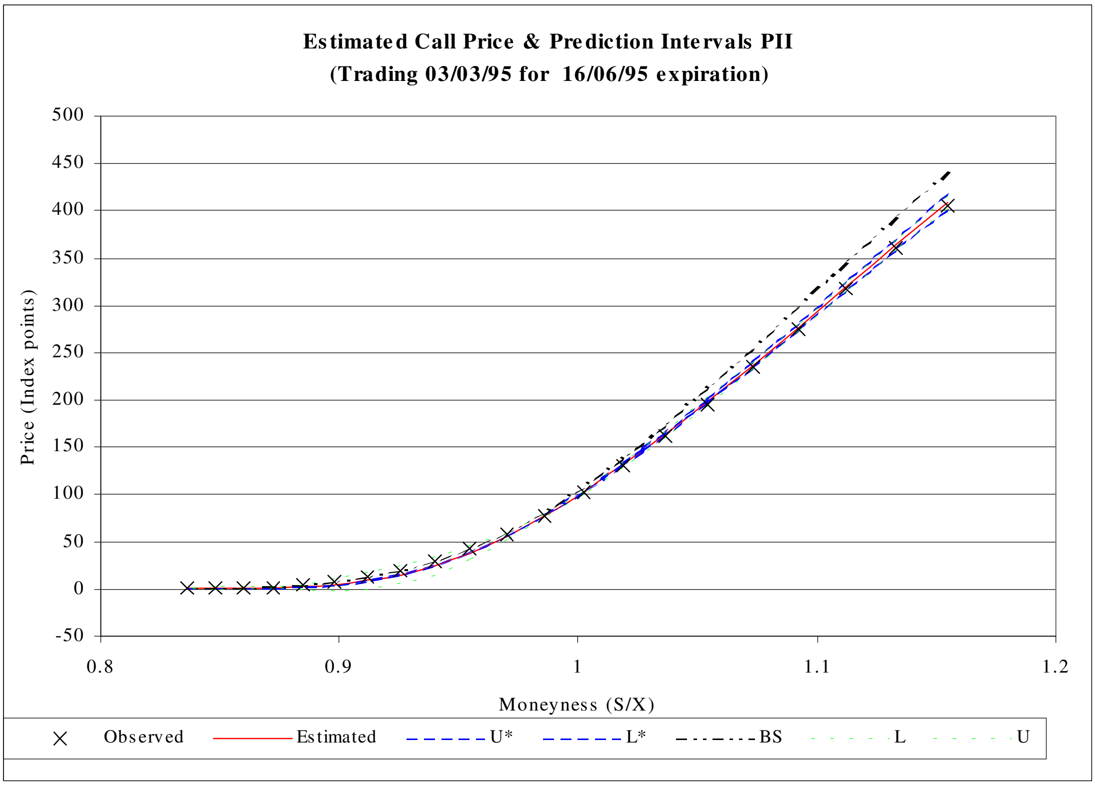
Confidence Limits for Data Mining Models of Options Prices

J V Healy, M Dixon, B J Read and F F Cai

CCTM, London Metropolitan University, 31 Jewry Street, LONDON EC3N 2EY

Non-parametric methods such as artificial neural nets can successfully model prices of financial options, out-performing the Black-Scholes (BS) analytic model. (See, for example, [HDRC02].) However, the accuracy of such approaches is usually expressed only by a global fitting error measure. This paper describes a robust method for determining prediction intervals for models derived by non-linear regression. We demonstrate it by application to a standard synthetic example [NW95]. The method is then used to obtain prediction intervals for financial option market data from LIFFE "ESX" European style FTSE 100 index options. We avoid special neural net architectures and use standard regression procedures to determine local error bars. It is appropriate for target data with non-constant variance (or volatility). We find that statistical hypothesis tests show variations in confidence for different moneyness partitions of the data.



In the graph above, the crosses are the observed option prices. The solid line "Estimated" is the proposed network estimate of the prices. The dashed lines U*, L* are the estimated upper and lower prediction intervals. The dotted lines U, L are the corresponding intervals calculated using the actually occurring residual errors. The dashed & dotted line is the BS formula estimate of the price. For the data in this figure, the bulge between moneyness of 0.89 and 0.975 reflects the relatively poorer neural net estimate of the observed prices in that region.

[HDRC02] J Healy, M Dixon, BJ Read & FF Cai, *A data-centric approach to understanding the pricing of financial options*, European Physical Journal B 27, pp 219-217 (2002).

[NW95] DA Nix & AS Weigend, "Learning Local Error Bars for Nonlinear Regression", in *Advances in Neural Information Processing Systems 7 (NIPS*94)*, G Tesauro, DS Touretzky & TK Leen (editors) pp 489-496, MIT Press, Cambridge, MA, 1995.