# Sensitivity studies for Shooter et al 2020

This document provides typical diagnostic plots supporting Shooter et al. (2020). Section S.1 provides supporting illustrations for a typical analysis. Section S.2 provides a sensitivity analysis into choice of conditional extremes threshold, and adoption of conditional quantile constraints (CQCs).

S.1 "Vanilla" analysis

Normal transect (SWNE), CQCs imposed, threshold non-exceedance probability 0.7. Conditioning location 1. Reported in main article.
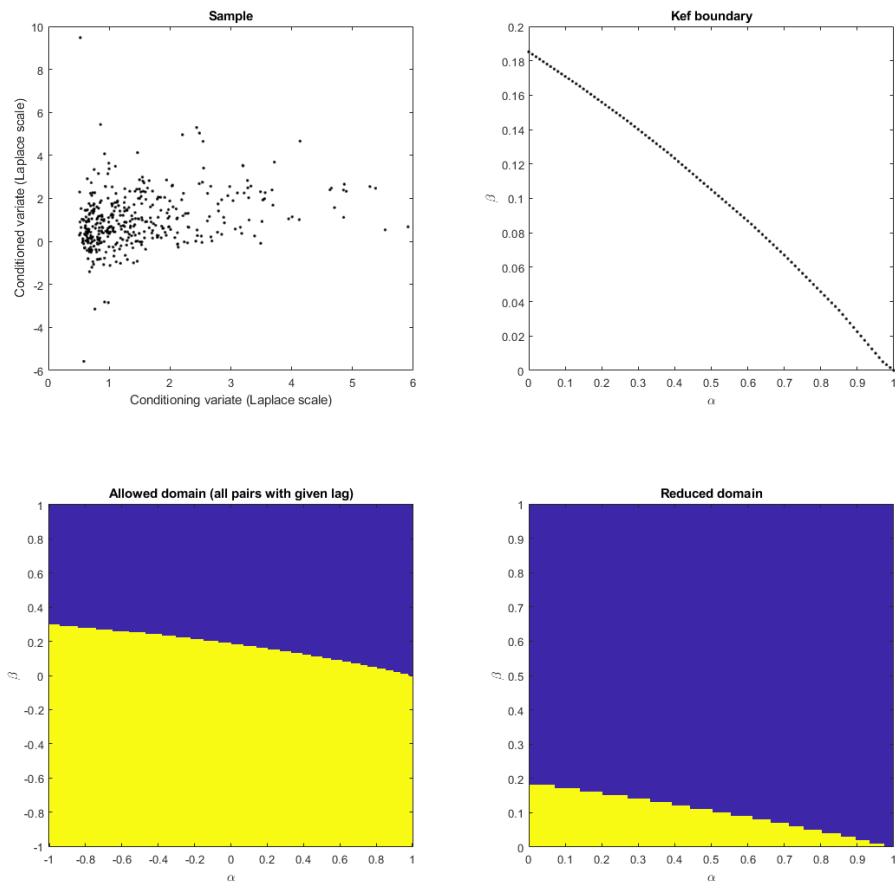
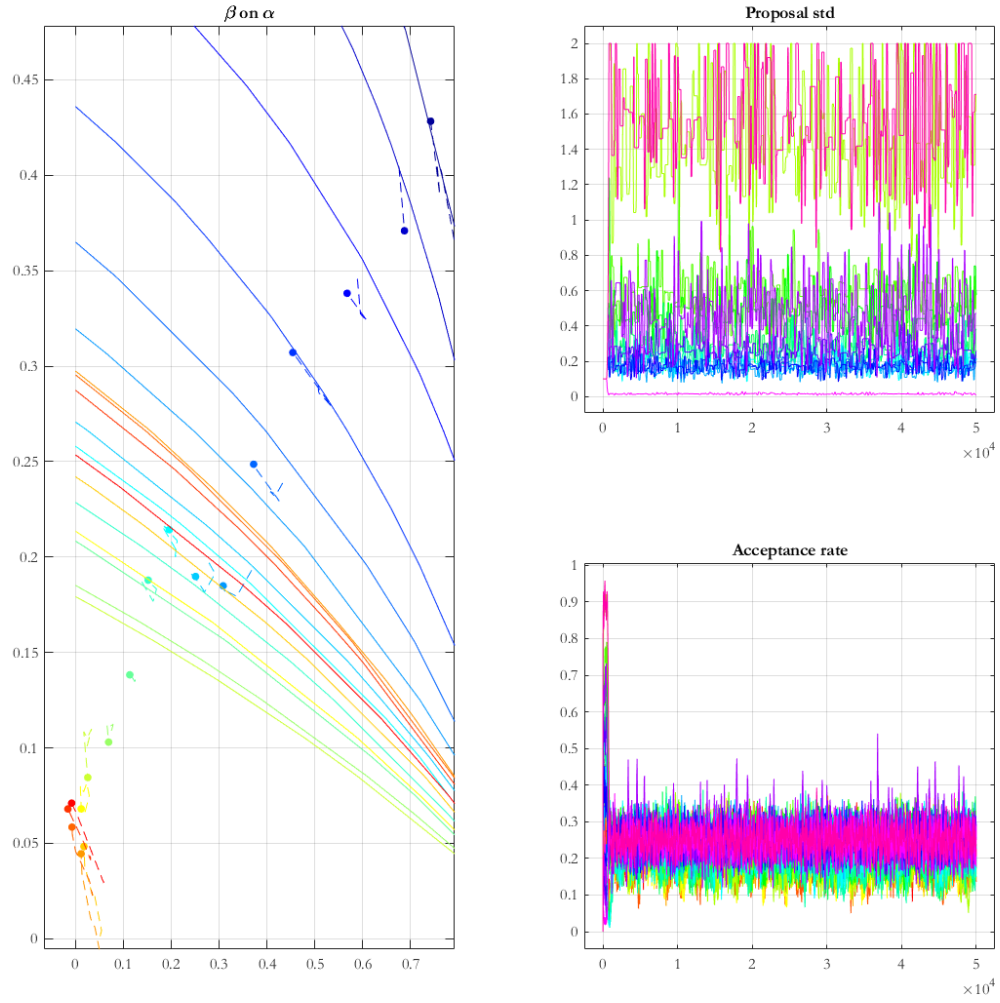Figure S.1: Illustration of sample and CQC ("Keef") boundary at lag 11 of 19.

Figure S.2: Left: illustration of CQC boundaries and MCMC trajectories for 10 iterations; α on x-axis, β on y-axis. Top right: proposal standard deviations. Bottom right: acceptance rates.
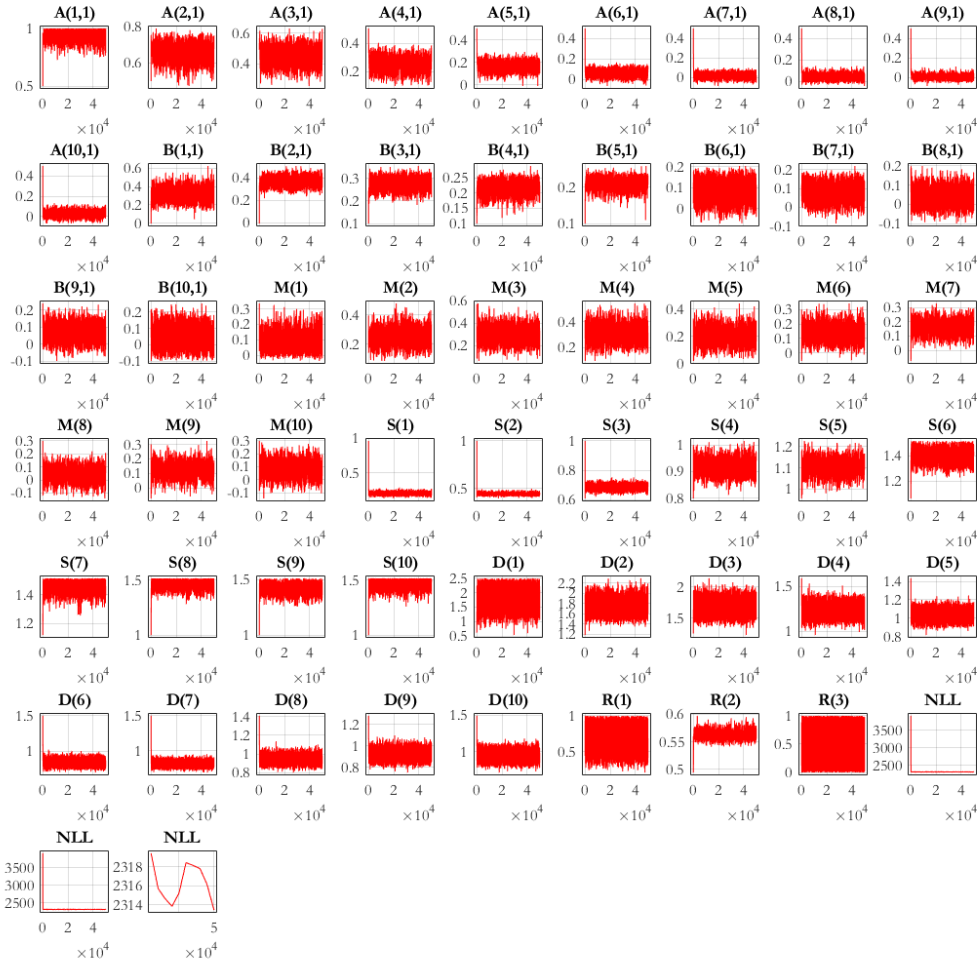
Figure S.3: MCMC trace plots for all model parameters, and negative log posterior likelihood. 50k iterations.
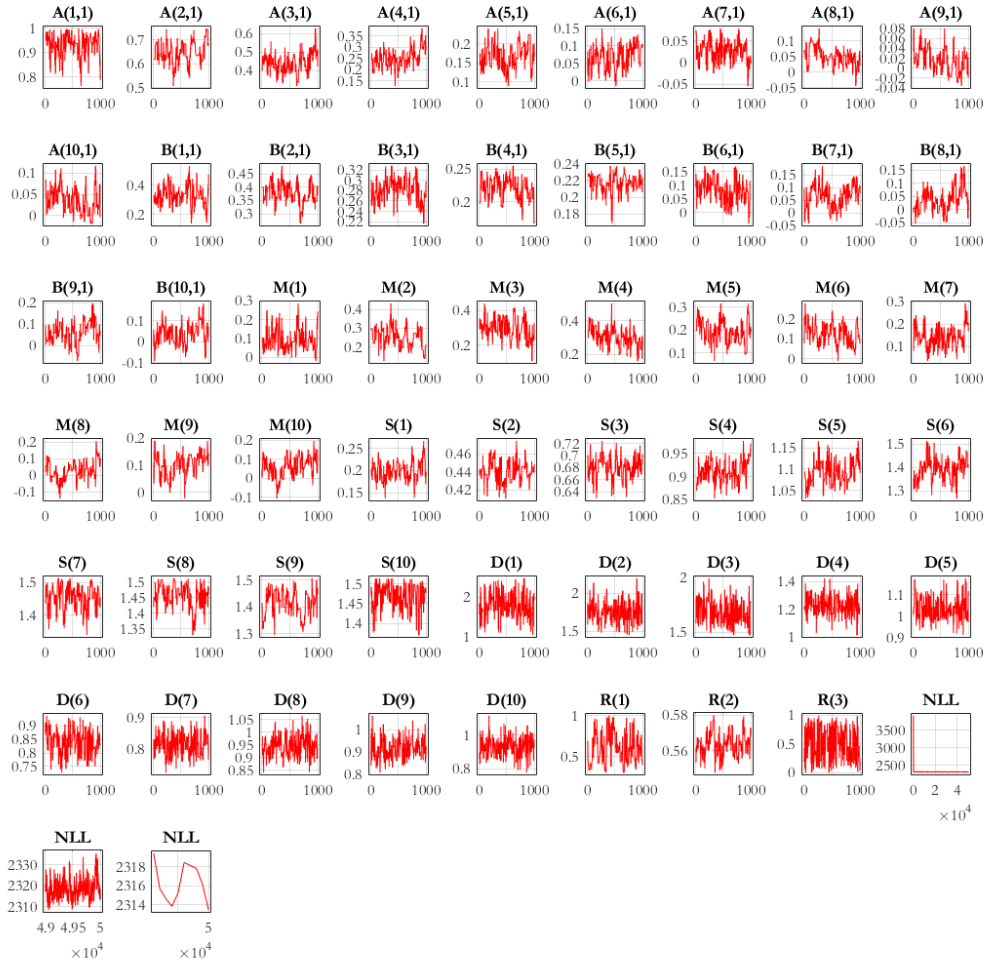
Figure S.4: MCMC trace plots for all model parameters, and negative log posterior likelihood. Last 1000 of 50k iterations.
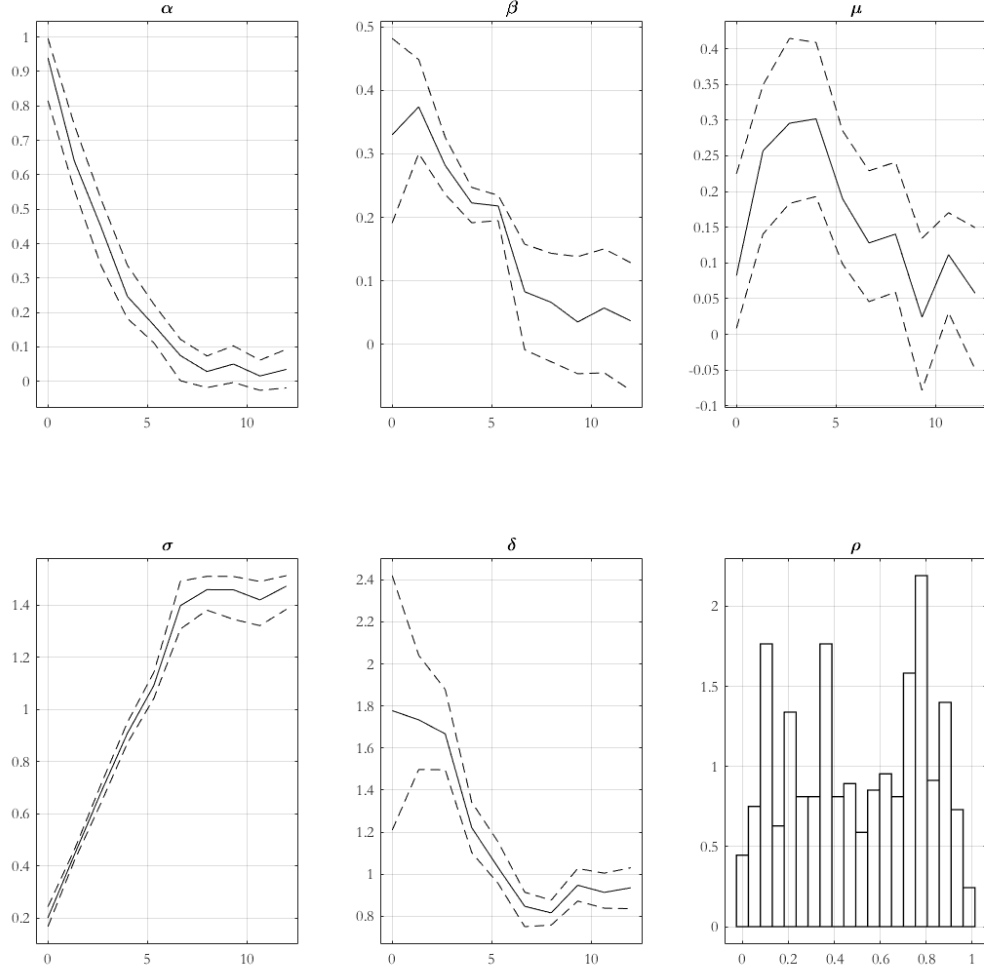
Figure S.5: Parameter estimates with distance. For all but ρ, posterior median and 95% credible intervals. For ρ, posterior density. One distance unit is approximately 111.2km, actually $(\pi/180)R$, where R is the radius of the Earth.

S.2 Effect of threshold and conditional quantile constraints

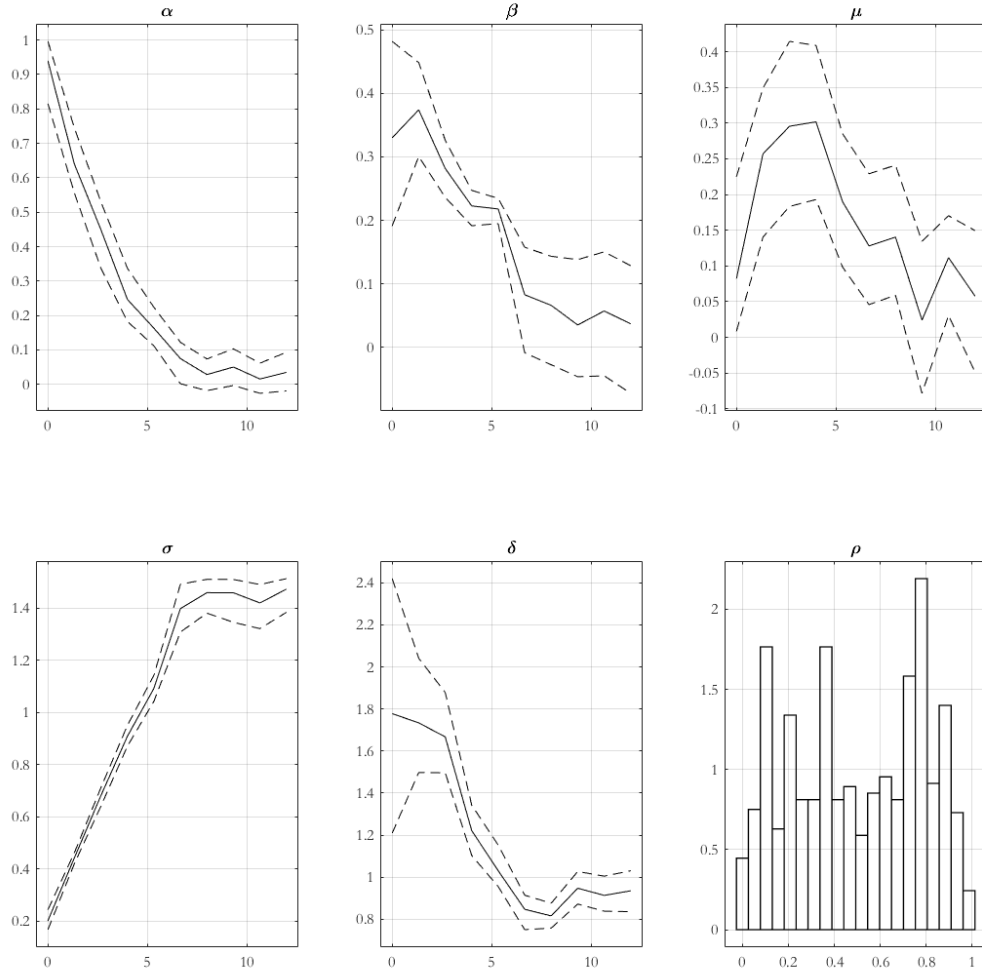### S.2.1 Normal (SWNE) transect

Figure S.6: Parameter estimates with distance (see Figure S.5). CQCs imposed. Threshold non-exceedance probability 0.7.
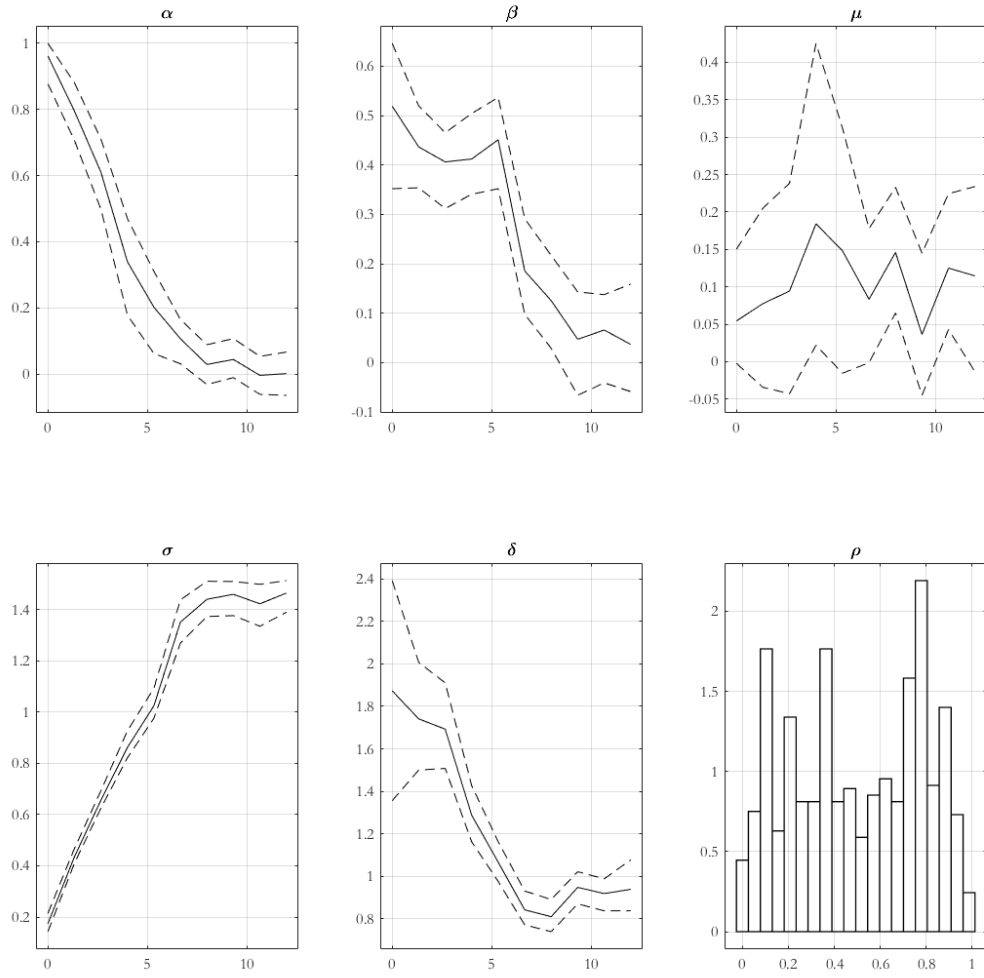
Figure S.7: Parameter estimates with distance (see Figure S.5). No CQCs. Threshold non-exceedance probability 0.7.
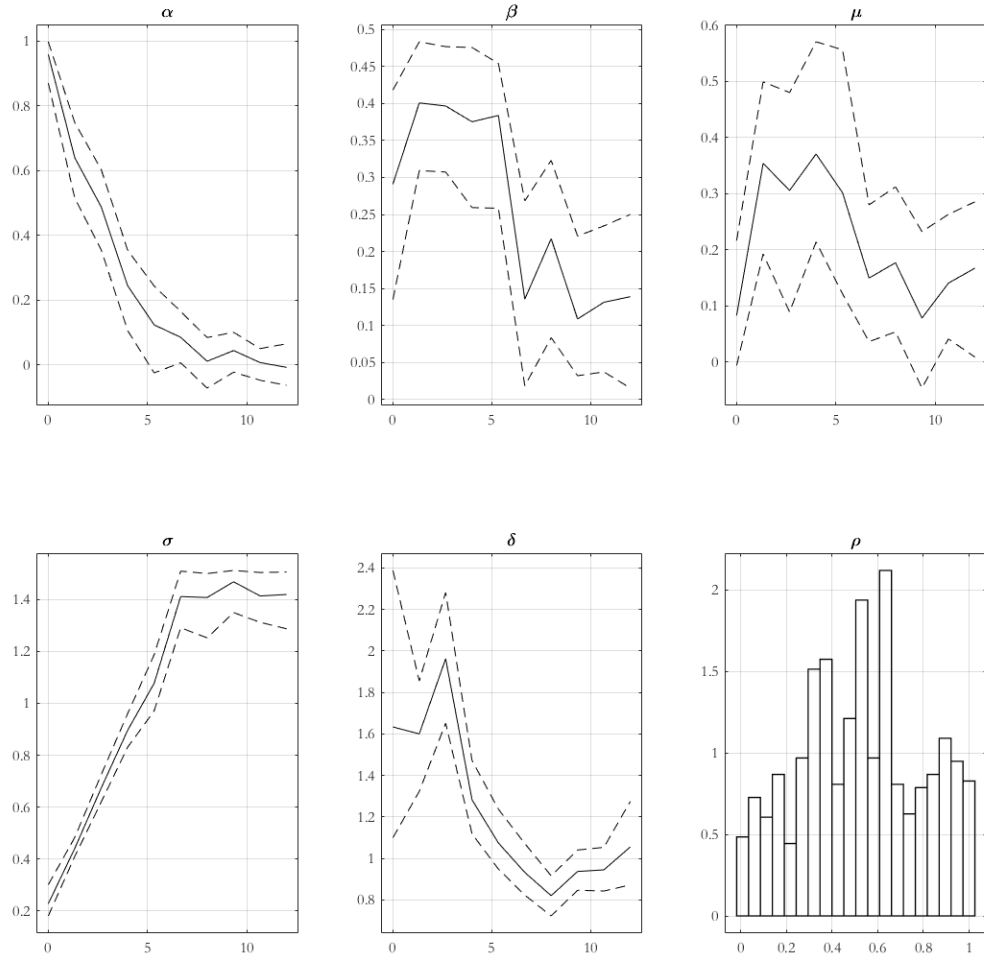
Figure S.8: Parameter estimates with distance (see Figure S.5). CQCs imposed. Threshold non-exceedance probability 0.8.
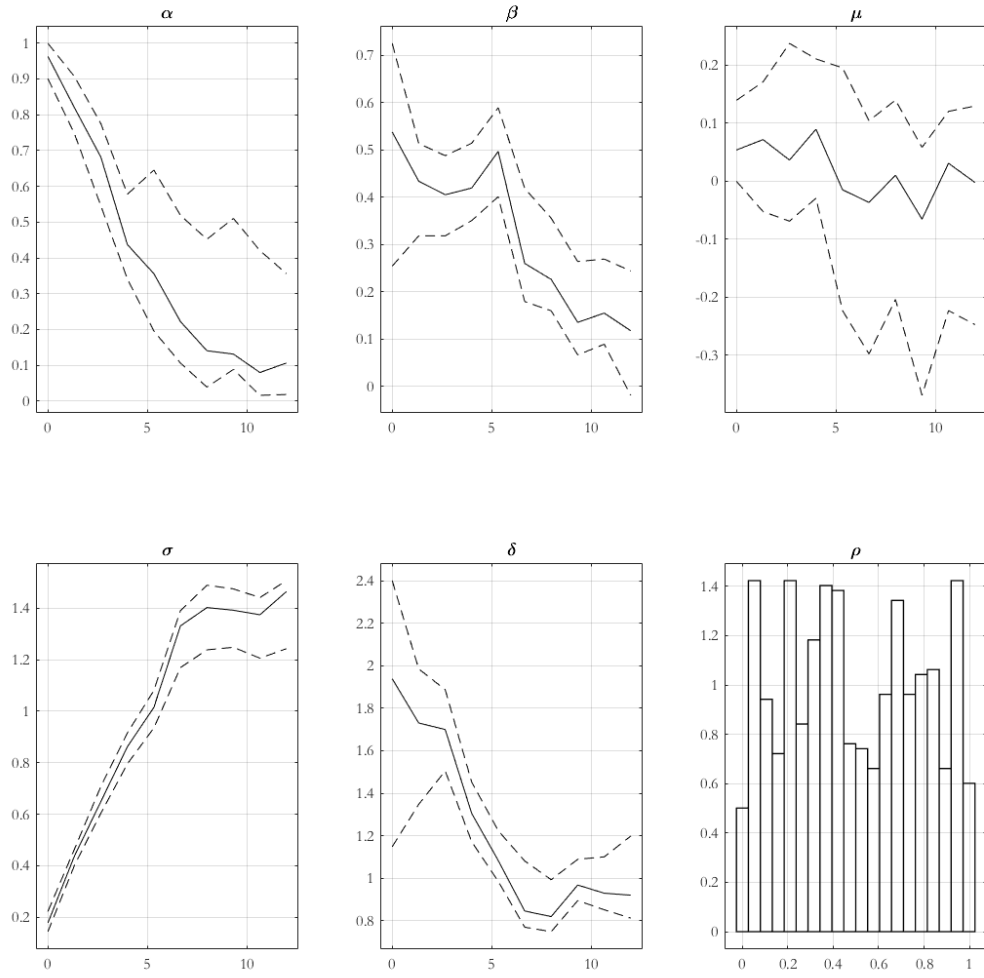
Figure S.9: Parameter estimates with distance (see Figure S.5). No CQCs. Threshold non-exceedance probability 0.8.
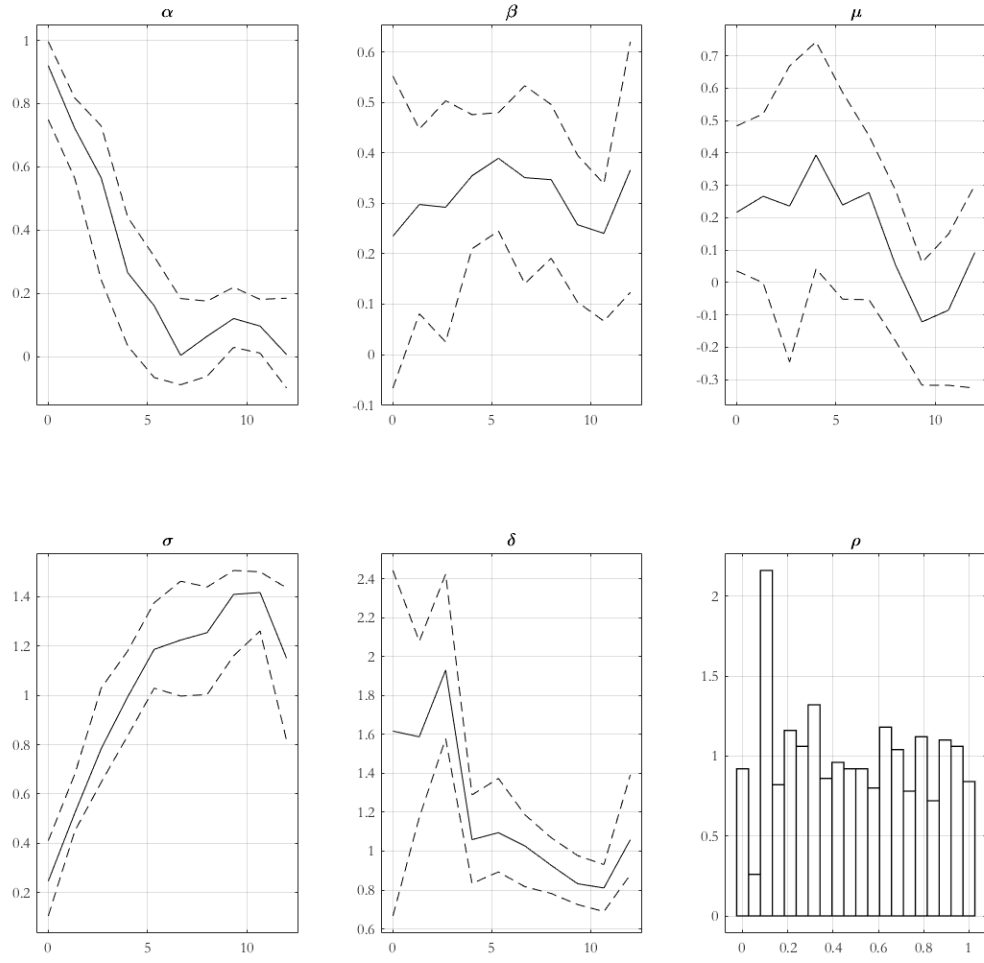
Figure S.10: Parameter estimates with distance (see Figure S.5). CQCs imposed. Threshold non-exceedance probability 0.9.
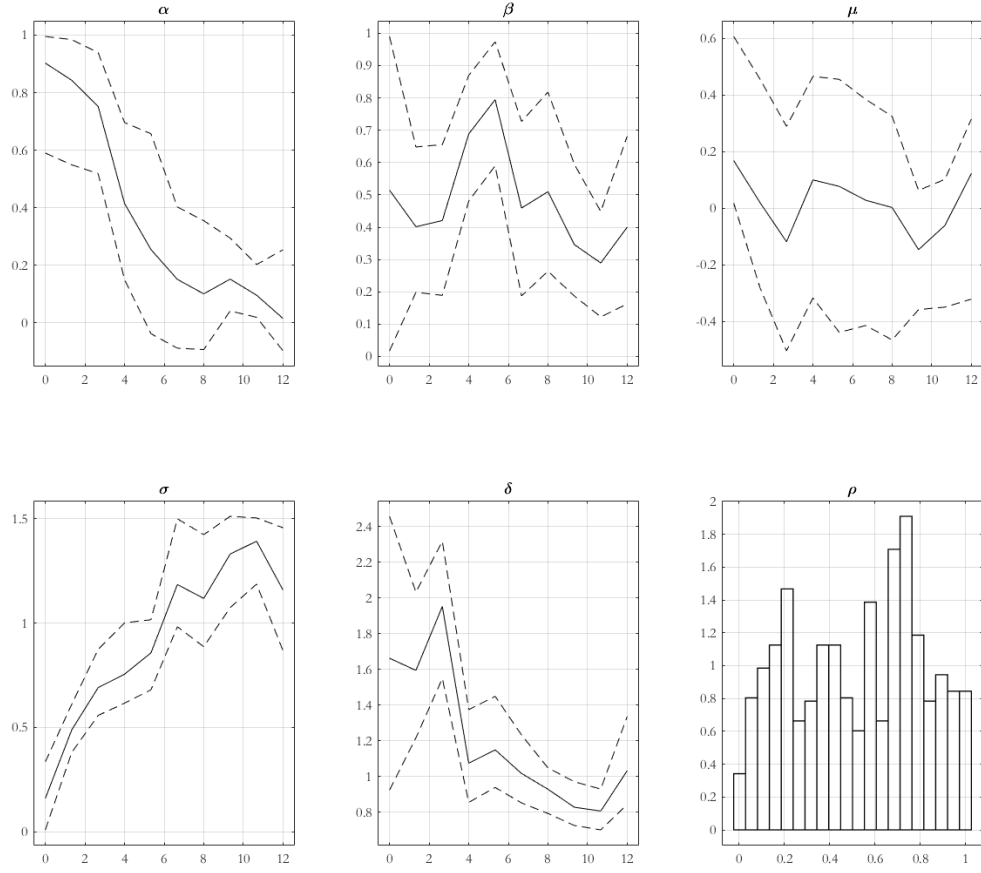
Figure S.11: Parameter estimates with distance (see Figure S.5). No CQCs. Threshold non-exceedance probability 0.9.
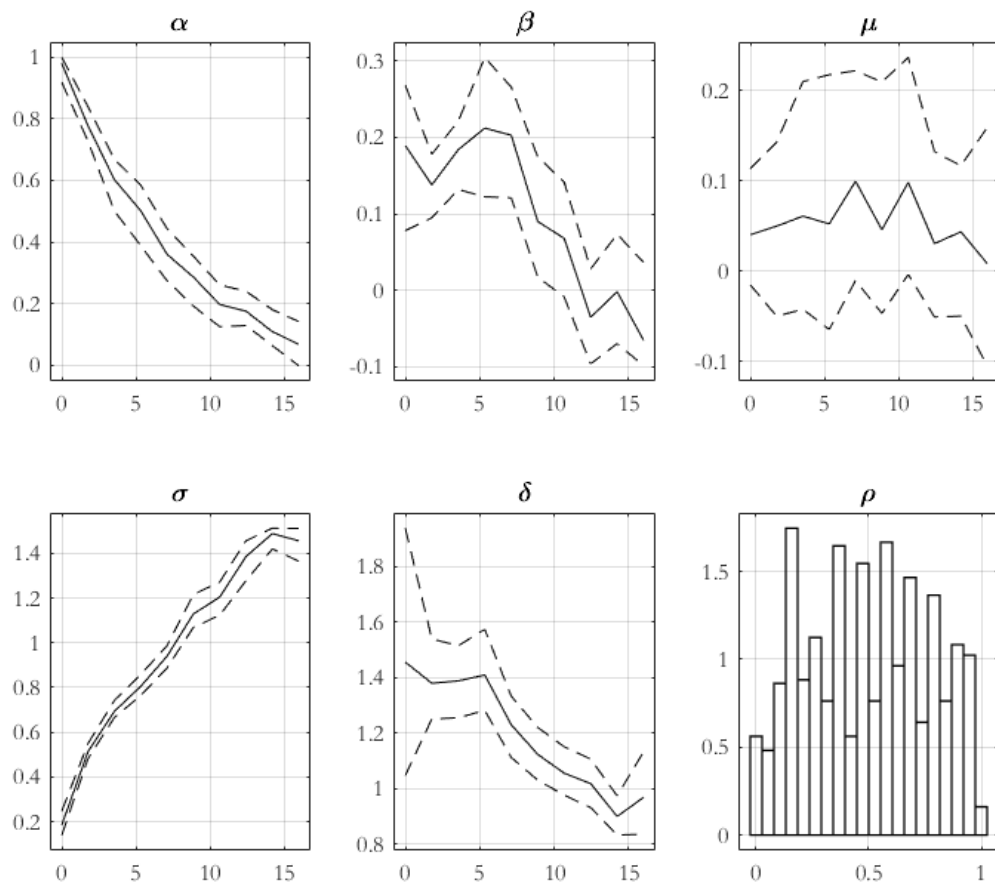
S.2.2 Opposite (NWSE) transect

Figure S.12: Parameter estimates with distance (see Figure S.5). CQCs imposed. Threshold non-exceedance probability 0.7.
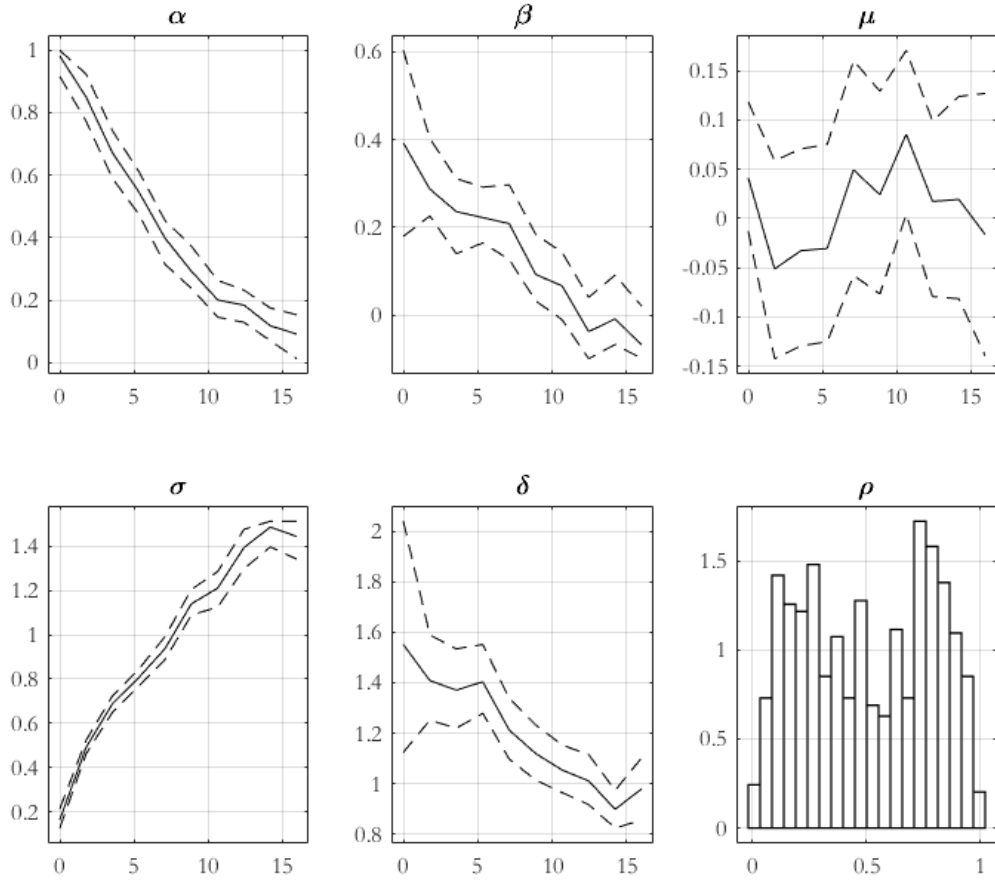
Figure S.13: Parameter estimates with distance (see Figure S.5). No CQCs. Threshold non-exceedance probability 0.7.
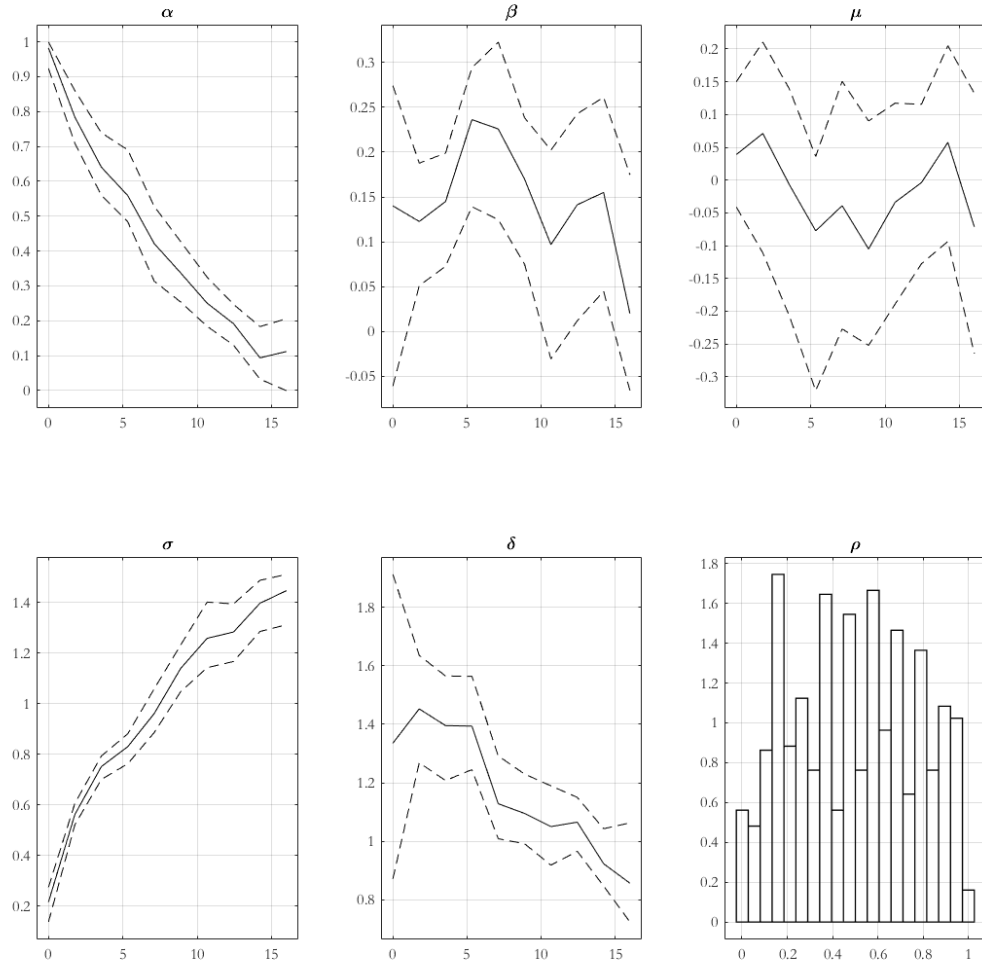
Figure S.14: Parameter estimates with distance (see Figure S.5). CQCs imposed. Threshold non-exceedance probability 0.8.
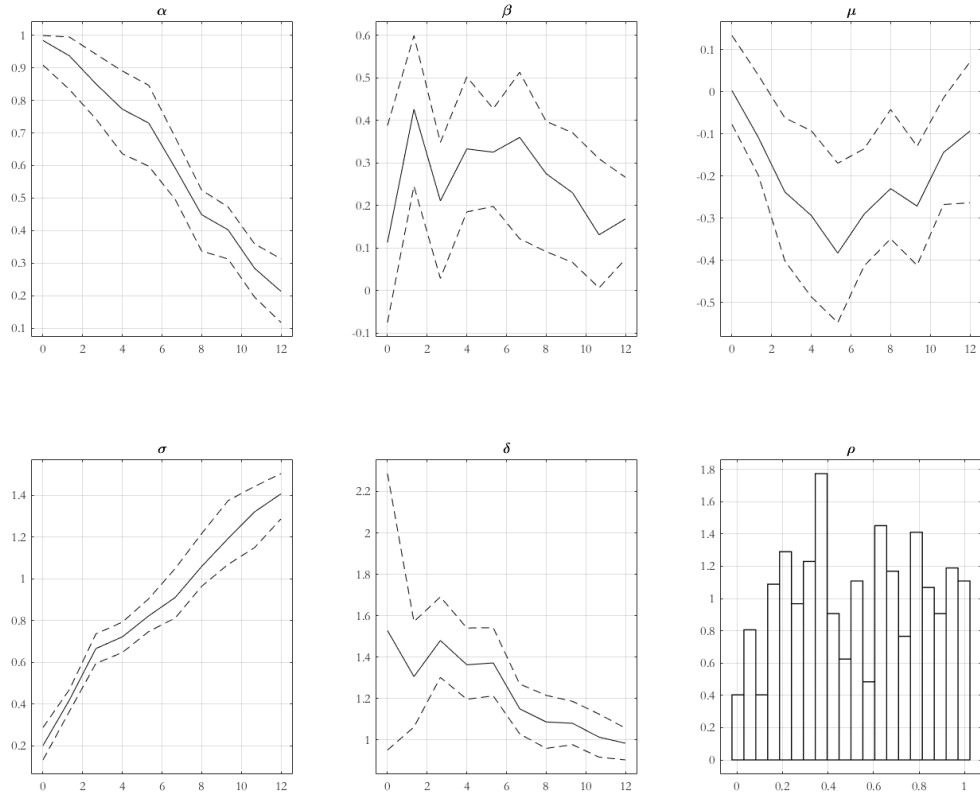
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Figure S.15: Parameter estimates with distance (see Figure S.5). No CQCs. Threshold non-exceedance probability 0.8.
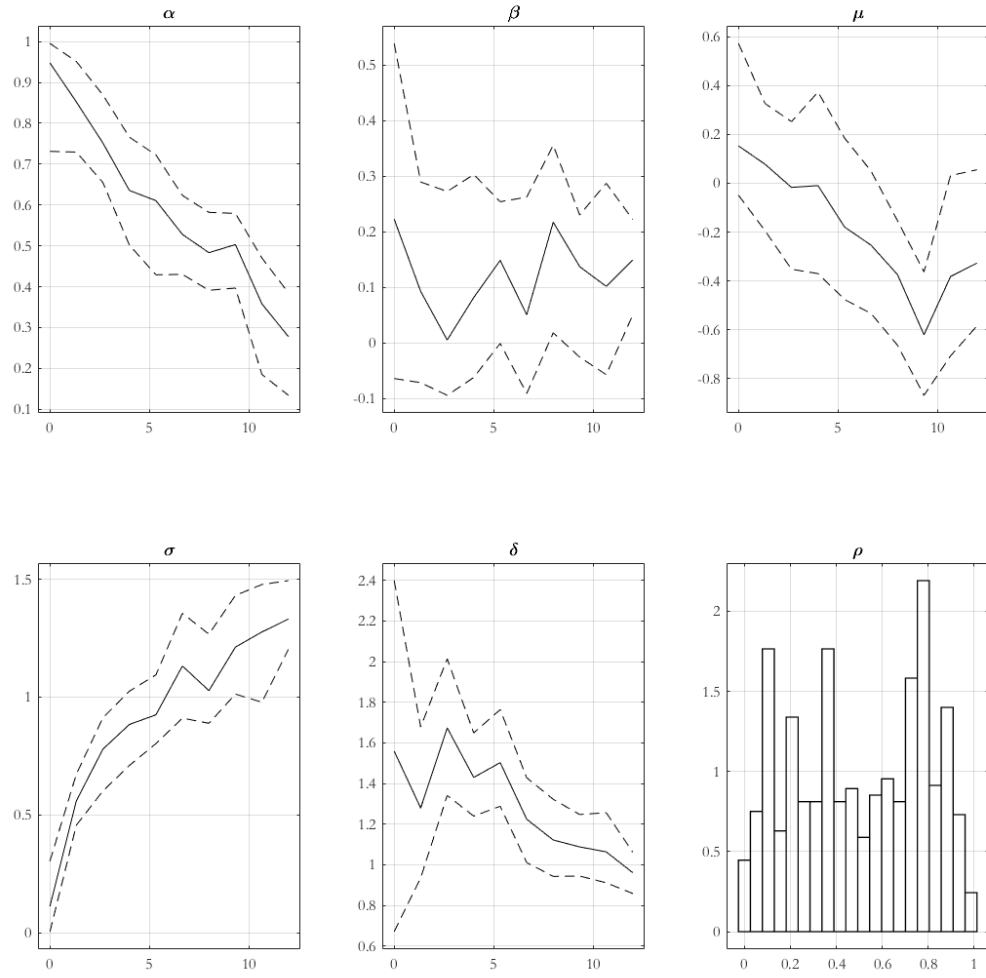
Figure S.16: Parameter estimates with distance (see Figure S.5). CQCs imposed. Threshold non-exceedance probability 0.9.
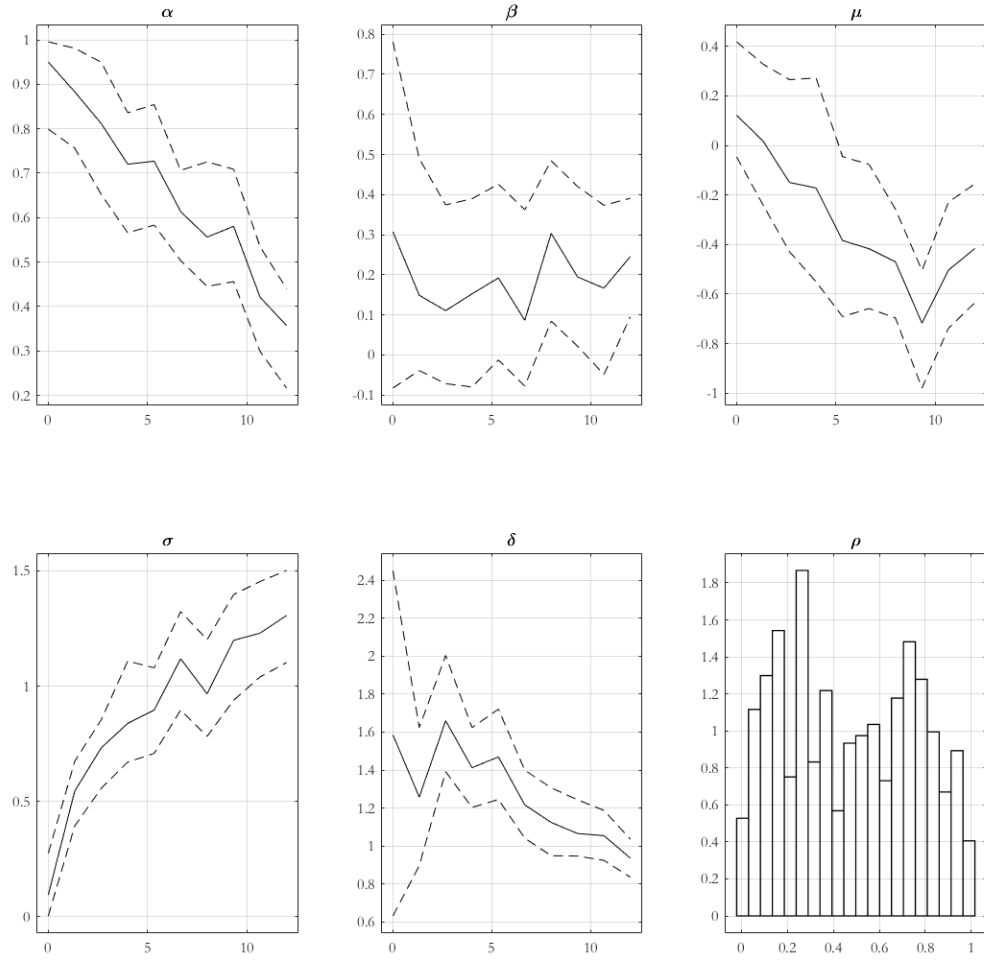
Figure S.17: Parameter estimates with distance (see Figure S.5). No CQCs. Threshold non-exceedance probability 0.9.

References

Shooter, R., Ross, E., Ribal, A., Young, I.R., Jonathan, P., 2020. Spatial conditional extremes for significant wave height from satellite altimetry. Submitted to Environmetrics (Draft at www.lancs.ac.uk/~jonathan) .