EST-46111 Fundamentos de Estadística **ITAM**

Case Study 1

Prof.: Juan Carlos Martínez-Ovando *09 de septiembre de 2015*

A tale at the NFL draft

The Green Bay Packers drafted a young talented Exterior Linebacker five seasons ago, who was coming from the Duke Blue Devils football. During the first seasons playing for the Packers, this young athletic promise performed a tremendous career progress, positioning himself as one of the top three Exterior Linebackers in the whole NFL. His productivity, measured as the average number of interceptions per game played in the season, could be represented as linear trend as a function of his performance for the previous immediate season and a constant term,

$$y_m = \alpha + \beta y_{m-1} + \varepsilon_m, \tag{1.1}$$

where ε is represents a negligible error term between the actual y_m and the linear trend $\alpha + \beta x_m$. The above a representation was computed by a Data Analyst of the Green Bay Packers, using the own player's data.

However, toward the end of the third season, this young player suffered a severe knee injury. The recovering of that injury was expected to be quick for this player. Although, the expected outcome of that recovery in terms of the player's performance was uncertain for the Coach, the Team's owner and for the player himself. By the same time, the team faced the problem of deciding to keep the player and wait for a satisfactory recovery, or to sell it and look for a high caliber replacement. That decision was taken considering only the expected player's performance for the upcoming seasons. Three scenarios where foreseen before making a decision: i) The recovery would be satisfactory and the player would continue performing at the same standards he had before being injured, ii) His recovery would not be as satisfactory, and his performance would suffer a slight drop in level but the time trend would remain unaffected, and iii) the recovery would be satisfactory but his performance would turn to be much more unstable as it was before the injure. After consulting a panel of experts in sports medicine, the three

plausible scenarios where pondered equally likely. After analyzing the three possible scenarios, the Team's owner and Coach decided to keep the player for the upcoming seasons. That decision was cataloged as wise by the other NFL team owners, as the the performance of this player stayed at the same standards of the three initial seasons of the player at the NFL and he continued to be a promising football player.

The Team's owner and Coach would like to have some insights on the expected player's performance for the upcoming season. If you were to advise the Team's owner and Coach on the decision of keeping or letting this player go, considering the above elements: What would it be your prevision of the player's performance for the upcoming season? Could you give a range for the player's performance of the upcoming season? What decision you would suggest and why? (Support your answer on the data available in Section 1.2.

1.1 Objective

Assess the need to incorporating additional information to the one contained in the actual data in order to robustifying and enriching the analysis and decision making process.

1.2 Some data and maths

Scenario i. The player's performance is described under the following equation:

$$y_m = 9.3 + 0.5y_{m-1} + \varepsilon_m^{(i)}, \tag{1.2}$$

where $\varepsilon_m^{(i)} \sim N(0,(1.3)^2)$, 1.3 is the standard deviation of $\varepsilon_m^{(i)}$.

Scenario ii. The player's performance would be described under the following equation:

$$y_m = 8.3 + 0.5y_{m-1} + \varepsilon_m^{(ii)}, \tag{1.3}$$

where $\varepsilon_m^{(ii)} \sim N(0,(1.3)^2)$, 1.3 is the standard deviation of $\varepsilon_m^{(ii)}$.

Scenario iii. The player's performance would be described under the following equation:

$$y_m = 9.3 + 0.5y_{m-1} + \varepsilon_m^{(iii)}, \tag{1.4}$$

where $\varepsilon_m^{(iii)} \sim N(0,(2.3)^2)$, 2.3 is the standard deviation of $\varepsilon_m^{(iii)}$ (i.e. the variance of the error term for this scenario turns out to be three times higher with regards to the one corresponding to scenarios i and ii).

Assume that the second injure took place at season m, and it is required to give a prevision at the player's performance toward season $m+1$. For that, consider that the player's performance at season m was equal to 8.65.

References

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