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Activity 3

1 Synopsis.

What we are set about to do. This activity will illustrate the use of statistical testing to decide whether data supports (or not) a given hypothesis. In this activity we will examine the issue of patents on pharmaceutical compounds, a matter which has stirred up considerable debate in recent years.

What you need to know. In order to benefit from this activity you need a working knowledge of R, such as you may have gained from previous seminars and activities, and a good understanding on how to perform a chi-square, Fisher's exact test, and related tests.

2 Context.

2.1 The intellectual property debate.

In the last ten years the debate over intellectual property has been increasingly heated, as big discographic companies press their interests while consumers claim what they see as their right to download or exchange music on the Internet without restraints. This has not been the only battle front: the purchase of Motorola by Google in the summer of 2011 has been seen as preparation for an all-out patent war over smart phones technology, with Apple as the other main contender. Even more recently, Apple obtained an injunction preventing Samsung from selling their tablets in some countries.

In Spain, the ill-fated "Sinde law" and the opposition it has aroused shows that the controversy is well alive and we are not anywhere near a consensus on the issue.

Intellectual property protection is a matter of great interest for an economists. Is it necessary for progress, or rather does it hinder progress? [1] is a passionate, well researched attempt to answer this question. One of the aspects they address is patent regulation in the pharmaceutical industry. The data next come from that book.

2.2 Pharmaceutical innovation.

In [1] the authors claim that intellectual property protection in the pharma industry does more harm than good. They present in Table 1 evidence from Italy, where legislation was enacted in 1980 affording considerable more protection to pharma intellectual property.

Period	Italy	Rest of world	% Italy s/total
1961 – 1980	119	1163	9.28
1980 – 1983	8	100	7.41

Table 1: Number of innovations in Italy and the rest of the World in the pharma industry. Source: [1], p. 251.

It is their claim that when the pharma industry became more protected in Italy, their rate of innovation actually *declined*. Italy made 9.28% of all pharma innovations prior to 1980, but only 7.41% afterwards.

3 Questions.

1. Propose a model for the data in Table 1.
2. Assuming the data has been generated by the model of your choice, what are the best (maximum likelihood) fits for each cell?
3. It is extremely unlikely that those fitted values entirely agree with the observe values. The further the observed values are from your fits, the strongest the evidence against your model. Propose an statistic summarizing the deviation of observations from fitted values.
4. Is there evidence that the rate of innovation in Italy in the post-1980 period *was different*?
5. Is there evidence that it actually *declined*?
6. Are the previous two questions *the same* question? Why or why not?

References

- [1] M. Boldrin and D.K. Levine. *Against Intellectual Monopoly*. Cambridge Univ. Press, 2010. Freely available at <http://www.dklevine.com/papers/imbookfinalall.pdf>.