Optimal Consumption of Cellared Wine

By

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Abstract

This paper develops a suite of conceptual models that explore issues of optimal consumption paths for cellared wine. The basic problem is cast as an inventory dissipation problem in which utility is generated by wines withdrawn and consumed from storage. Utility is assumed to be a function of the quality of the stored wine, which changes over calendar time according to known aging profiles. Stored wine imposes a storage cost, and the benefits of drinking improved wine must be traded off with increasing cumulative storage costs. We begin with the simplest model that assumes that the cellar owner holds an exogenously given amount of wine that is intended to be consumed over a known time horizon. Given that costs must be incurred to improve the wine’s drinking quality, there is a tension between aging the wine to increase the utility of consumption and absorbing the storage and opportunity costs of capital tied up in inventory. We focus especially on the manner in which the aging profile affects the decision about when to begin consuming a vintage and about how much to consume in each period. We examine a number of qualitatively different aging profiles ranging from least storable to most storable. The least storable are wines whose quality profile declines relatively quickly with age. An intermediate type ages over an intermediate length of time, but suffers declining quality at longer ages. Another type examined has a long aging profile, with gradual improvement that continues and plateaus out in the long run. For various assumed aging profiles, optimal consumption patterns are derived that reflect the value of postponing consumption to take advantage of quality improvement. After exploring this simple model, we then consider a number of generalizations of the problem. The first generalization includes simultaneously determining planned consumption profiles of different vintages with wine storage replenishment. The easiest case is where the cellar is replenished by similar types of wines with identical aging profiles. The results depend upon alternative uses of
investment income, and the qualitative results depend upon what is assumed about the consumer's discount rate, the costs of storage, and rates of return to alternative uses of capital. The final generalization of our suite of model development involves a more complete characterization of the wine storage and consumption problem under continuous cellar replenishment of wines that differ by vintage. This problem can be characterized as a stochastic optimal control problem where future vintage qualities are stochastic and unknown. We approach this problem with a stochastic dynamic programming model and derive optimal cellaring and wine consumption decisions. We discuss the respective roles of constraints including both budget constraints and cellar storage space constraints.