DIPARTIMENTO DI ECONOMIA E GIURISPRUDENZA
UNIVERSITÀ DI CASSINO E DEL LAZIO MERIDIONALE

UNICAS
1979 >2019
40 ANNI DALLA FONDAZIONE
UNIVERSITÀ DI CASSINO E DEL LAZIO MERIDIONALE

CLADAG 2019
11-13 SEPTEMBER 2019
CASSINO

Book of
Short Papers

Giovanni C. Porzio
Francesca Greselin
Simona Balzano

Editors

SIS
Società
Italiana di
Statistica

12-TH SCIENTIFIC MEETING
CLASSIFICATION AND DATA ANALYSIS

THE EVOLUTION OF THE PURCHASE BEHAVIOR OF SPARKLING WINES IN THE ITALIAN MARKET

Francesca Bassi[1], Fulvia Pennoni[2] and Luca Rossetto[3]

[1] Department of Statistical Sciences, University of Padova,
(e-mail: `francesca.bassi@unipd.it`)

[2] Department of Statistics and Quantitative Methods, University of Milano-Bicocca,
(e-mail: `fulvia.pennoni@unimib.it`)

[3] Department of Land. Environment, Agriculture and Forestry, University of Padova,
(e-mail: `luca.rossetto@unipd.it`)

ABSTRACT: A dynamic analysis of purchases in the Italian market of sparkling wines is conducted by using scanner data derived from a consumer panel. We propose a continuous-time hidden Markov model that allows the transitions between states at any point in time. Results identify consumers' profiles in terms of type of purchases and socio-economic characteristics and describe the dynamics, and its determinants, across market segments. The findings improve the understanding of the market and provide useful evidences to design successful marketing strategies.

KEYWORDS: consumers' profiles, hidden Markov model, market dynamics, consumer panel.

1   Introduction

We study the dynamics of consumers' behavior in the Italian market of sparkling wine. In the last decade, the strong increase in the sparkling wines market has been coupled by a growth in brands, appellations, price range as well as other attributes (e.g. packaging), to catch consumers' attention. While in many countries the market tends to be dominated by Champagne, Cava or Prosecco, in Italy there is a greater fragmentation due to the preponderance of numerous domestic products and their complex denomination of origin classification. The consumption occasions for drinking sparkling wines have changed. Italian drinkers have started to drink and buy sparkling wine throughout the year rather than at specific seasons (e.g. Christmas); for this reason, the market is growing and it is expected to grow, offering more opportunities for sparkling wine producers.
In 2017 in Italy 31.6 million people (64% of adults)[1] consumed sparkling wine at least once; the majority of purchases is made in supermarkets; some specific

---

[1]https://www.wineintelligence.com

appellations, especially Champagne, are bought also in wine shops. Brand awareness, promotional offers and friends and family recommendations are the most important drivers of choice. Other relevant wine attributes for preferences are the method of production (Charmat, like Prosecco vs. Classic or Champenoise), appellations, especially the Controlled Denomination of Origin (DOC) and the Guaranteed Controlled Denomination of Origin (DOCG), the producer brand, the label, and its location.

The market of sparkling wines is relatively young, therefore the literature focusing on this topic is quite scarce. It mainly reports works on technical and sensorial aspects (Culbert *et al.*, 2017) or on consumer's behavior and preferences (Cohen *et al.*, 2012). With the proposed study of the market dynamics and of the factors that favor it we provide important information for designing successful marketing strategies. By using information collected on a panel of Italian families with purchases in stores we aim at identifying typical customers' profiles and analysing if and how they change acquisition behavior within two years of time. We also evaluate the effects of the characteristics of the consumers and the families on purchases.

2   Data and method

Data concerns a panel of 9,000 Italian households who registered their purchases in 2015 and 2016. The sample is representative of the Italian population with reference to the area of residence, number of components, monthly per capita income, age of the person responsible for purchases, type of the family. The survey collects longitudinal data with continuous time, each household may perform multiple purchases in the reference period. We observe a total of 22,362 purchases in unspecialized stores, made by 5,155 households, they make from 1 to 230 purchases in the reference period.

The dynamics of consumers' behavior is analyzed by assuming that preferences can be represented by an underlying latent variable $U = (U_{i1},...,U_{iT})$ for each customer $i = 1,...,n$, at occasion t, $t = 1,...,T$, where each t refers to the purchase time period. The latent process follows a continuous-time hidden Markov chain with discrete states, initial and transition probabilities parameterized with covariates (Bartolucci *et al.*, 2013). We propose a multivariate hidden Markov model (HMM) for the vector of categorical responses $Y_{it} = (Y_{i1t},...,Y_{irt})$ where the responses observed for every customer are: the value of each purchase in Euros, denomination and type of wine. The main assumption is that the latent process fully explains the observed customer behavior and the time-fixed and time-varying customer socio-demographic characteristics describe the dynamics of the underlying latent preferences. The conditional probabilities of the responses are assumed constant over time to stabilize the customer's profiles. The Expectation-Maximization algorithm is employed to maximize the log-likelihood. The suitable number of latent states is selected by using the Bayesian Information Criterion.

3   Results

Five clusters of homogeneous purchases are identified as reported in Table 1. The first latent state identifies consumers that spend no more than four Euros for an ordinary sparkling wine, with no specific appellation. We refer to this segment as that of customers with low quality purchases, concerning 19% of the population. Latent state 2 defines customers with low quality purchases preferring sweet wine, this concerns 34% of the customers. Latent state 3 defines customers with mainly purchases of Prosecco wine both with DOC and DOCG, of dry or extra dry type, and the amount spent per purchase is over three Euros; we define this profile as Prosecco (20% of the population). Latent state 4 denotes the profile of sophisticated customers, not choosing Prosecco since they select mainly prestigious denominations such as Franciacorta, Asti, Brachetto D'Aqui, Oltrepo Pavese (13% of the customers). Latent state 5 denotes the profiles of sparkling wine connoisseurs, since they show purchases with the highest purchasing power, over six Euros, for brut classic sparkling wine with appellations such as Franciacorta, Trento and Champagne (14% of the customers).

Table 2 lists the average transition probabilities among each segment. The percentage of customers who do not change purchase behavior can differ quite a lot across states. Purchases of types 1, 2 and 3 are more stable than those of type 4 and 5. However, a non-negligible percentage of customers, greater than 12%, tend to move towards segment 1. The state from which there is the highest mobility is 5, these are purchases with the highest amount of money spent and the most prestigious appellations: this reveals as an occasional consumption behavior.
Concerning the effects of the covariates we mention that purchases in segment 3 of Prosecco refer with higher probability to middle-age consumers, living mainly in the North-east of Italy and Lazio region, with a medium-level income.

4   Conclusions

We propose a dynamic analysis of the Italian market of sparkling wines estimating a hidden Markov model on scanner data from a consumer panel. Latent states identify five homogenous types of purchases according to prices, type of wine and appellation. A non-negligible proportion of consumers perform purchases of different types, the most unstable segment is that with the highest price. Consumers tend to move to a segment of lower quality wine for their subsequent purchase and consumers' characteristics act as drivers of preferences.

Table 1. Latent states' profiles

Response variables	Estimated conditional probabilities				
Average purchase in Euros					
<2.99	0.22	0.51	0.03	0.05	0.00
2.99-3.98	0.30	0.21	0.19	0.24	0.00
3.99-5.68	0.19	0.13	0.26	0.30	0.01
5.69-8.98	0.18	0.10	0.28	0.27	0.22
>8.98	0.11	0.05	0.24	0.14	0.76
Type of wine (sugar content)					
Brut	0.78	0.07	0.07	0.00	0.97
Extra dry	0.14	0.02	0.59	0.02	0.00
Dry	0.08	0.04	0.34	0.00	0.00
Sweet	0.01	0.88	0.00	0.98	0.00
Denomination					
No appellation	0.69	0.95	0.04	0.01	0.01
Prosecco DOCG	0.06	0.01	0.41	0.00	0.00
Prosecco DOC	0.11	0.00	0.58	0.00	0.01
Franciacorta DOCG	0.00	0.00	0.00	0.16	0.40
Asti DOCG	0.00	0.03	0.00	0.39	0.00
Trento DOC	0.00	0.00	0.00	0.00	0.42
Brachetto DOCG	0.00	0.00	0.00	0.28	0.00
Oltrepo DOCG	0.04	0.00	0.00	0.06	0.00
IGT	0.07	0.00	0.00	0.00	0.01
French appellation	0.00	0.00	0.00	0.00	0.14
Other	0.01	0.00	0.00	0.07	0.00

Table 2. Average transition matrix

	State 1	State 2	State 3	State 4	State 5
State 1	0.74	0.06	0.11	0.04	0.04
State 2	0.12	0.66	0.09	0.09	0.04
State 3	0.12	0.08	0.72	0.04	0.05
State 4	0.14	0.18	0.11	0.52	0.05
State 5	0.18	0.11	0.15	0.10	0.47

References

BARTOLUCCI, F., FARCOMENI, A., & PENNONI, F. 2013. *Latent Markov Models for Longitudinal Data*. Boca Raton: Chapman & Hall/CRC.

COHEN, J., LOCKSHIN, L., & SHARP, B. 2012. A better understanding of the structure of a wine market using the attribute of variety. *International Journal of Business and Globalisation,* **8**, 66-80.

CULBERT J.A., RISTIC R., OVINGTON A., SALIBA A.J. & WILKINSON K. 2017. Influence of production method on the sensory profile and consumer acceptance of Australian sparkling white wine styles. *Australian Journal of Grape and Wine Research*. **23**, 170-178.