

Haworth's Law

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HAWORTH'S LAW

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The latest ‘Depth to Mate’ results from the Lomonosov team (Zakharov, 2013) find a maxDTM 7-man wtm win in KQPKRBN of 1,097 plies, i.e., of 549 winner’s moves. They therefore add one data point to an already suggestive trend of $\log(\text{maxDTM})$ against k , the number of men on the board. Figure 1 is a plot of the data (Haworth, 2013) showing the actuals for 3- to 7-man chess, the best least-squares linear fit² to these points, and the extrapolation of that ‘fit’ to 10-man chess with 2σ , 97% probability, confidence levels.

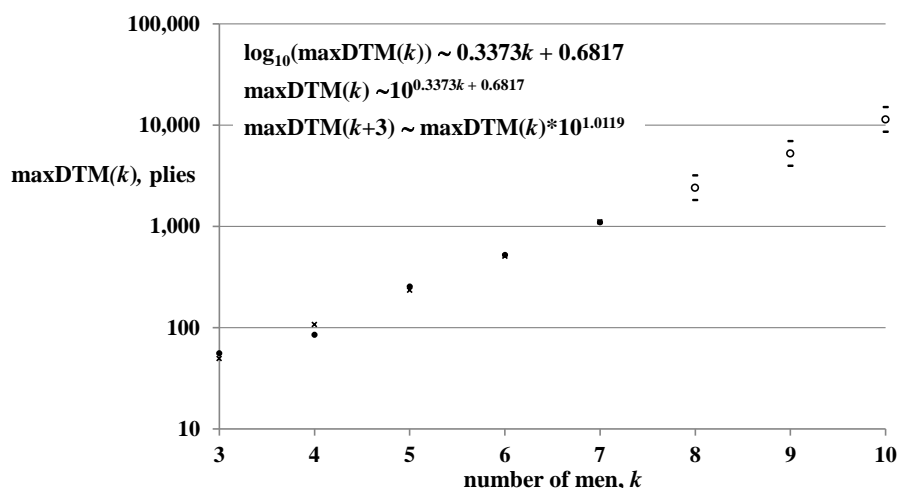


Figure 1. The maxDTM(k) trend: actuals, best linear fit, predictions and 2σ confidence intervals.

Here are some of the conjectures which may be made, using the following notation:

$E \equiv WB$, an endgame with White force W and Black force B ,

$Em \equiv WmBm$, endgame E with man m added to both sides,

$\text{maxDTM}(E) \equiv$ the maximum DTM in plies of the White wins in E (‘0’ if there are no wins), and

$\text{maxDTM}(k) \equiv \max\{\text{maxDTM}(E) \mid E \text{ is a } k\text{-man endgame}\}$

- 1) if $k \geq 3$, $\text{maxDTM}(k+1) > \text{maxDTM}(k)$,
- 2) if $k \geq 3$, a maxDTM k -man position p_k may be modified to a position p_{k+1} with greater DTM depth: the side which does not have the move may often be imagined to have just captured a man,
- 3) if $k \geq 3$, there is a k -man endgame E and man m such that $\text{maxDTM}(Em) \geq \text{maxDTM}(E)$,
- 4) the linear trend above will continue for some time, i.e., ‘Three more men: maxDTM times ten!’”

With Moore’s Law in mind, the last conjecture was dubbed *Haworth’s Law*, as it were, *en passant* by a visiting Thomine Stolberg-Rohr WFM. It is certainly a prediction like Moore’s Law rather than a provable, physical law. However, it is not a self-fulfilling prophecy as many argue Moore’s Law is. The rules of the game have determined those deep wins and losses already. For 8/9/10-man chess, the model gives a 50% probability of decisive results in $2400^+ / 5220^+ / 11340^+$ plies and 2σ -predictions of results in $1810^+ / 3940^+ / 8570^+$ plies. It gives a 90% probability of an 8m result in 2000^+ plies and an 80% probability of a 10m result in 10000^+ plies. The model at least challenges us to consider why this might be and how long the trend will continue.

References

Haworth, G. M^cC. (2013). Chess Endgame Records. Dataset at <http://centaur.reading.ac.uk/34268/>.

Zakharov, V. (2013). Private communication of ‘MVL’ Lomonosov 7-man DTM EGT statistics.

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² The best-fit quadratic polynomial reduces the ‘linear’ residual error by only 6% and gives even higher predictions for the 8/9/10-man maxDTM. The best cubic and quartic fits clearly give overfitted models which are not credible.