Complementary cumulative distributions **QNGOptimizer** AdamOptimizer approx='block-diag',  $\lambda$ =0.5  $\beta_1$ =0.9,  $\beta_2$ =0.99,  $\varepsilon$ =10<sup>-8</sup> 1.0  $\eta = 0.2$ n = 0.45 $\eta = 0.01$  $\eta = 0.01$  $\eta = 0.225$  $\eta = 0.025$  $\eta = 0.025$  $\eta = 0.5$ Probability of occurrence 8.0  $\eta = 0.05$ - n = 0.25 $\eta = 0.05$  $- \eta = 0.55$  $\eta = 0.075$  $\eta = 0.275$  $\eta = 0.1$  $\eta = 0.6$  $\eta = 0.1$  $- \eta = 0.3$  $\eta = 0.15$  $-\eta = 0.65$ n = 0.125 $-\eta = 0.4$  $\eta = 0.2$ --- n=0.70.6 ----  $\eta = 0.5$  $\eta = 0.15$ n = 0.25--- n=0.75 $\eta = 0.175$ --- n=0.6n = 0.3--- n=0.8 $\eta = 0.35$  $---- \eta = 0.85$  $\eta = 0.4$  $- \eta = 0.9$ 0.2 (b) 0.0 MomentumQNGOptimizer MomentumOptimizer  $\rho$ =0.9, approx='block-diag',  $\lambda$ =0.5  $\rho = 0.9$ 1.0  $\eta = 0.01$ n = 0.25 $\eta = 0.001$  $\eta = 0.012$ n = 0.275n = 0.025n=0.002- n=0.013Probability of occurrence  $\eta = 0.05$ --  $\eta = 0.3$  $\eta = 0.003$ ---  $\eta = 0.014$ 0.8  $\eta = 0.075$  $\eta = 0.325$  $\eta = 0.004$  $-\eta = 0.015$  $-\eta = 0.35$  $-\eta = 0.016$  $\eta = 0.1$  $\eta = 0.005$  $\eta = 0.125$  $- \eta = 0.375$  $\eta = 0.006$ -  $\eta = 0.017$ 0.6  $\eta = 0.15$ ---  $\eta = 0.4$  $\eta = 0.007$ ---  $\eta = 0.018$  $\eta = 0.175$ ---  $\eta = 0.425$ ---  $\eta = 0.019$  $\eta = 0.008$  $\eta = 0.2$ ---  $\eta = 0.45$  $\eta = 0.009$ ---  $\eta = 0.02$ 0.4 n = 0.225 $\eta = 0.01$ --- n=0.021n = 0.0110.2 (d)0.0 0.3 0.1 0.2 0.4 0.0 0.1 0.2 0.3 0.4 0.0 quality ratio quality ratio