. An
advantage of the metrics we present is that they aggregate information for the entire inventory, rather than examining each wine on its own. Each wine, on its own, may be within its drinking window, but the overall wine inventory could be unbalanced.

One of the metrics we present is the average, across all wines in the inventory, of the age of the wine as a percentage of the time from its vintage to the end of its peak drinking window. This metric will be low in new wine inventories, but high values can indicate that the inventory is not being replenished. High values may be appropriate for personal wine inventories, when an aging owner has decided to reduce new purchases in favor of drinking what was laid down earlier. In commercial inventories, however, a high value could indicate that the current owners/managers were benefitting from decisions and actions of earlier owners/managers, but not laying the groundwork for the success of future owners/managers.

A second metric measures maturity “bulges” and “hollows.” This is done by totaling the amount of wine in inventory that will reach the end of its peak drinking window within a specified time, say one year or two years, measured as proportion of the expected sales or consumption of wine over the same period. Higher values of the ratio indicate a “bulge”, meaning a higher proportion of the wine in the inventory will reach maturity in the same time interval. Bulges are not bad, per se, as long as appropriate sales or consumption decisions are made to manage the bulge: it is the unmanaged bulges that can lead to wine passing its peak drinking period. Lower values of the ratio, or “hollows,” can be used to guide purchase decisions.

The third metric we consider is concentration, defined as the proportion of the inventory comprised of wines of the same or similar varietal or the same general region. Concentration matters, because the tastes of the consumers or the cellar owners often change over time. So, a highly concentrated cellar carries a greater risk of delivering less than ideal satisfaction, even if the wines are consumed during their peak windows. Concentrate can also manifest itself by time, so that we see concentration “bulges” or “hollows” in the maturity windows.

We illustrate the use of the metrics using a wine inventory of approximately 1,500 bottles, comprising both New and Old World wines. We also examine, via a computer simulation, how the metrics perform under different conditions. The simulation mimics the decisions of the owner/manager over time, as well as the consumption/sales decisions. We find, for example, that a key factor is the size of the inventory relative to the usage rate. We see that, in general, the larger the inventory relative to usage, the greater the challenge in ensuring the wines are consumed in their peak periods. We also explore how the typical purchase quantity affects the management of the inventory. For example, purchasing smaller quantities reduce the ability to monitor how the wine is aging, by drinking a bottle. Because purchasing multiple cases of a wine can increase concentration, we look for the sweet spot of purchase quantities.