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Galton-Watson trees with vanishing martingale limit

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(Submitted on 13 Apr 2012)

We show that an infinite Galton-Watson tree, conditioned on its martingale limit being smaller than \$\eps\$, agrees up to generation \$K\$ with a regular \$\mu\$-ary tree, where \$\mu\$ is the essential minimum of the offspring distribution and the random variable \$K\$ is strongly concentrated near an explicit deterministic function growing like a multiple of \$\log(1/\eps)\$. More precisely, we show that if \$\mu\ge 2\$ then with high probability as \$\eps \downarrow 0\$, \$K\$ takes exactly one or two values. This shows in particular that the conditioned trees converge to the regular \$\mu\$-ary tree, providing an example of entropic repulsion where the limit has vanishing entropy.

Comments: This supersedes an earlier paper, arXiv:1006.2315, written by a subset of the authors. Compared with the earlier version, the main result (the two-point concentration of the level at which the Galton-Watson tree ceases to be minimal) is much stronger and requires significantly more delicate analysis

Subjects: **Probability (math.PR)** Cite as: arXiv:1204.3080v1 [math.PR]

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