The maths of train delays

Keith Briggs keith.briggs@bt.com

Mobility Research Centre, BT Innovate
http://keithbriggs.info

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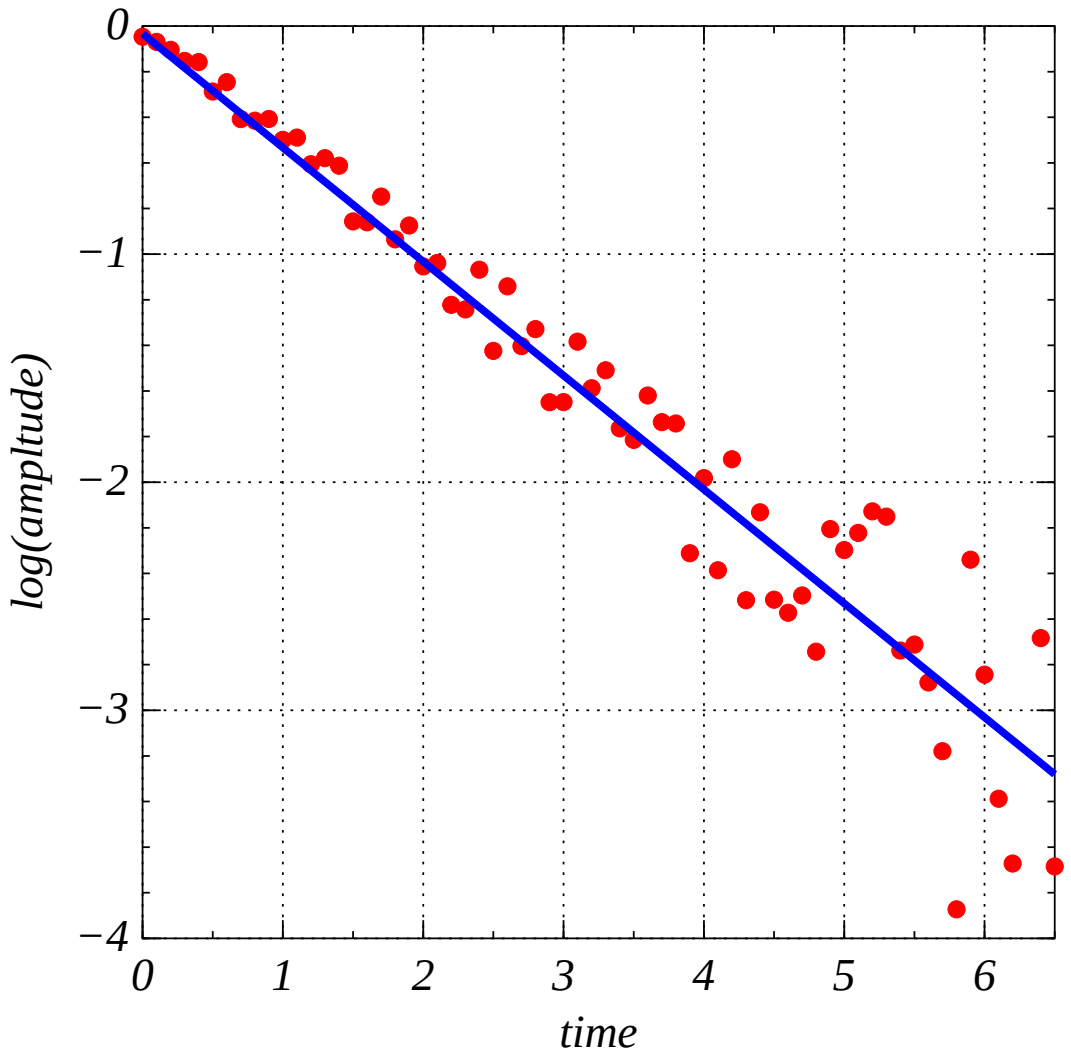
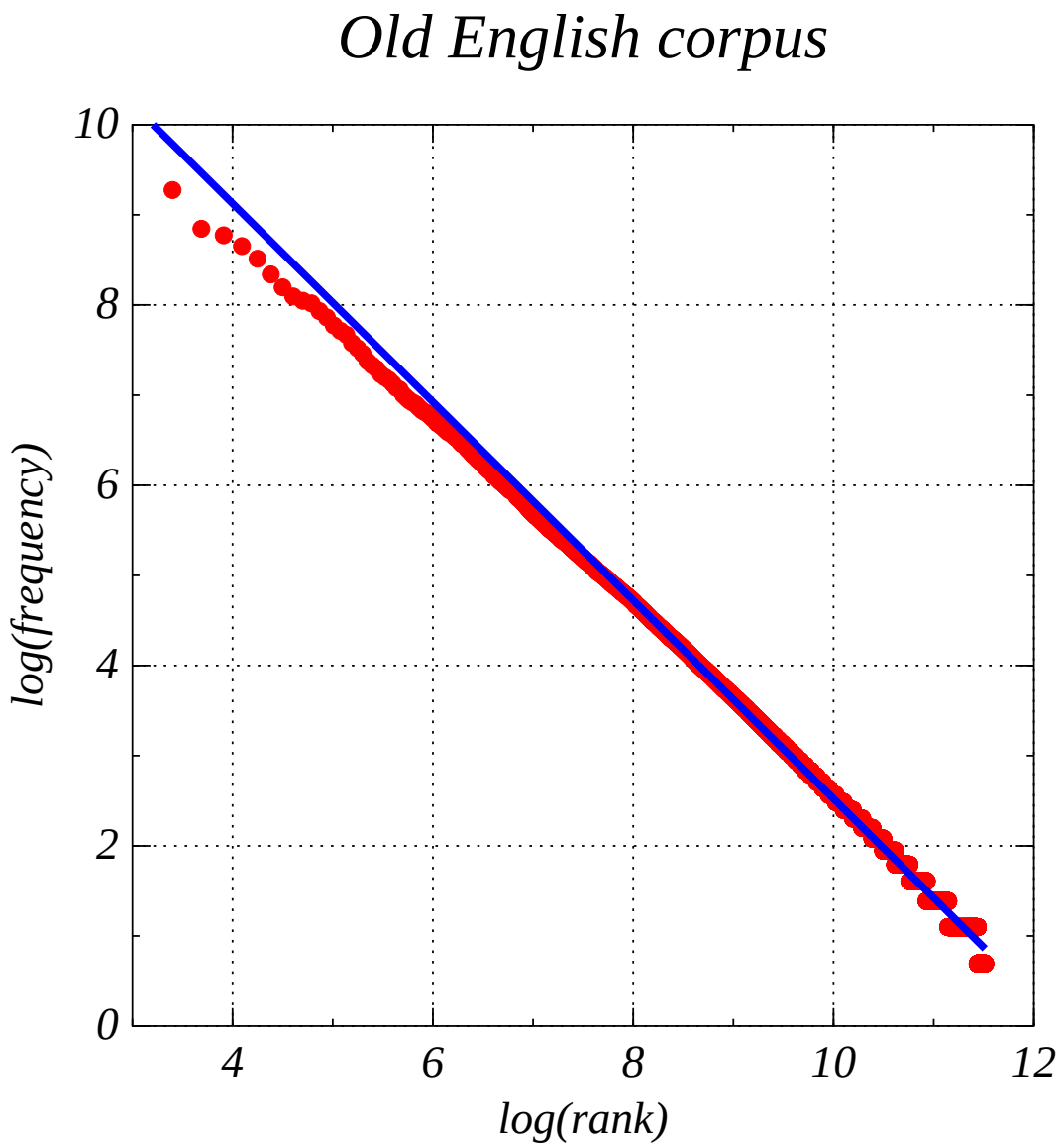
Exponential decay law

$\log(\text{amplitude})$ *vs.* time is a straight line.



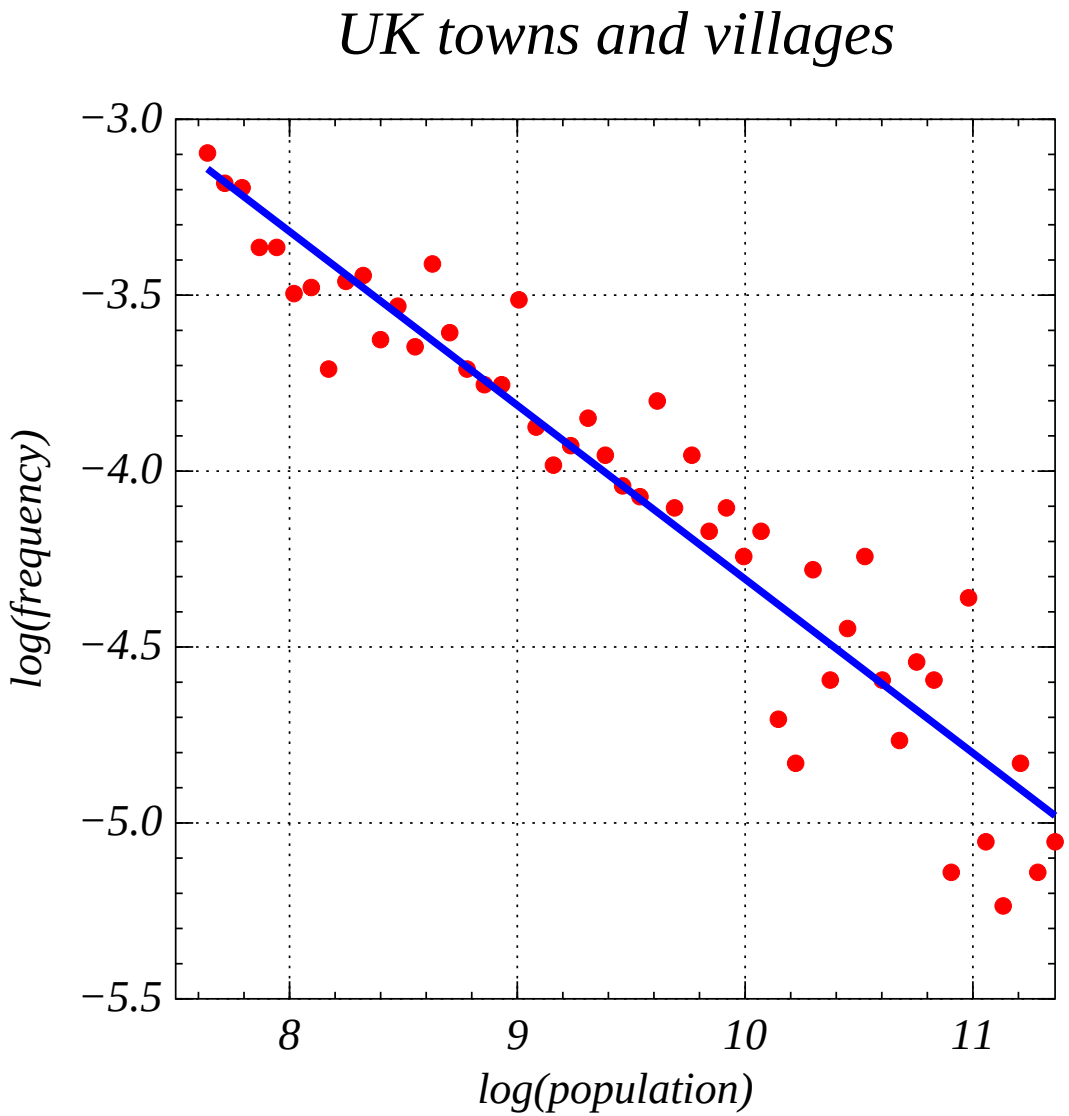
Zipf's law

$\log(\text{frequency})$ *vs.* $\log(\text{rank})$ is a straight line.



Population distribution

$\log(\text{frequency})$ *vs.* $\log(\text{population})$ is a straight line.



The $q-$exponential law

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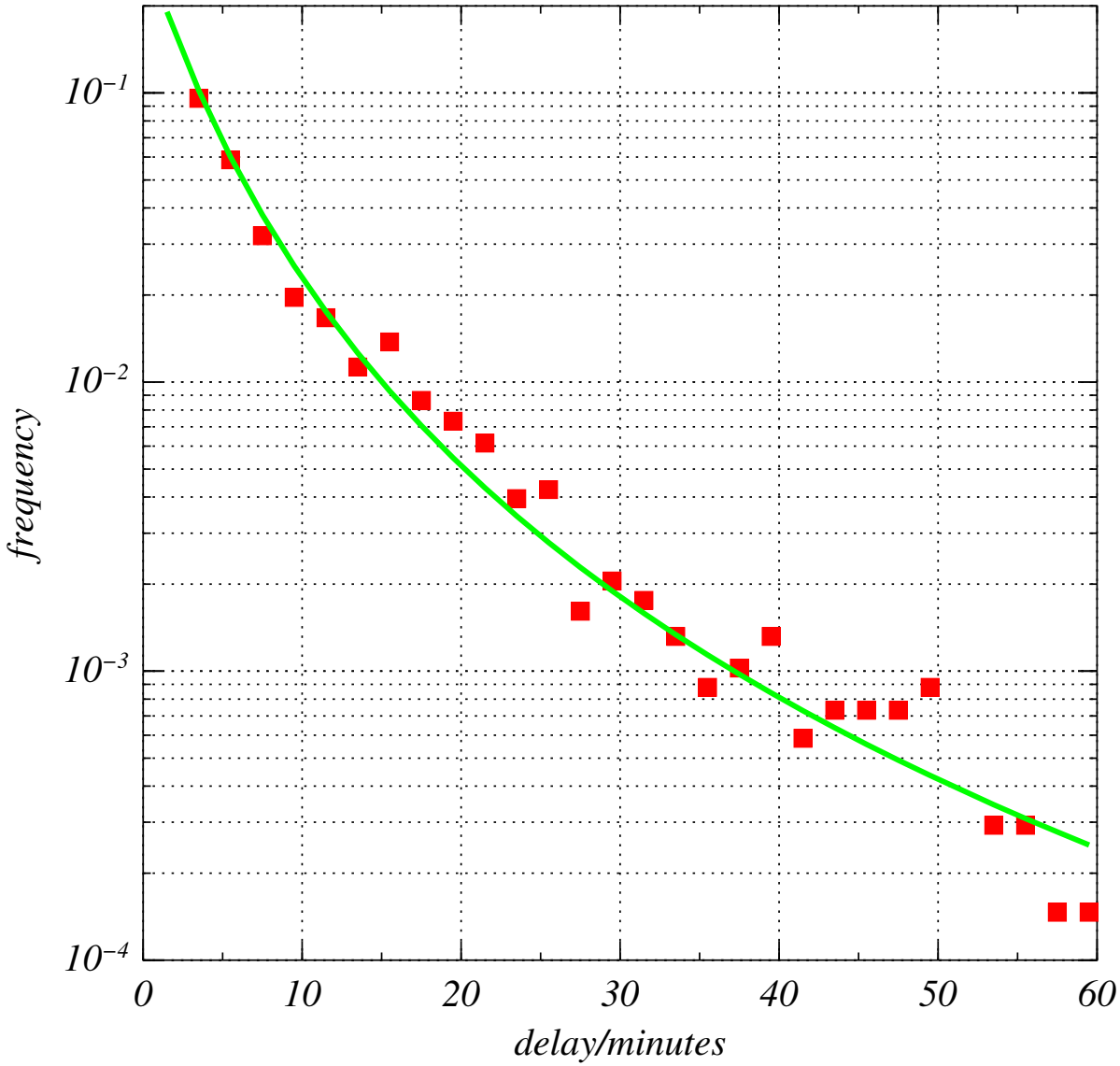
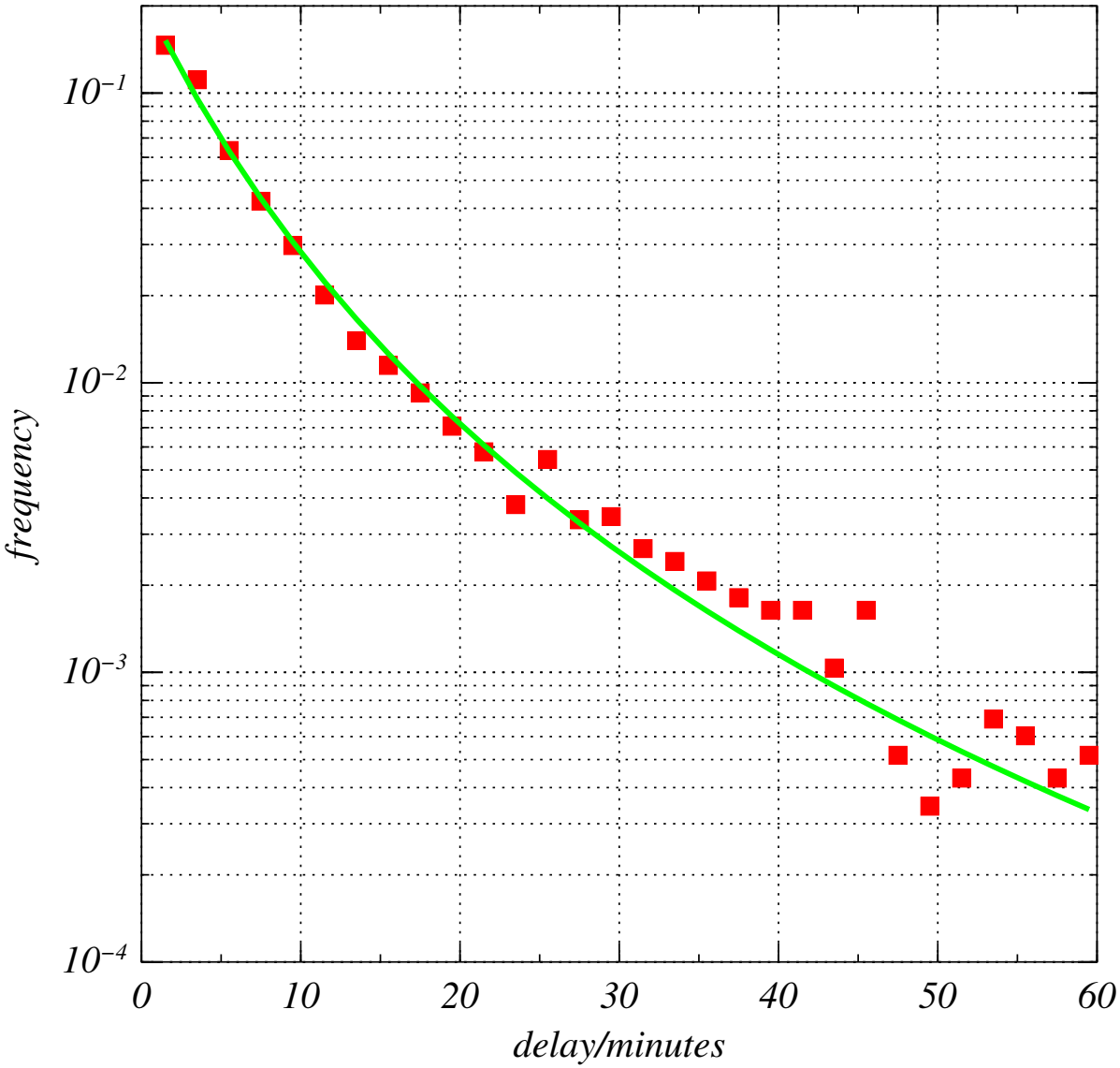
The $q-$exponential law

- $e_{q,\beta}(x) := (1+\beta(q-1)x)^{1/(1-q)}$
- $\lim_{q\to 1} e_{q,\beta}(t) = \exp(-\beta t)$
- large q gives a power-law (long tail)

Ipswich to London



Ipswich to Norwich



Newcastle to Edinburgh