# Wisdom of (Artificial) Crowds

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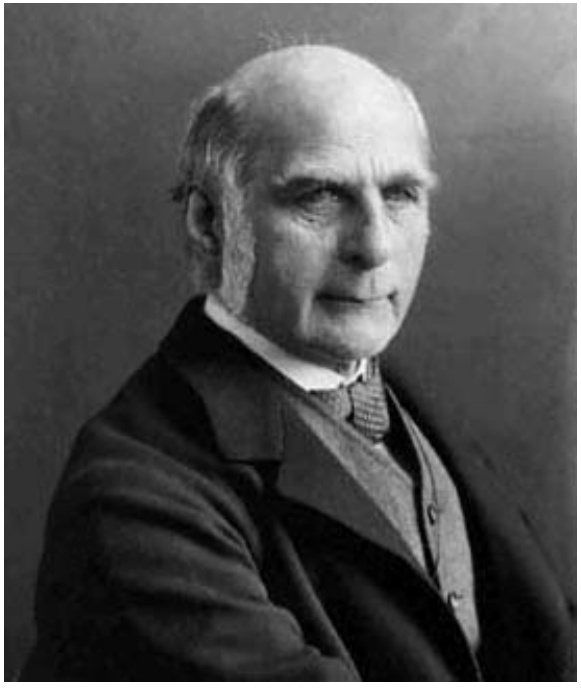
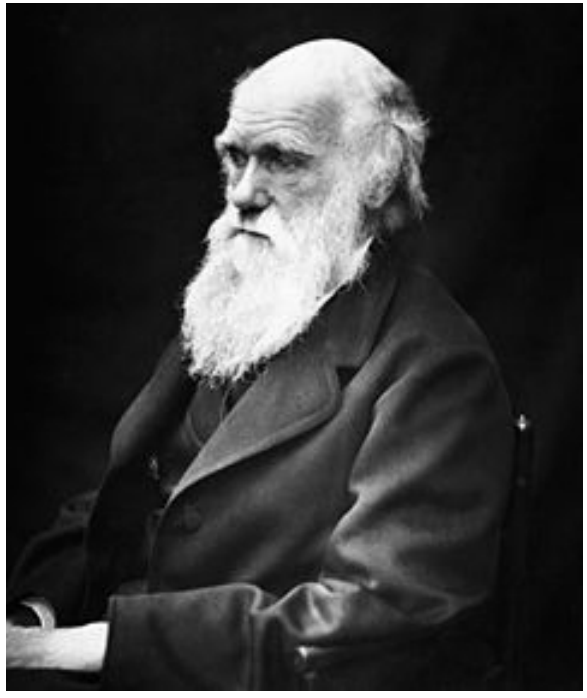
# Two (half) Cousins of the XIX Century

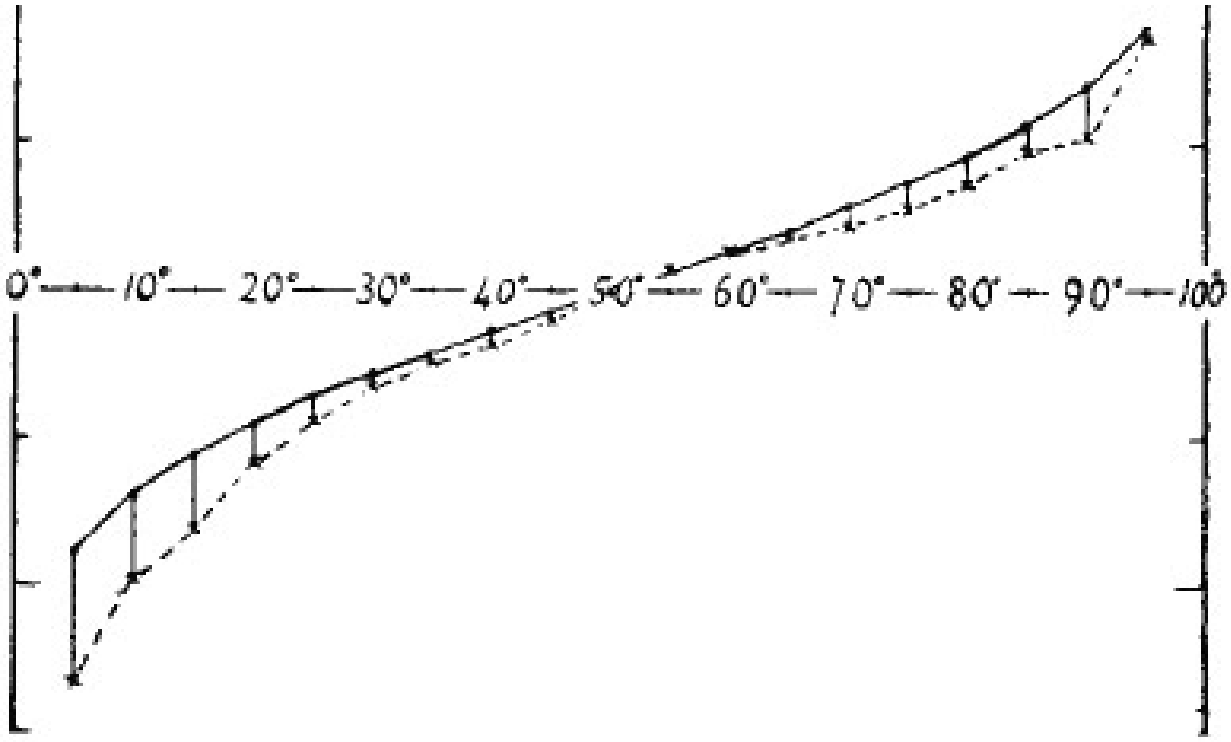


Francis Galton (1822-1911)



Charles Darwin (1809-1882)

# The 1906 West England Fat Stock and Poultry Exhibition




The continuous line is the normal curve with p.e.=37.
The broken line is drawn from the observations.
The lines connecting them show the differences between the observed and the normal.

Figure 1: Source: Galton, F. (1907). Vox populi (The wisdom of crowds). Nature, 75(7), 450-451.

# Prediction Markets I

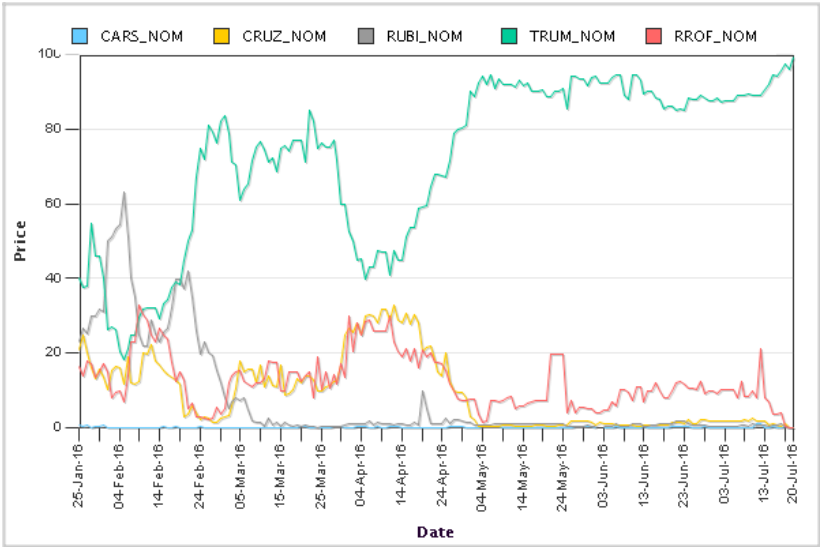
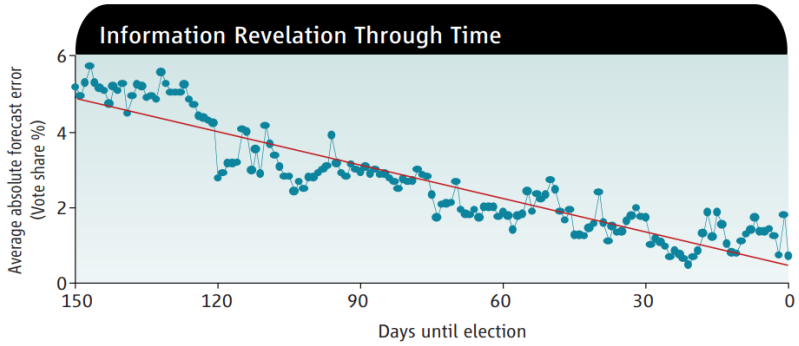



Figure 2: Daily price of 2016 Republican Nomination Market. Source: Iowa Electronic Markets website.




**Information revelation through time.** Data are from the Iowa Electronic Markets for markets predicting the two-party vote shares from the 1988, 1992, 1996, and 2000 presidential elections (*19*). The vertical axis plots the average absolute difference between the market prediction and the actual vote share. In the week immediately before the election, the market erred by an average of 1.5 percentage points compared with an average error of 2.1 percentage points for the final Gallup poll. The longer-run forecasting performance of the market is also impressive, with an average error of only 5 percentage points 150 days before the election, a time when polls have much larger errors when interpreted as predictions. Calculations are based on data available at www.biz.uiowa.edu/iem.

Figure 3: Source: "The promise of prediction markets", Arrow et al. (2008), Science, Vol. 320, No. 5878, pp. 877-878.

# Prediction Markets II

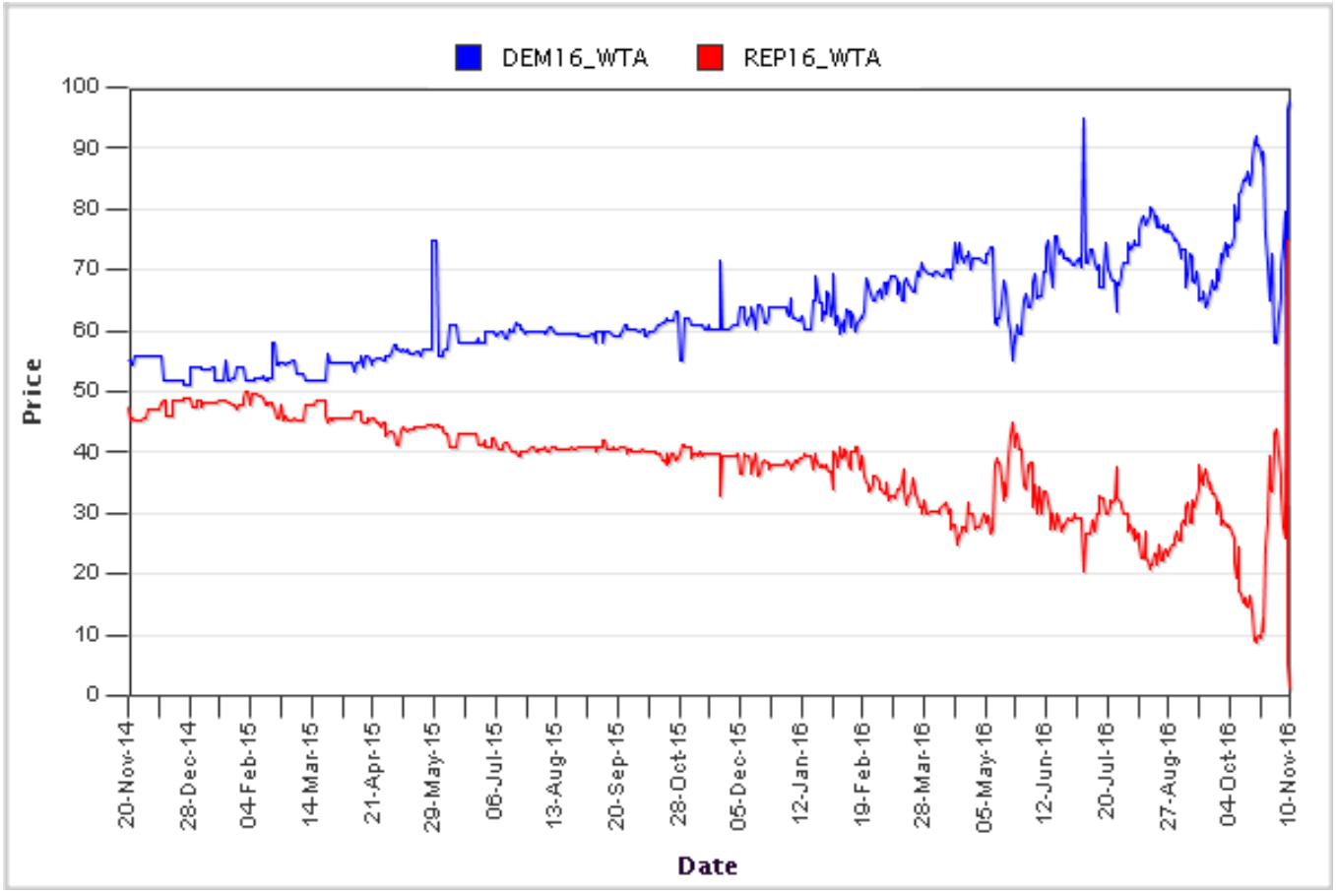



Figure 4: Daily price of 2016 Presidential Election Market. Source: Iowa Electronic Markets website.

# Ecology, Selection, Competition: from Biology to Markets

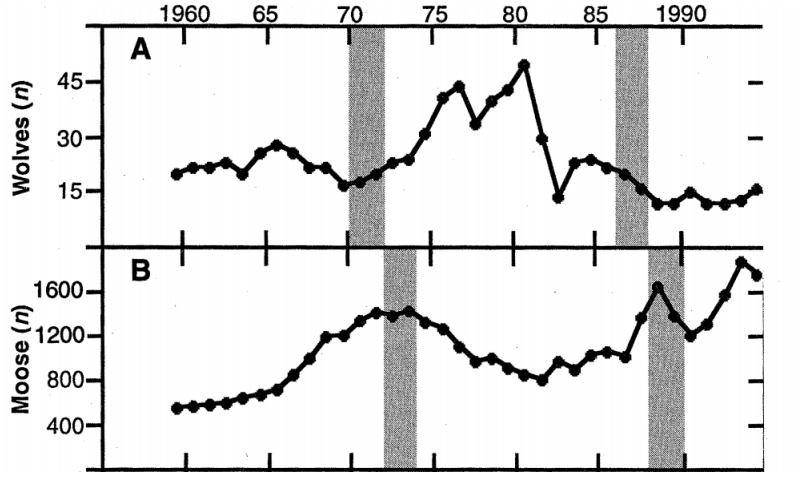



Figure 5: Population of Wolfes and Moose in Isle Royale National Park. Source: "Wolves, Moose, and Tree Rings on Isle Royale", McLaren and Peterson (1994), Science, Vol. 266, No. 5190, pp. 1555-1558.

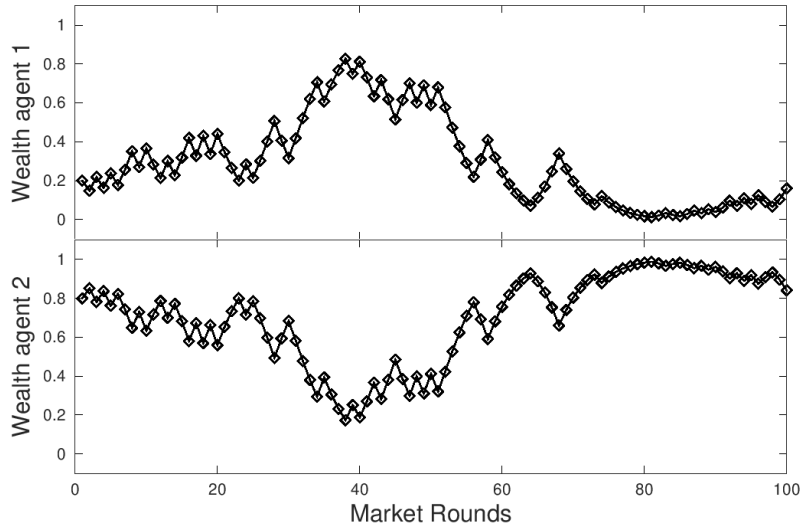



Figure 6: Wealth dynamics of two heterogeneous traders in the repeated market model of "Wealth and price distribution by diffusive approximation in a repeated prediction market", Bottazzi and Giachini (2017), Physica A, No. 471, pp. 473-479

# Repeated Artificial Prediction Market

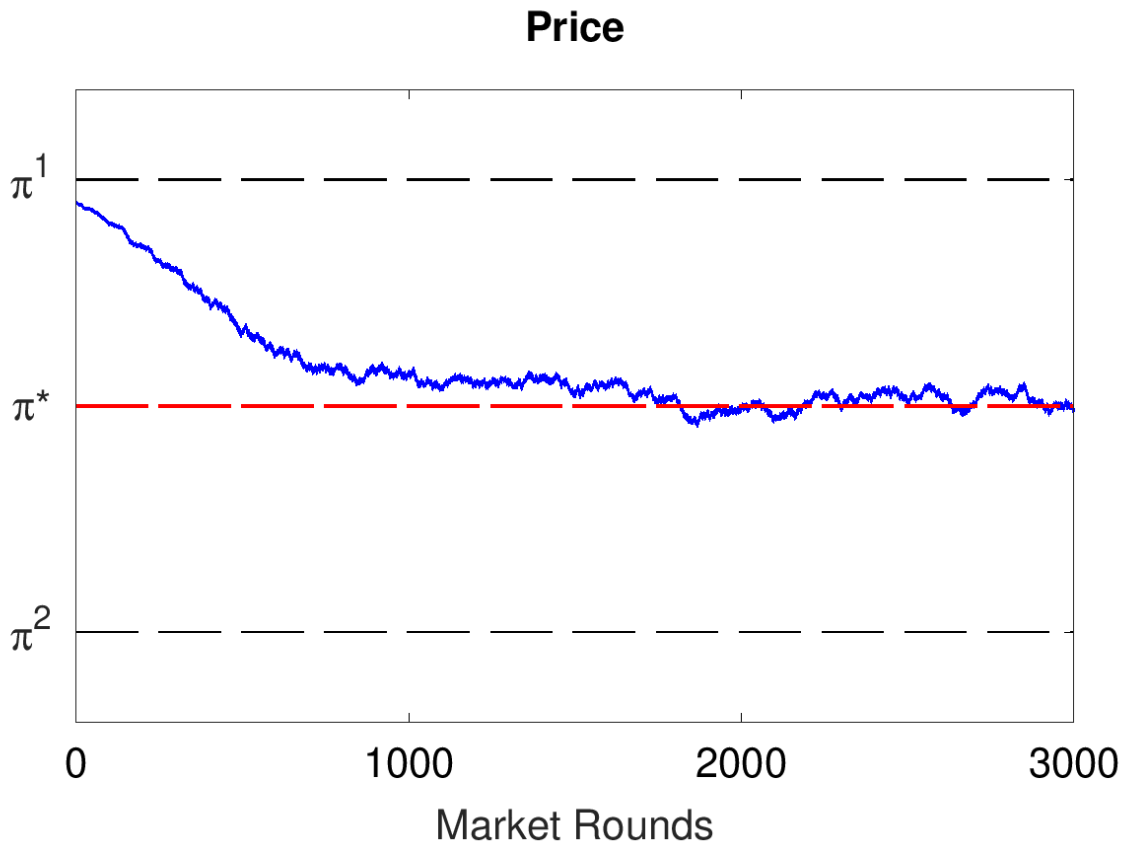



Figure 7: Bottazzi and Giachini (2017) and "Far from the Madding Crowd: Collective Wisdom in Prediction Markets", Bottazzi and Giachini (2016), LEM working papers series 2016/14.

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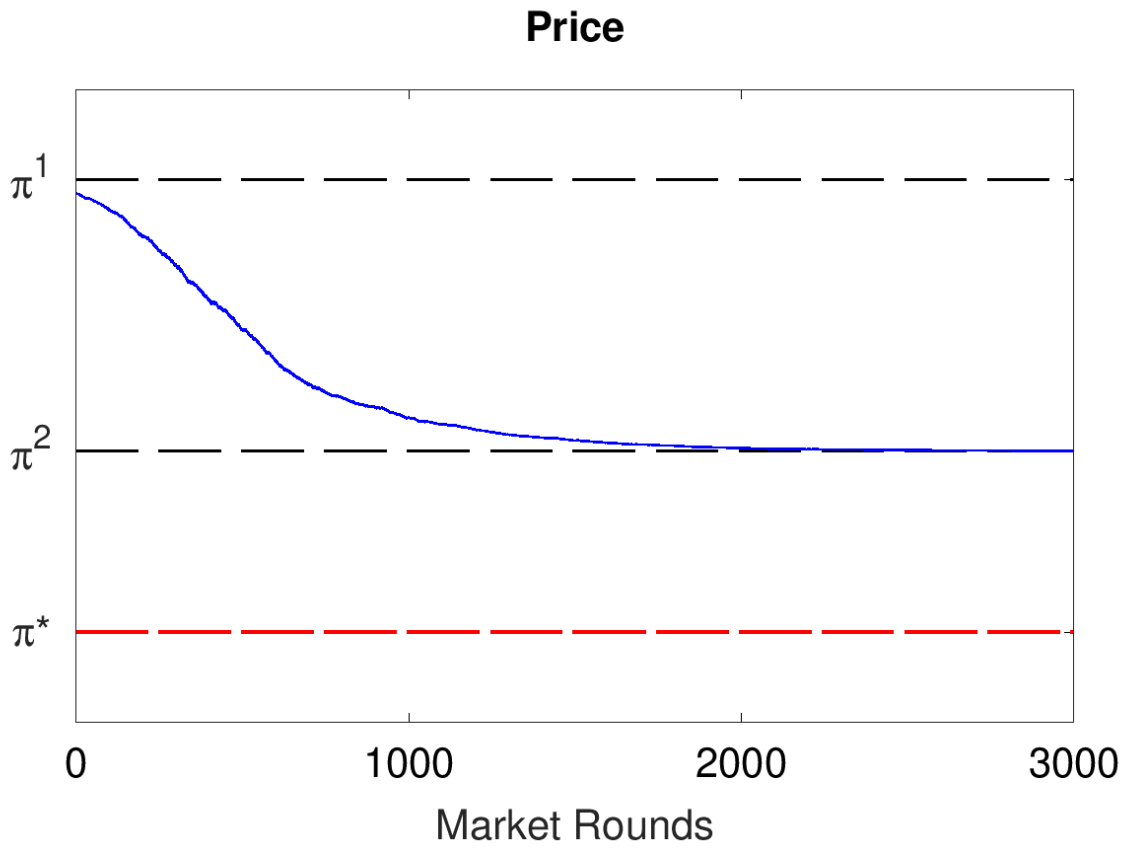


Figure 8: Bottazzi and Giachini (2017) and "Far from the Madding Crowd: Collective Wisdom in Prediction Markets", Bottazzi and Giachini (2016), LEM working papers series 2016/14.

# Evolutionary Learning

Market learns better:

- in the worst case scenario we have a model selection procedure;
- in all the other cases we have an efficient model aggregation procedure.