



Modelling the Cyclical Behaviour of Wine Production in Douro Region Using a Time-Varying Parameters Approach

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The regional wine production is characterized by large variations which represent a major threat for viticultural and the winery industry. The impact of these unpredictable variations have adverse consequences concerning, land and inputs use and thus, indirectly, the environment. These have contributed to the development of sectorial regulations (e.x. Common Organisation of the Market in Wine) that have no parallel in other crops. Investigating a potential cyclical nature of wine production is therefore vital for everyone, from the vintners and grape growers, to the investors, policy makers and all those whose business relies on wine supply chain. It is essential for efficient harvest organization, regional pricing negotiations, investment in new winery capital equipment and the development of marketing strategies for both domestic and export markets.

This study investigates the cyclical behaviour of the wine production in Portugal's Douro region during the period of 1932 to 2008. When conducting a long-time cyclical analysis, one has to take into account that the analysis is affected by structural and climatic variability of the vineyard. At this time there is no regional analysis that co-integrates these two sources of information. These are the changes we wish to test for here. Enhanced production and climate effects will come in several parts: obviously, climate affects production via grapevine growth convergence (coherence, correlation); but production methods have changed themselves and there is a non-constant impact (or spillovers) of climate onto wine production; which translates into stronger lead/lag relationships between production and climate. We examine all three in this context; focusing on measures of coherence and gain respectively.

The wine production in Douro region, in general, is characterised by large fluctuations which are composed of short-term and/or long-term cycles. Preliminary results show that in addition to an upward trend, there is a clearly identifiable cycle around the long term trend in Douro wine production. We also show how much of the production cycle and what cycle in particular is explained by the medium spring temperature. We use the short time Fourier Transform to decompose the link between wine production and temperature. Model results suggest: i) wine production is characterized by 5 and 3 years cycles, ii) there is a strong link between wine production and the mean temperature in spring, iii) this link is not constant, but stable.

Developed model suggests that stationary is a questionable assumption and this means that historical distributions of wine production are going to need dynamics updating. We should consider this when developing wine production models where climate plays an important direct or indirect role and climate variability is increasing as indicated by the recent IPCC reports.

Key Words: Spectral analysis; Time-varying spectra; Kalman Filter; Climate variability