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P2_2 Complexity in popular music.

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Abstract

This paper looks at how self organisation can apply to the music industry. Two data sets, one of the 2010 UK top 100 and another of the UK top 60 ever are explored. These data sets are grouped by frequency, and plotted. It is found they largely obey a power law, and the reasons and implications of this relation are discussed.

Introduction

Power laws seem to be a signature element of the natural world, and are a cornerstone of complexity science. They appear in the Stefan–Boltzmann law and Kepler's third law, all the way to seemingly unconnected things, such as the size of cities, or the size of craters on the moon. Such a relationship is caused by some unique properties, such as neighbour effects and interconnectivity. They also imply that, despite first appearances, such events have the same (or at least no special) cause. In this example, the UK chart will be examined. Music has all the hallmarks of a complex system. People influence each other with respect to their music tastes, no one has a “perfect” knowledge of all music, and the overall behaviour of the system is not implied by the actions of the individuals alone. Could it be that no single is, in fact, any better than any other?

Discussion

The data set used here will be the top 100 selling singles of 2010[1]. In order for the theory to work, any data set with sufficient points could have been used. Scale invariance means that the law or rule in data does not change, regardless of what scale it is examined on. In order to try to show this, another set of data will be explored and compared. This is why this graph will be plotted as a log versus log graph, and also they are the most widely accepted method of plotting power laws[3]. It is also the best way of demonstrating that the overall trend is the same: the gradient of the graph will be roughly the same at any point.

In this case, it should not matter where or when the data was collected, only that it is part of a coherent set where interconnectedness could apply. Each of these values were grouped by frequency. In order to keep the number of data points down, they were grouped by thousands. Smaller groupings could have been used, however.

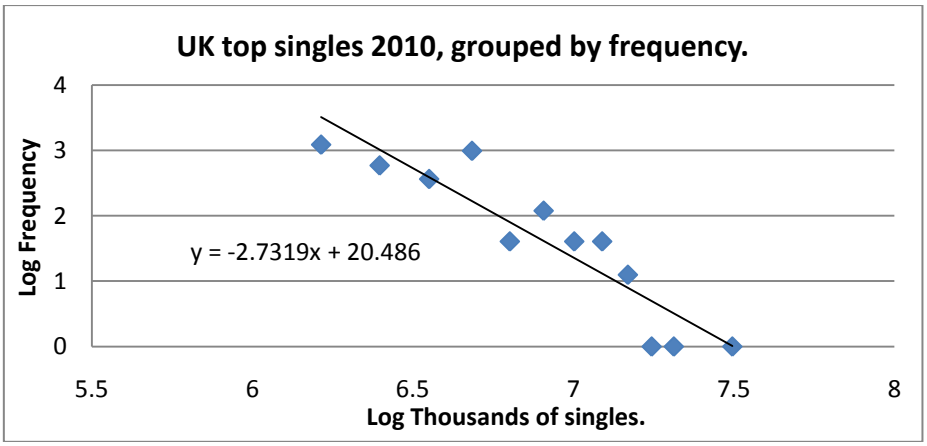

Figure 1. UK 2010 top 100 singles grouped by frequency.

Along with the graph, a trend line has been fitted. It is clear to see that there is good agreement between the line and the data. This also implies that the interconnected features theories hold true. No other trend line would fit this data, such as an exponential or similar, as it clearly has a negative trend. The gradient or location could be adjusted slightly, however this would only make the trend slightly different, and not affect the conclusion.

This was repeated for the top 60 UK singles of all time[2]. This again led to a power law; however the coherence was not as good. Below is the graph:

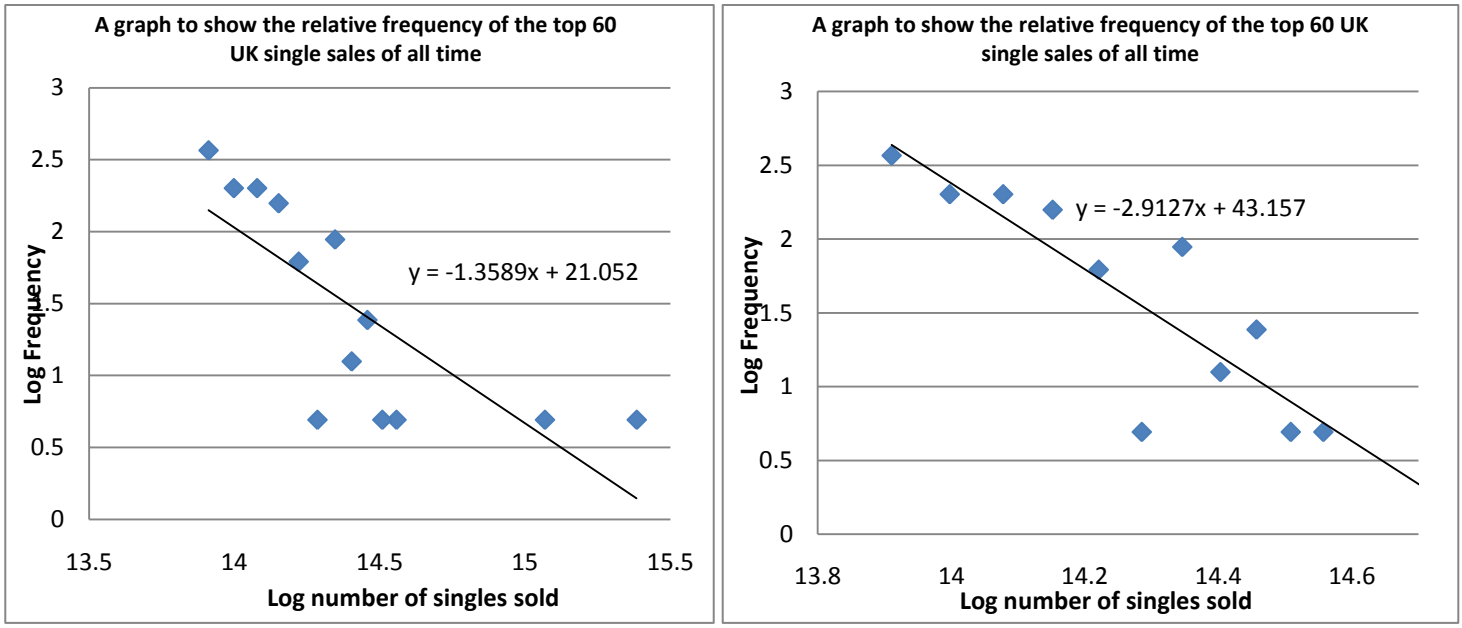

Figure 2. The all time top 60 UK singles, left with outliers, right without.

The left graph seems to have a fair level of agreement. The gradient, however, is significantly different from the first instance. This would suggest that the scale invariance hypothesis does not hold true. However, the right graph has the two large outliers discounted. This graph has a gradient which is very similar to figure 1. The two data points removed represent only two songs (one of which was Candle in the Wind), and would hint that these two are exceptions that break the fundamentally assumed rules. Discounting these points should not harm the conclusion if this is true, as they would have different causes for being successful.

Conclusion

The first graph seems to imply that a power law does seem to be the best explanation of the data. This leads to the conclusion that interconnectedness is the biggest factor in how well a single sells. This conclusion is not borne out by the second set of data, however removing two outliers gives the same trend. The scale invariant properties would imply that the trend should hold as well over a year as over sixty years, and it may be that the two outlying points do not obey these rules, yet obey different ones. A further test could be other regions, or other years to see if it is uniquely a feature of the UK music industry.

Bibliography:

[1] *2010 in popular music* "Wikipedia" http://en.wikipedia.org/wiki/2010_in_British_music, (01/02/11)
[2] "TimeFM" http://www.timefm.co.uk/bestselling-singles/ (20/02/11)
[3] *Power Laws* "Santa Fe Institute" http://tuvalu.santafe.edu/~aaronc/powerlaws/, (20/02/11)