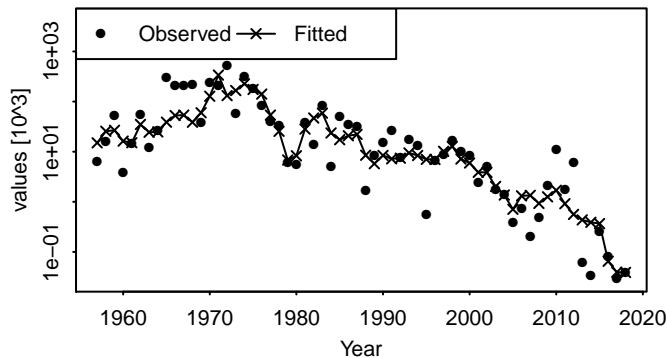
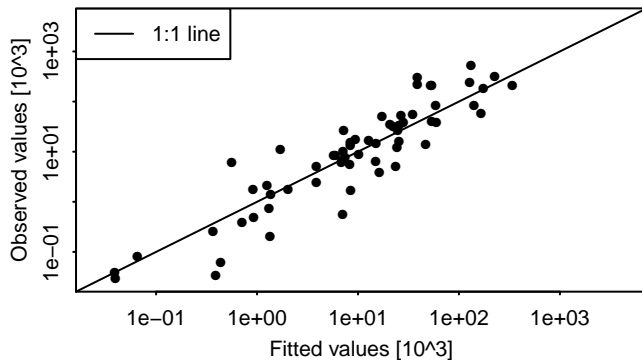


# Herring in Vla (combined) and VIIbc Diagnostics – catch unique, age 1

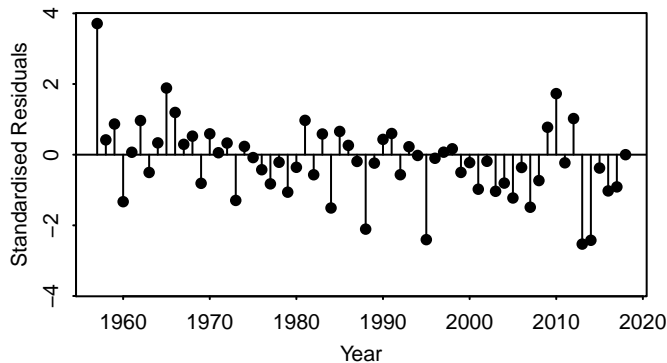
a) Observed and fitted values time series



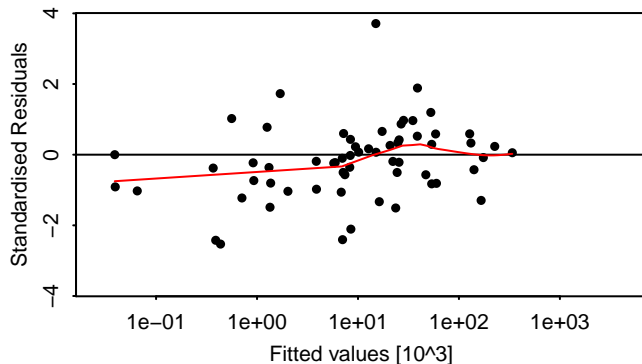
b) Observed vs fitted values



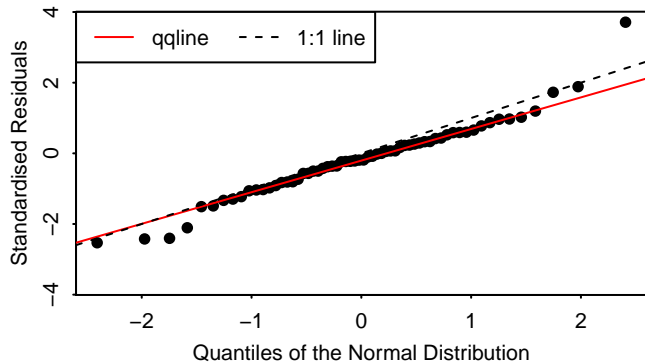
c) Standardised residuals over time



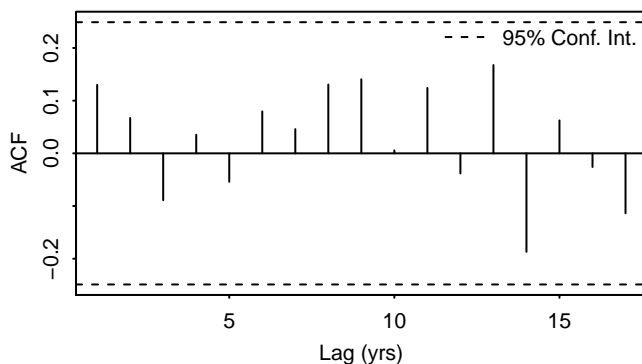
d) Tukey–Anscombe plot



e) Normal Q–Q plot

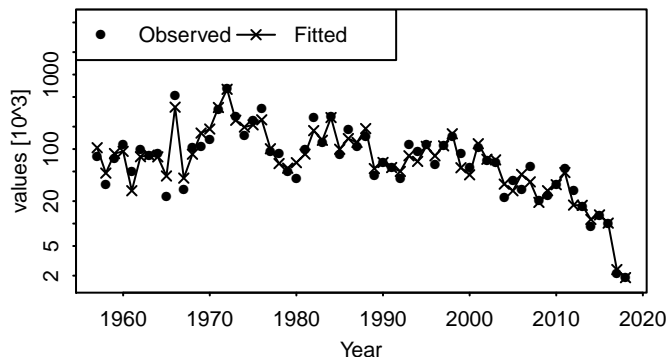


f) Autocorrelation of Residuals

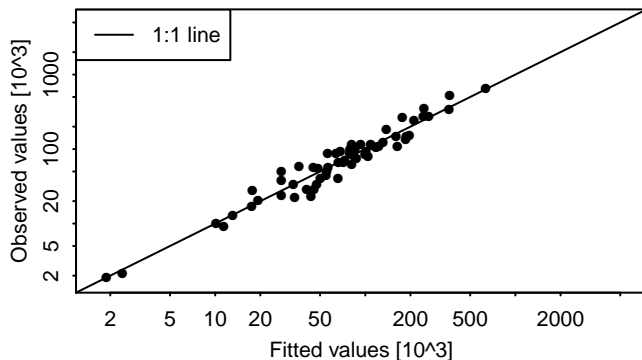


# Herring in Vla (combined) and VIIbc Diagnostics – catch unique, age 2

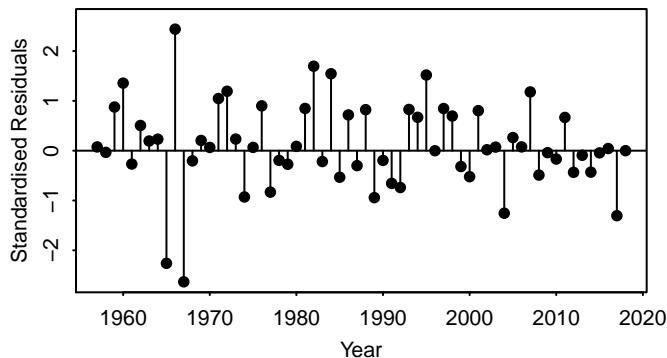
a) Observed and fitted values time series



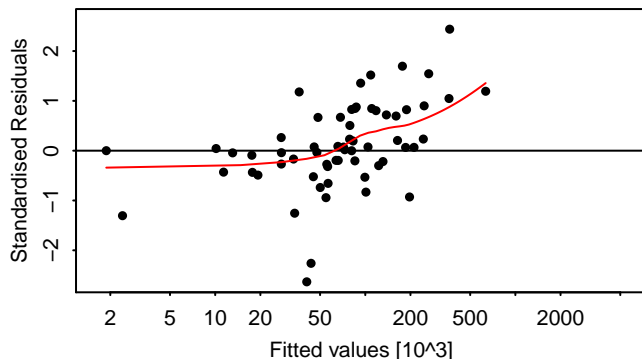
b) Observed vs fitted values



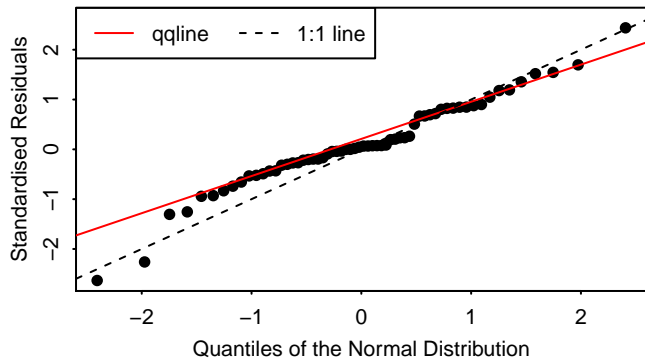
c) Standardised residuals over time



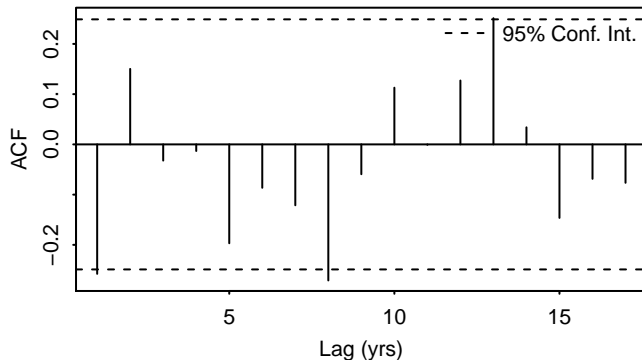
d) Tukey–Anscombe plot



e) Normal Q–Q plot

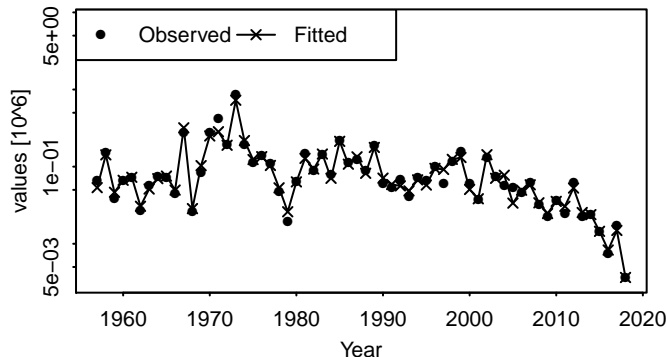


f) Autocorrelation of Residuals

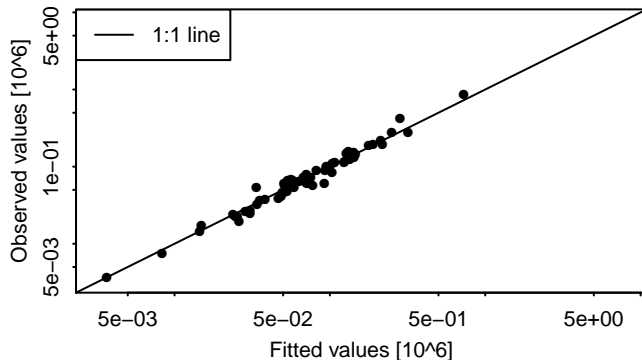


# Herring in Vla (combined) and VIIbc Diagnostics – catch unique, age 3

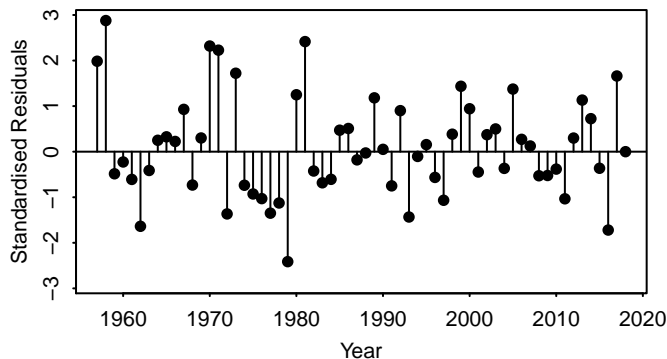
a) Observed and fitted values time series



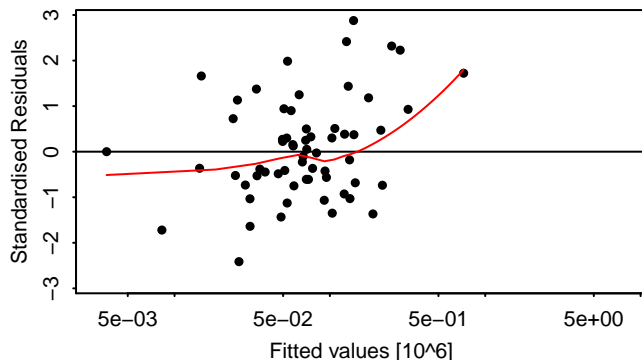
b) Observed vs fitted values



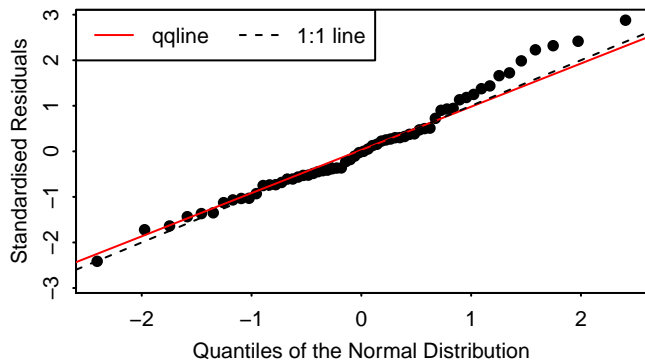
c) Standardised residuals over time



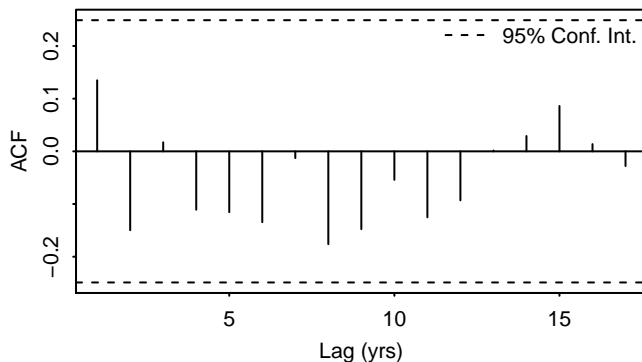
d) Tukey–Anscombe plot



e) Normal Q–Q plot

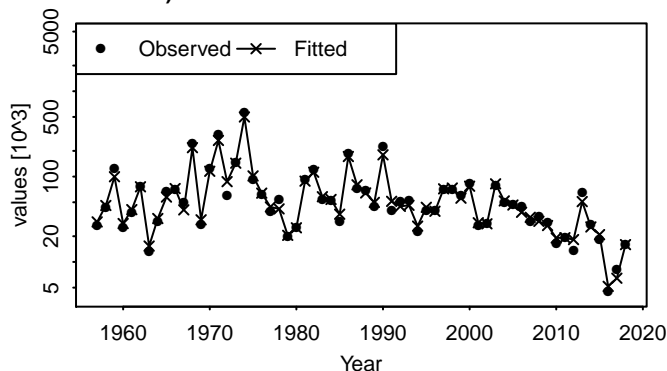


f) Autocorrelation of Residuals

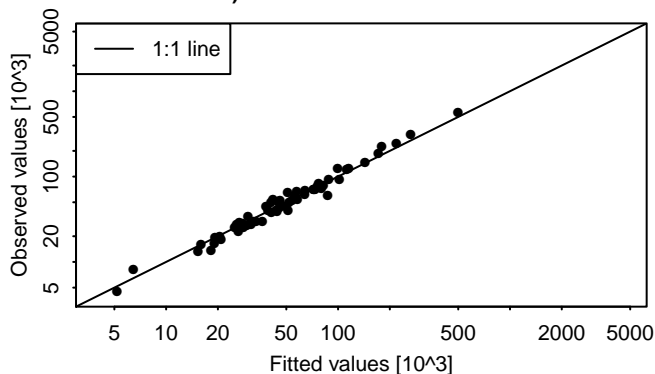


# Herring in Vla (combined) and VIIbc Diagnostics – catch unique, age 4

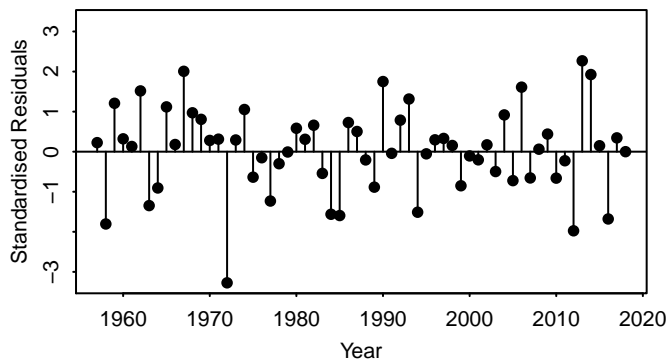
a) Observed and fitted values time series



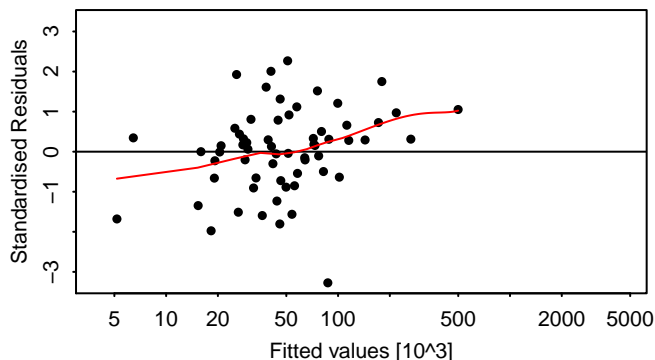
b) Observed vs fitted values



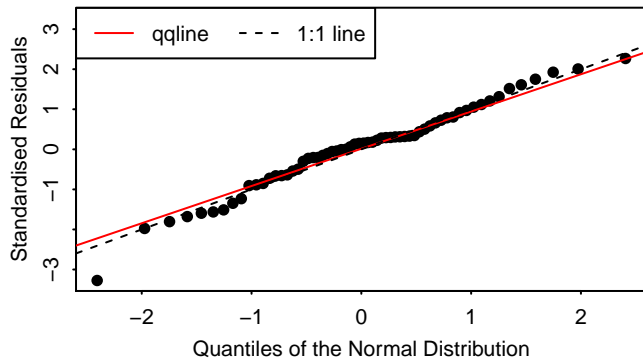
c) Standardised residuals over time



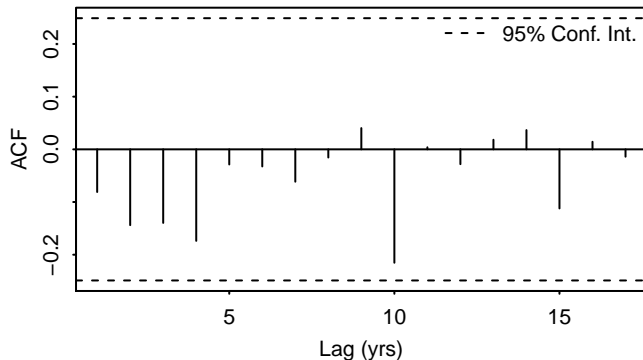
d) Tukey–Anscombe plot



e) Normal Q–Q plot

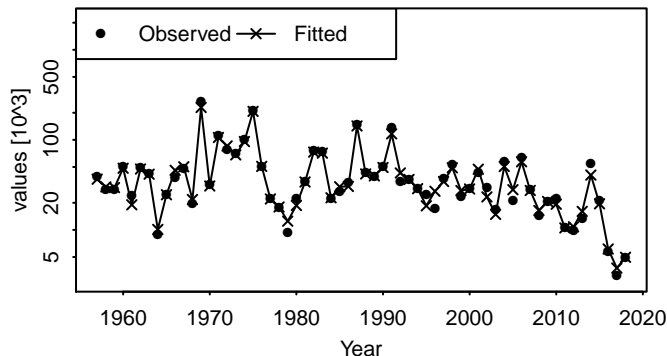


f) Autocorrelation of Residuals

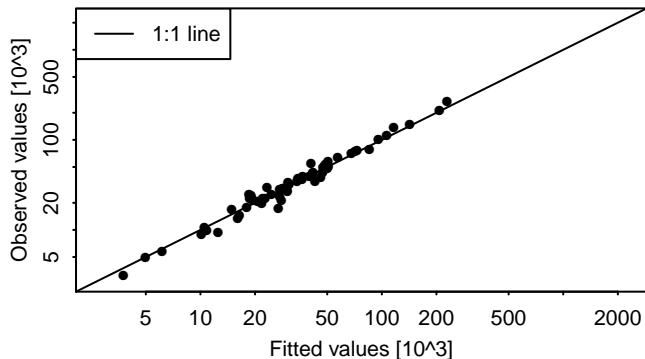


# Herring in Vla (combined) and VIIbc Diagnostics – catch unique, age 5

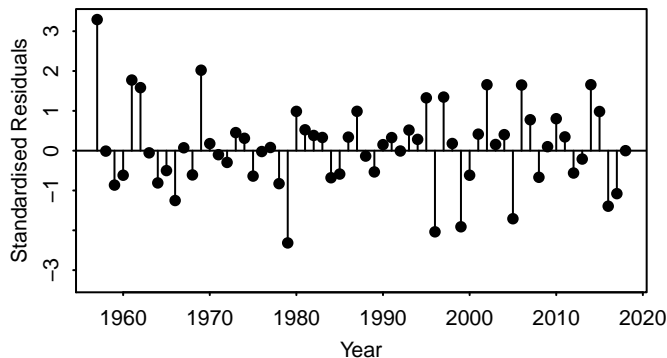
a) Observed and fitted values time series



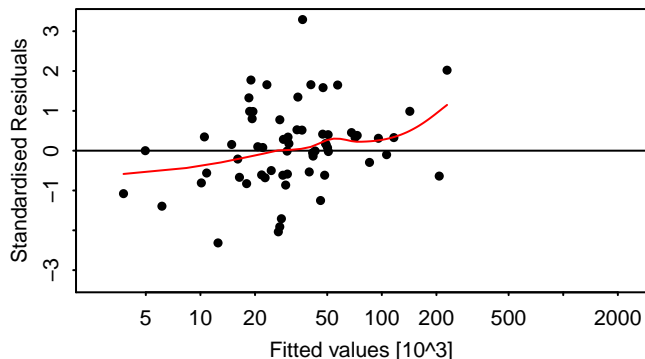
b) Observed vs fitted values



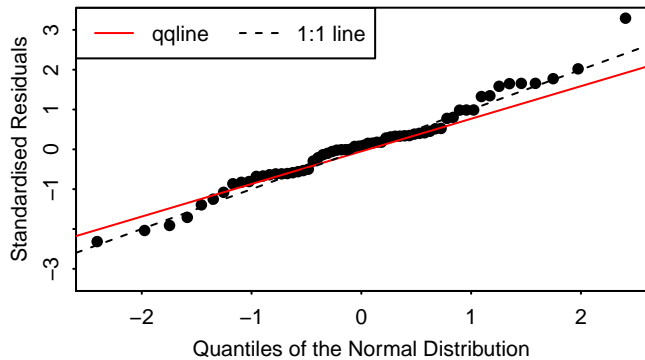
c) Standardised residuals over time



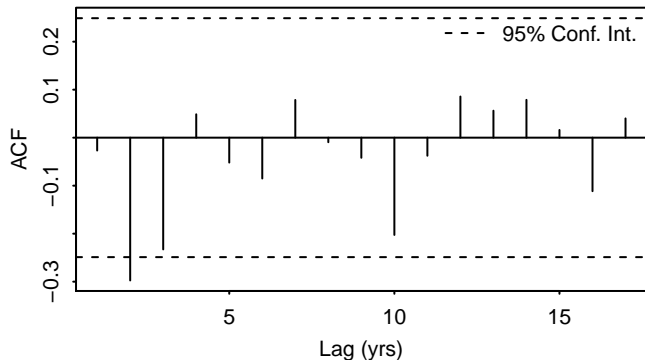
d) Tukey–Anscombe plot



e) Normal Q–Q plot

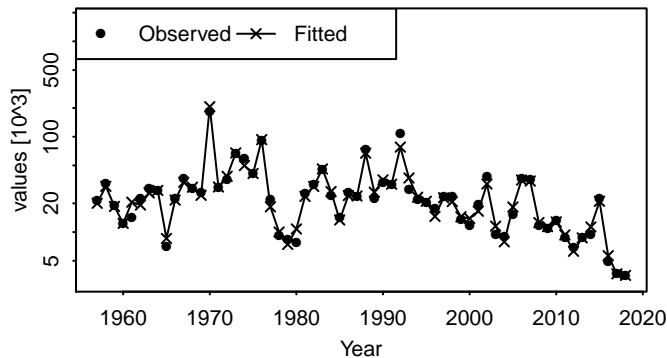


f) Autocorrelation of Residuals

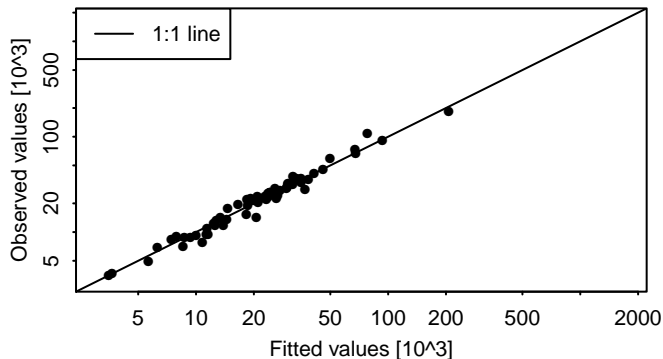


# Herring in Vla (combined) and VIIbc Diagnostics – catch unique, age 6

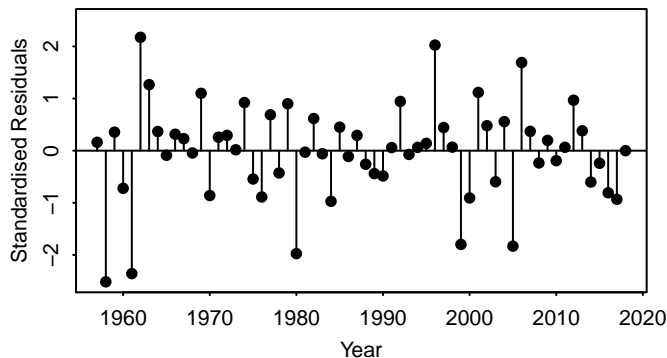
a) Observed and fitted values time series



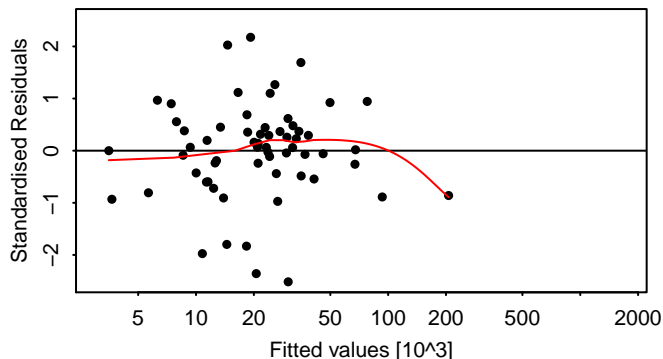
b) Observed vs fitted values



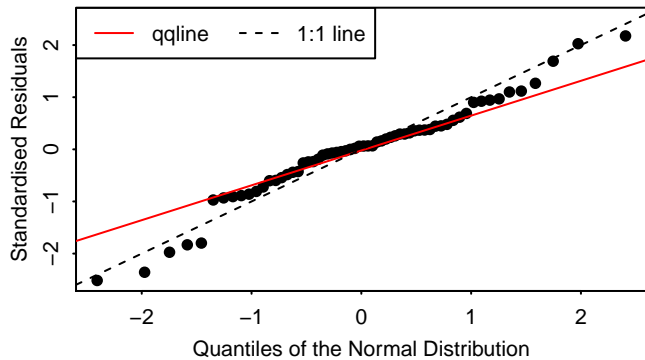
c) Standardised residuals over time



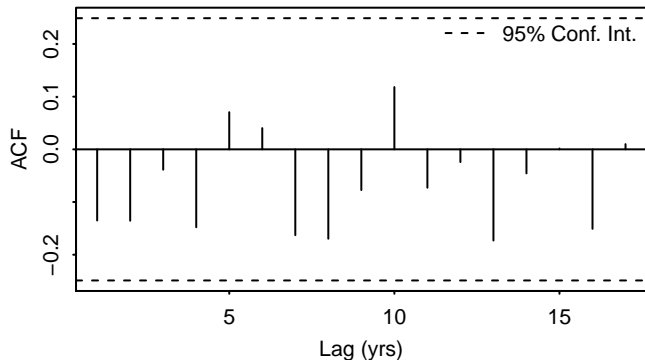
d) Tukey–Anscombe plot



e) Normal Q–Q plot

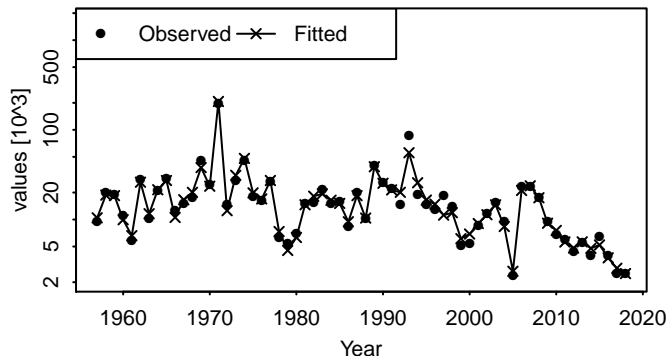


f) Autocorrelation of Residuals

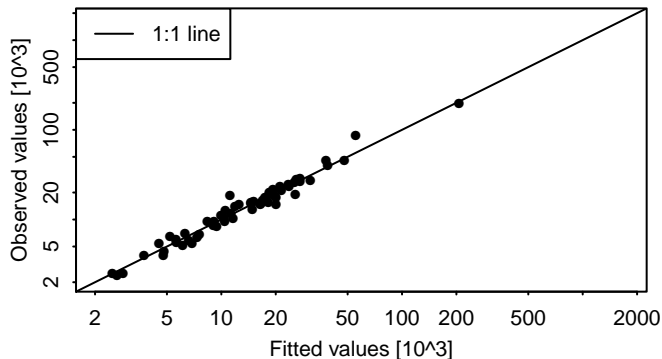


# Herring in Vla (combined) and VIIbc Diagnostics – catch unique, age 7

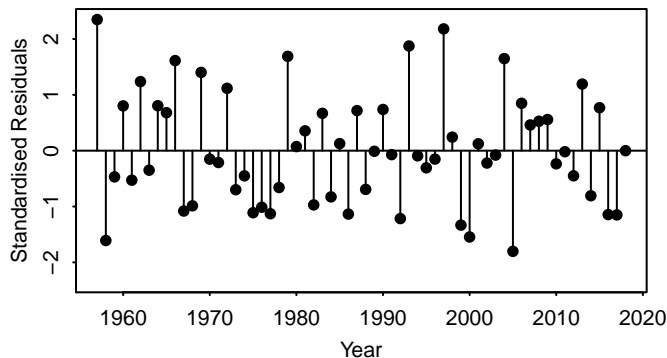
a) Observed and fitted values time series



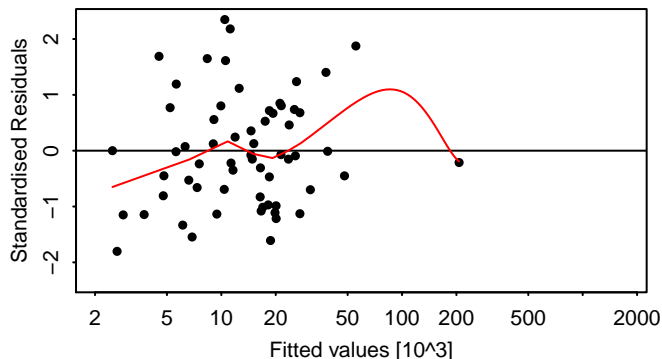
b) Observed vs fitted values



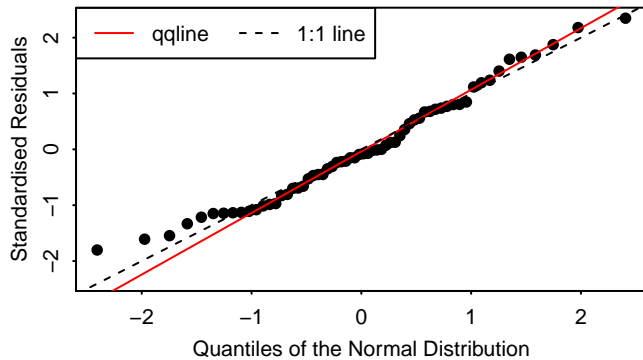
c) Standardised residuals over time



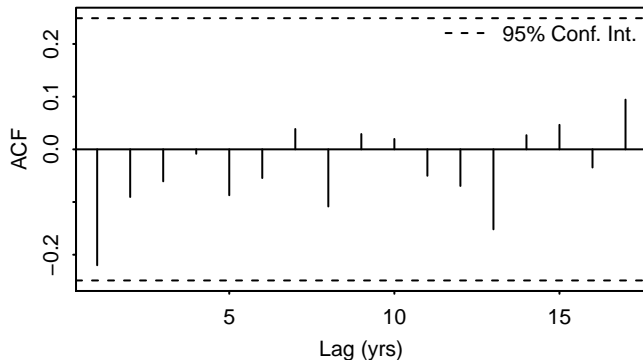
d) Tukey–Anscombe plot



e) Normal Q–Q plot

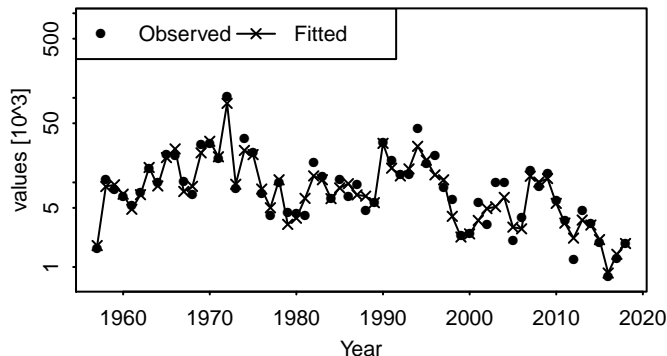


f) Autocorrelation of Residuals

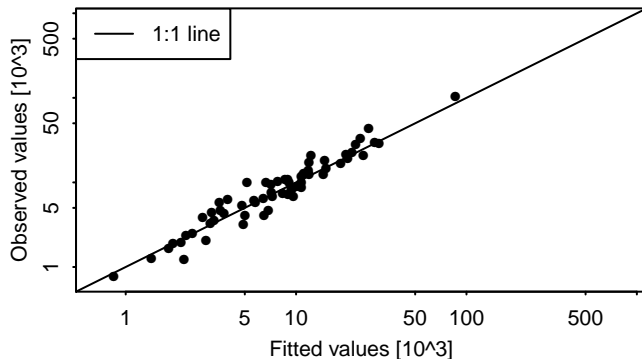


# Herring in Vla (combined) and VIIbc Diagnostics – catch unique, age 8

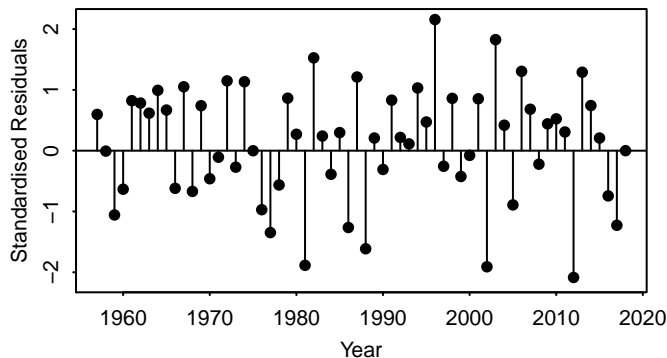
a) Observed and fitted values time series



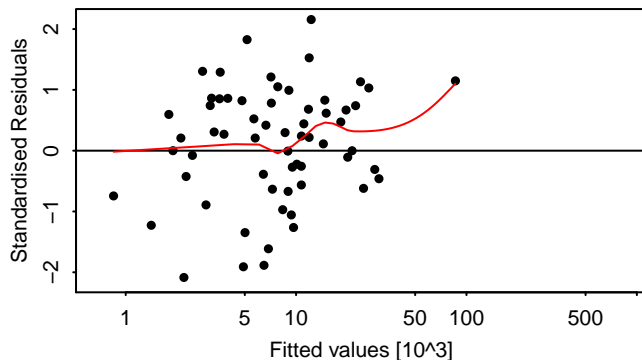
b) Observed vs fitted values



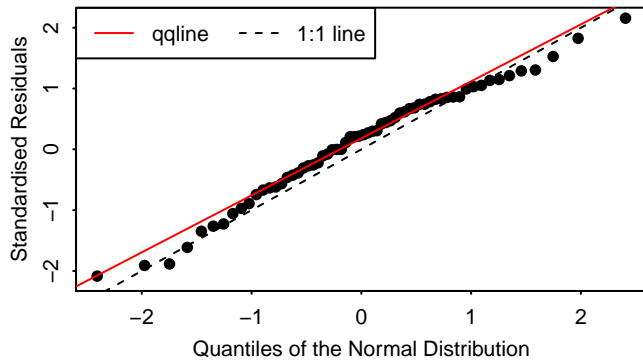
c) Standardised residuals over time



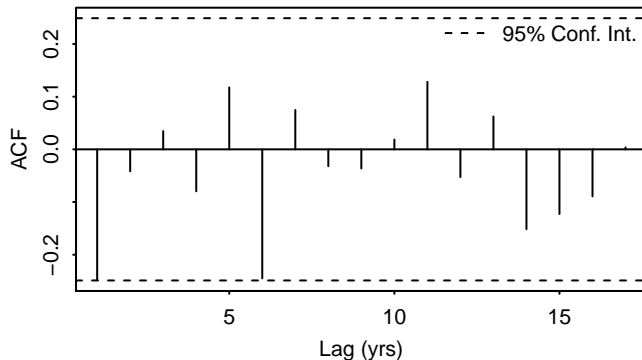
d) Tukey–Anscombe plot



e) Normal Q–Q plot



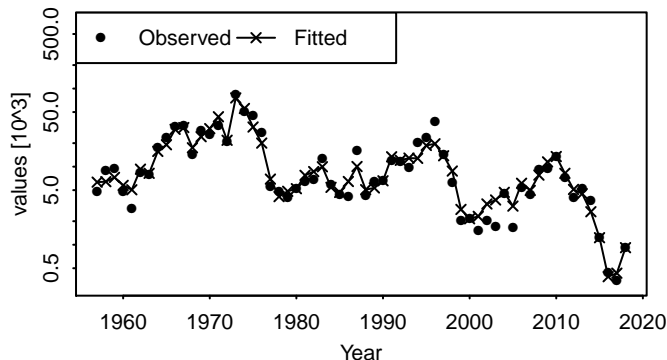
f) Autocorrelation of Residuals



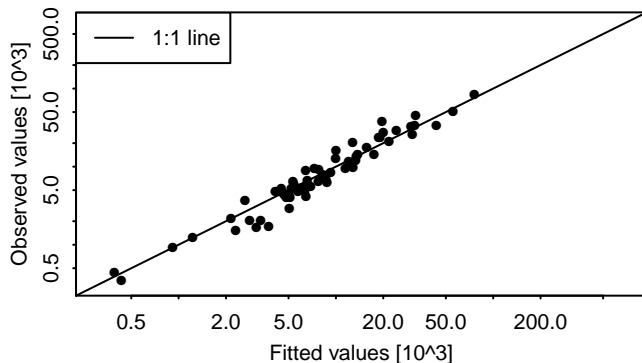


# Herring in Vla (combined) and VIIbc Diagnostics – catch unique, age 9

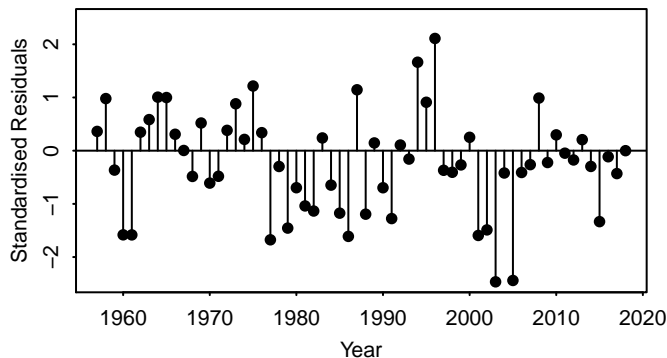
a) Observed and fitted values time series



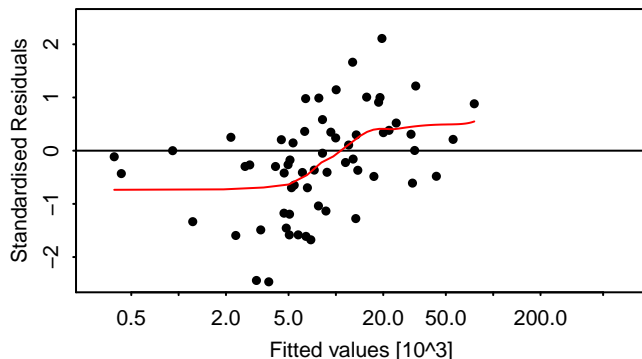
b) Observed vs fitted values



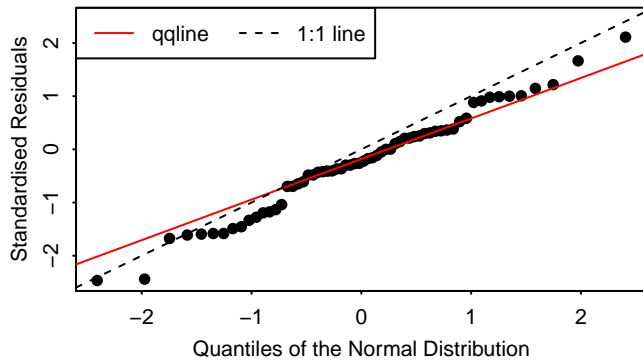
c) Standardised residuals over time



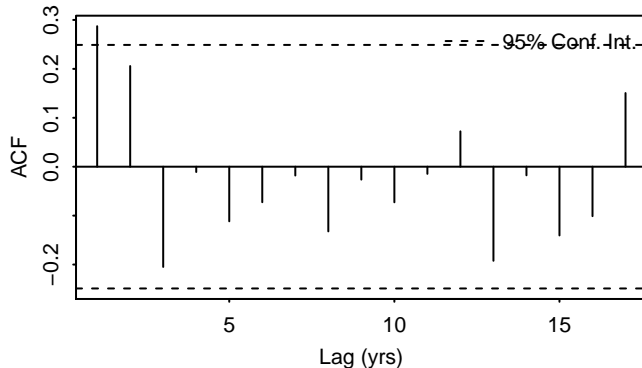
d) Tukey–Anscombe plot



e) Normal Q–Q plot

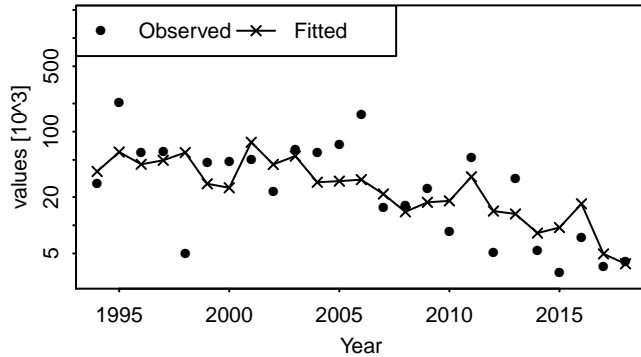


f) Autocorrelation of Residuals

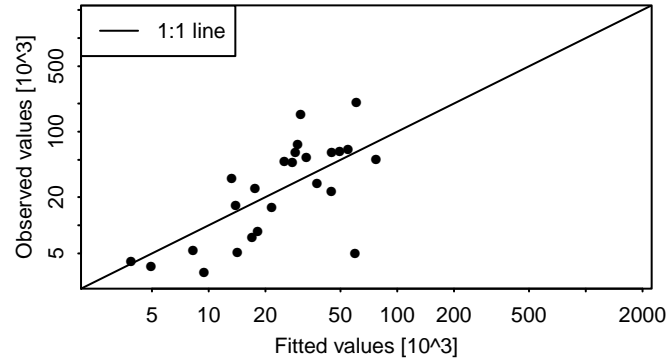


# Herring in Vla (combined) and VIIbc Diagnostics – IBTS\_Q1, age 2

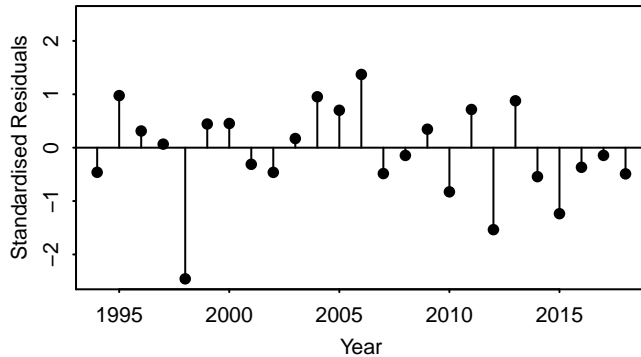
a) Observed and fitted values time series



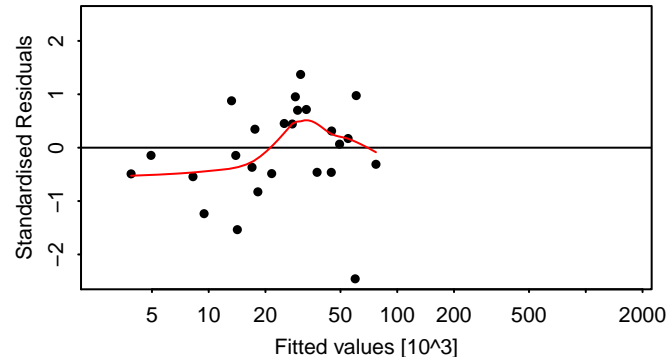
b) Observed vs fitted values



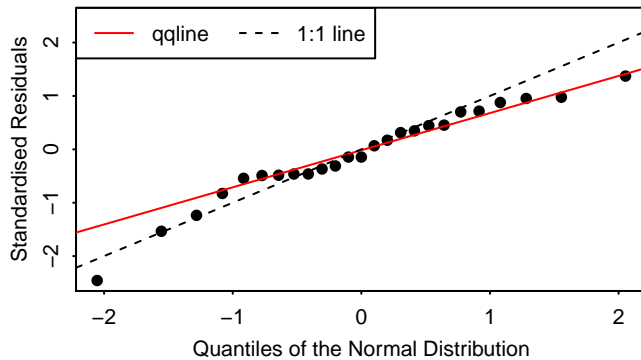
c) Standardised residuals over time



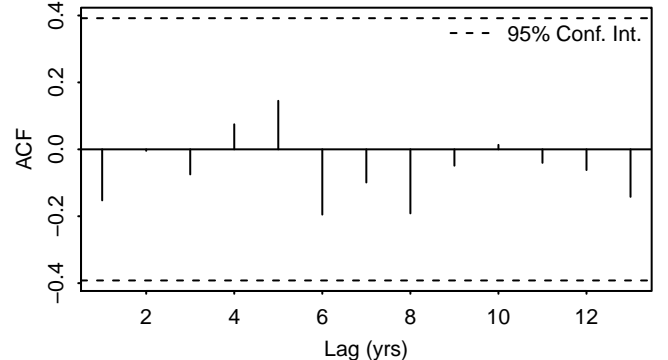
d) Tukey–Anscombe plot



e) Normal Q–Q plot

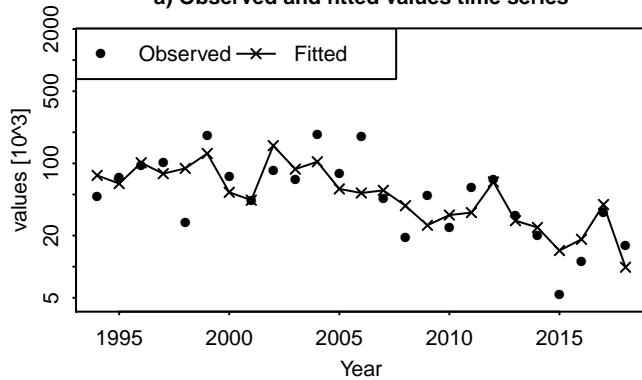


f) Autocorrelation of Residuals

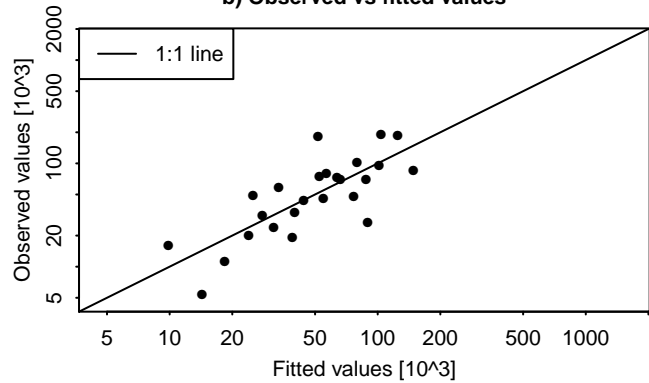


# Herring in Vla (combined) and VIIbc Diagnostics – IBTS\_Q1, age 3

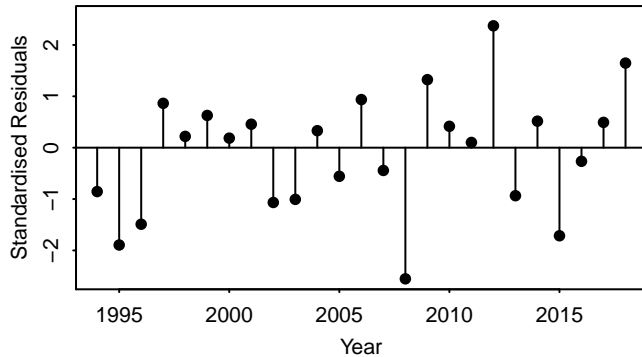
a) Observed and fitted values time series



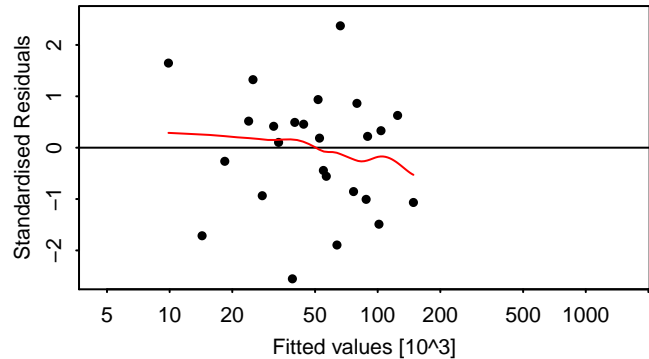
b) Observed vs fitted values



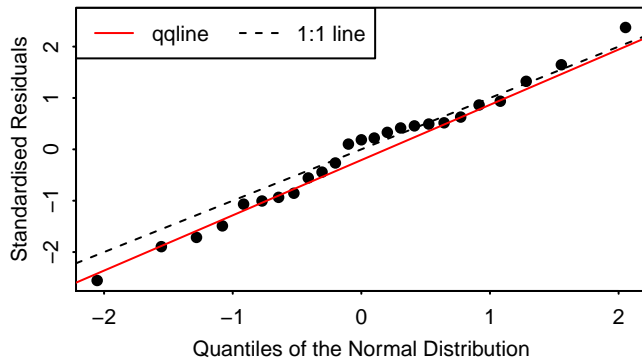
c) Standardised residuals over time



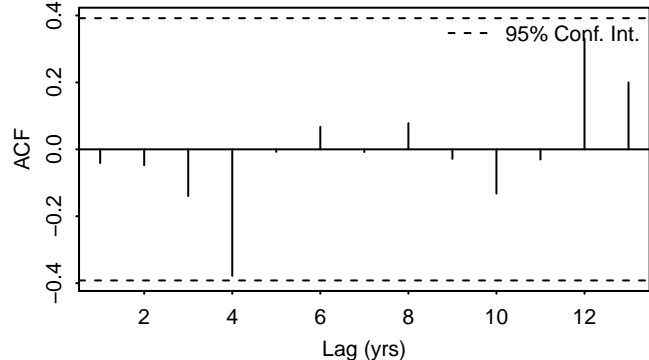
d) Tukey–Anscombe plot



e) Normal Q–Q plot

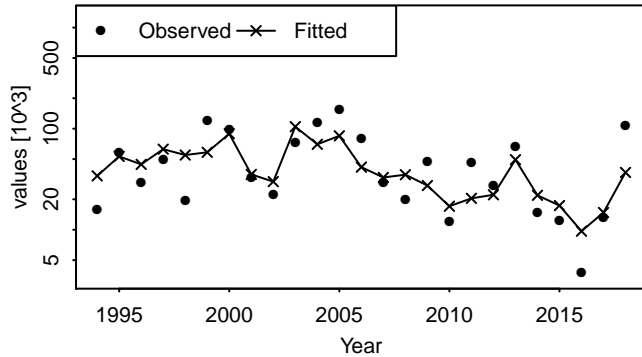


f) Autocorrelation of Residuals

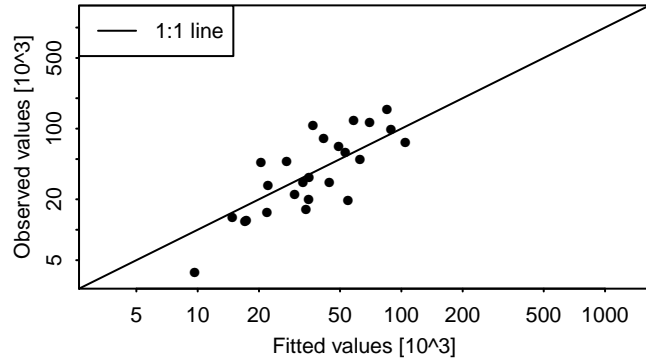


# Herring in Vla (combined) and VIIbc Diagnostics – IBTS\_Q1, age 4

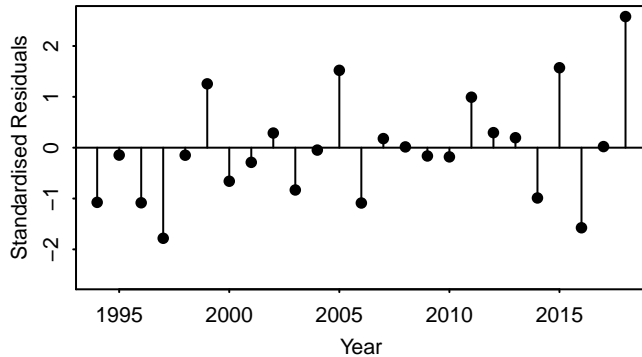
a) Observed and fitted values time series



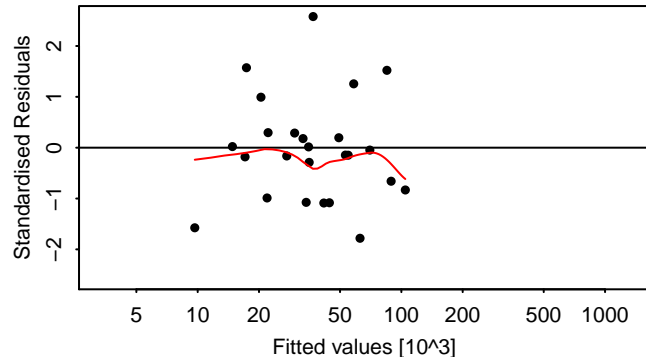
b) Observed vs fitted values



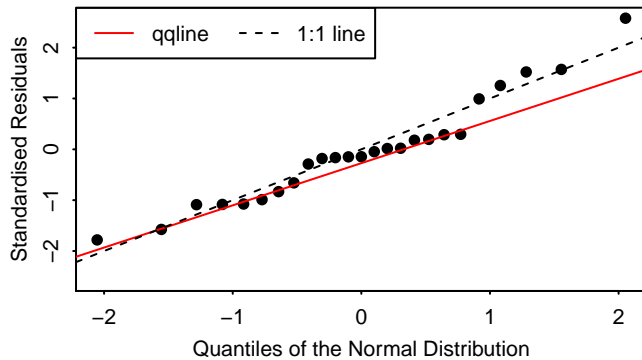
c) Standardised residuals over time



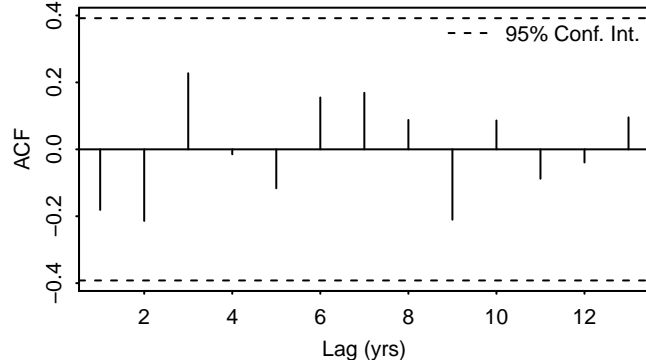
d) Tukey–Anscombe plot



e) Normal Q–Q plot

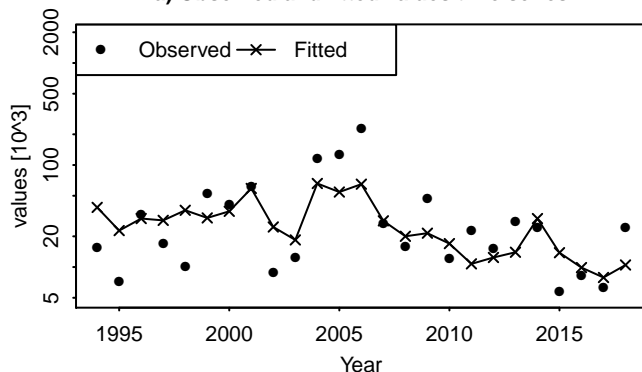


f) Autocorrelation of Residuals

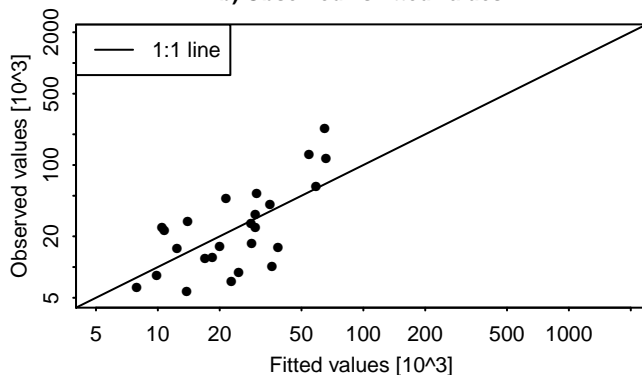


# Herring in Vla (combined) and VIIbc Diagnostics – IBTS\_Q1, age 5

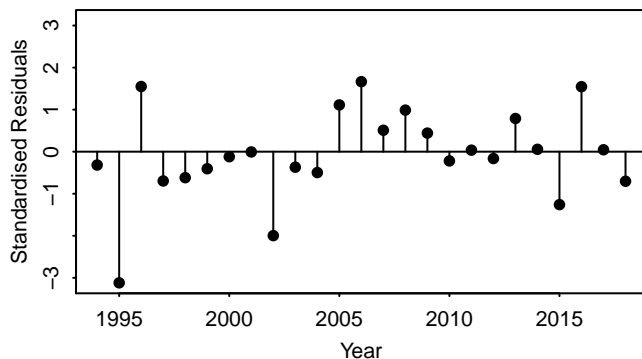
a) Observed and fitted values time series



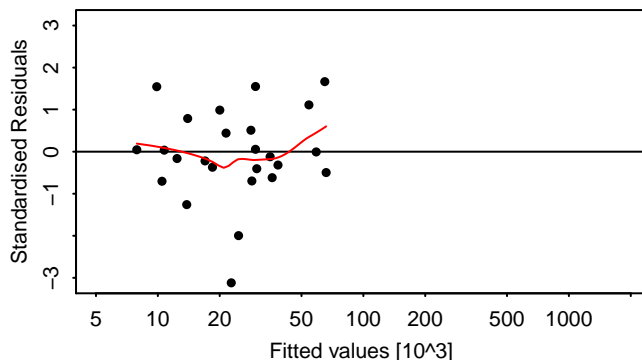
b) Observed vs fitted values



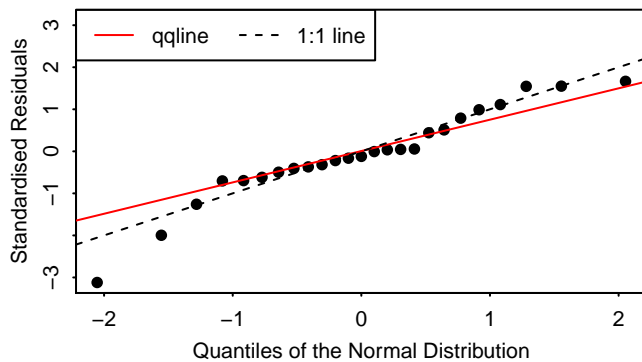
c) Standardised residuals over time



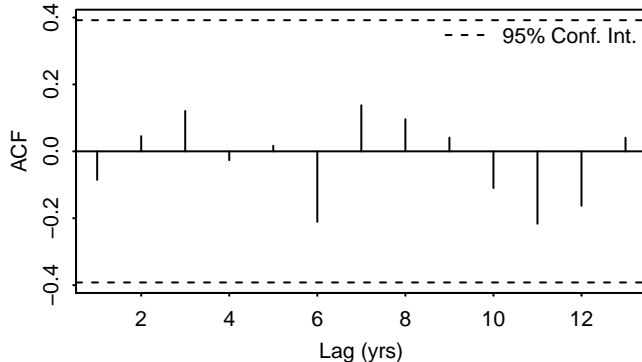
d) Tukey–Anscombe plot



e) Normal Q–Q plot

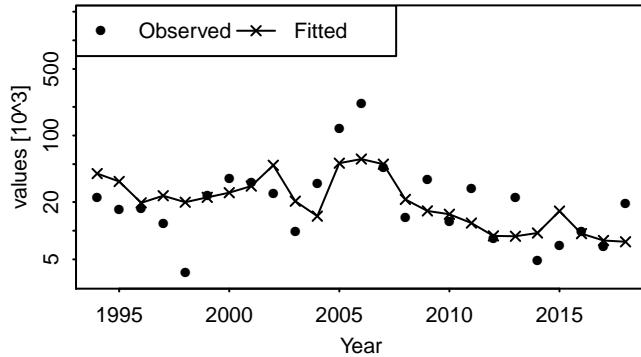


f) Autocorrelation of Residuals

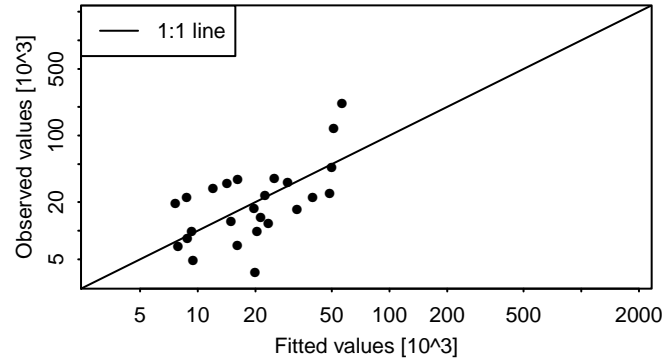


# Herring in Vla (combined) and VIIbc Diagnostics – IBTS\_Q1, age 6

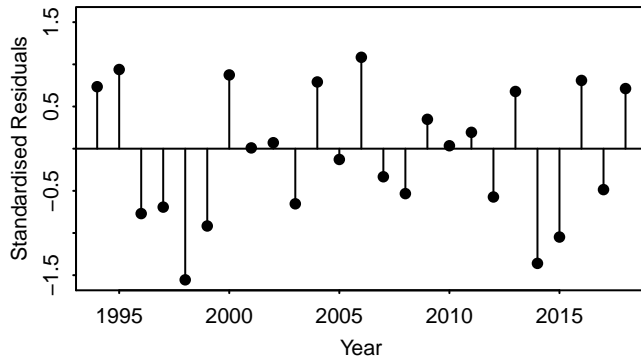
a) Observed and fitted values time series



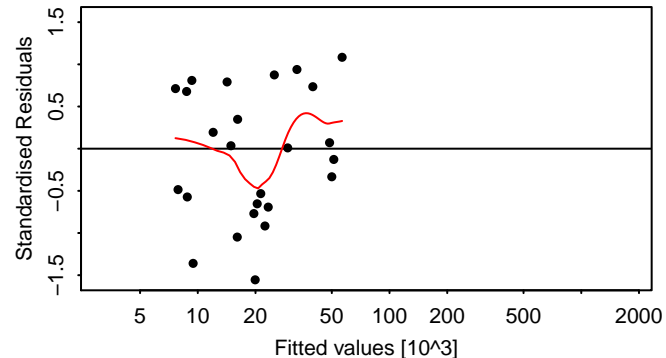
b) Observed vs fitted values



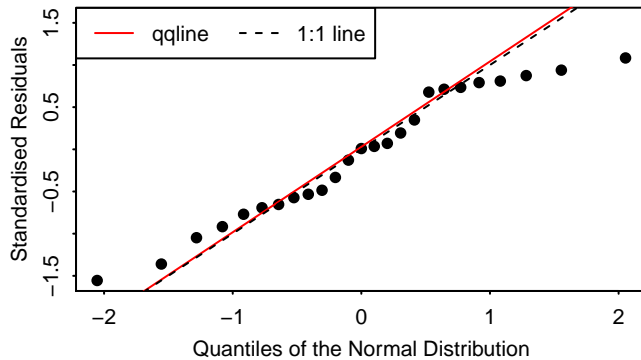
c) Standardised residuals over time



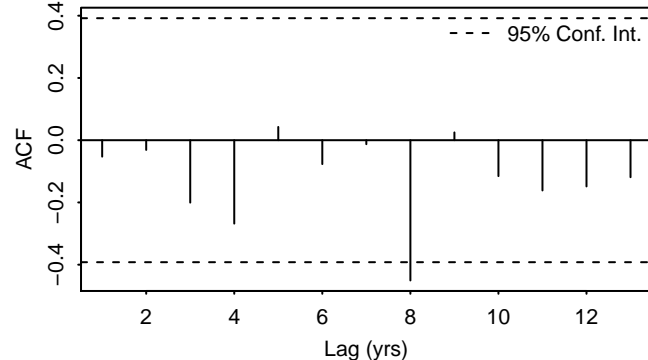
d) Tukey–Anscombe plot



e) Normal Q–Q plot

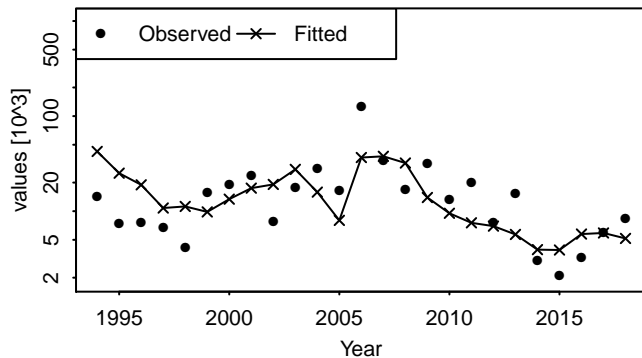


f) Autocorrelation of Residuals

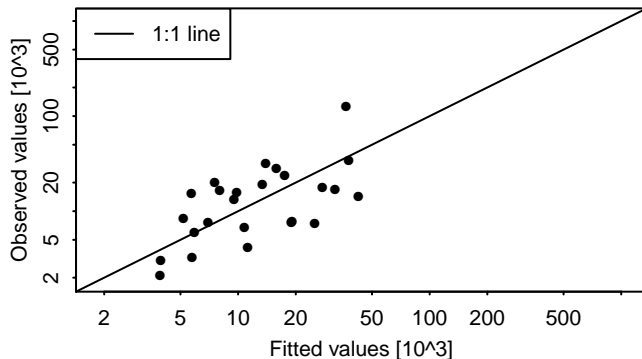


# Herring in Vla (combined) and VIIbc Diagnostics – IBTS\_Q1, age 7

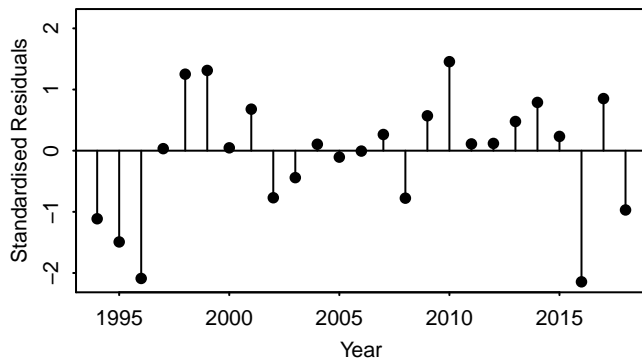
a) Observed and fitted values time series



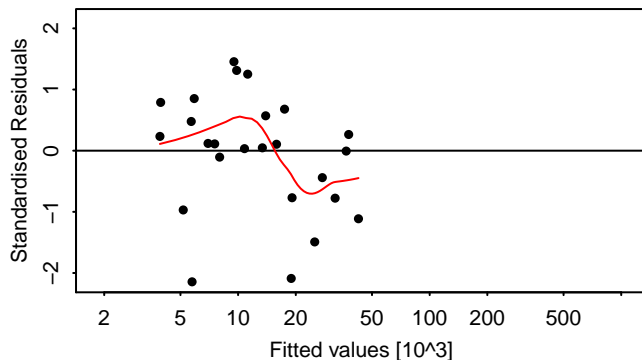
b) Observed vs fitted values



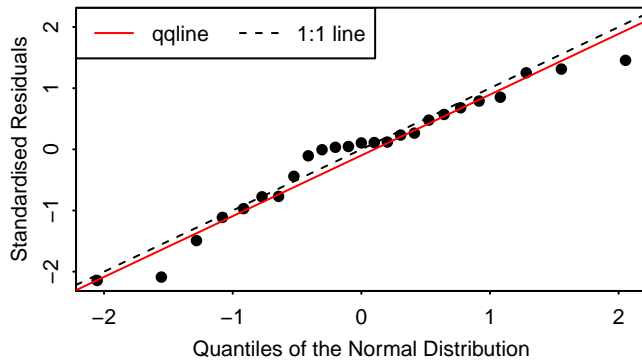
c) Standardised residuals over time



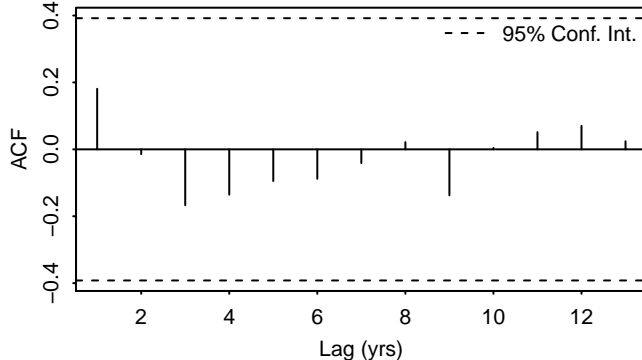
d) Tukey–Anscombe plot



e) Normal Q–Q plot

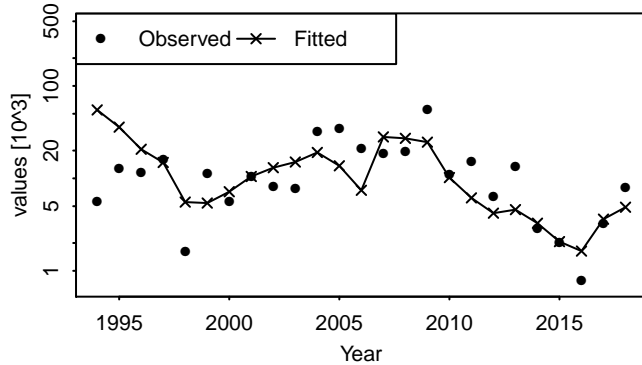


f) Autocorrelation of Residuals

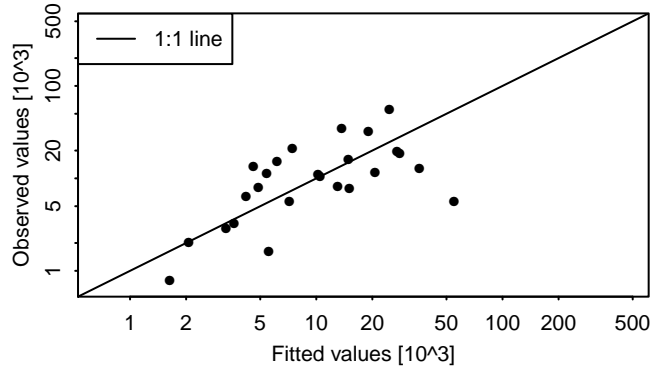


# Herring in Vla (combined) and VIIbc Diagnostics – IBTS\_Q1, age 8

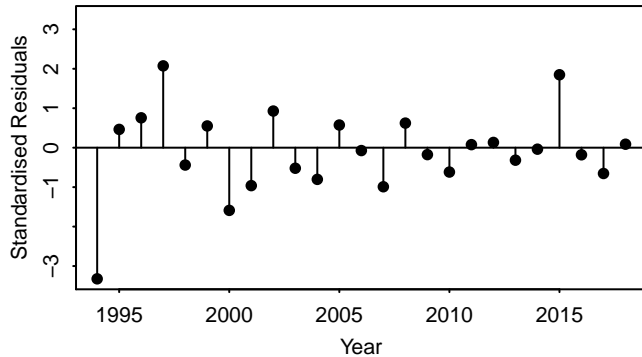
a) Observed and fitted values time series



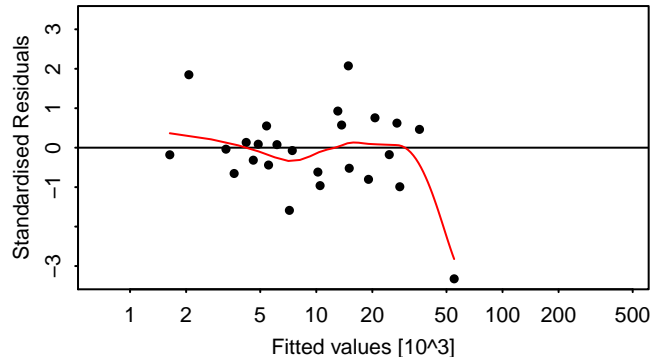
b) Observed vs fitted values



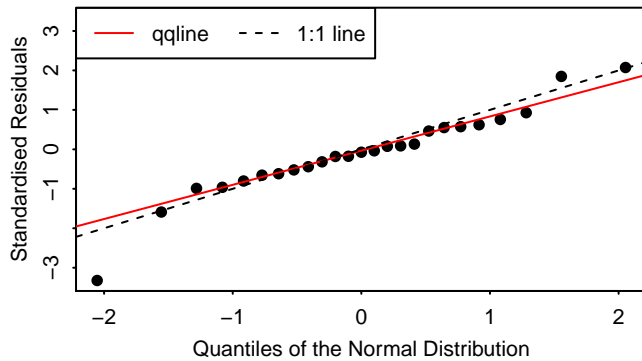
c) Standardised residuals over time



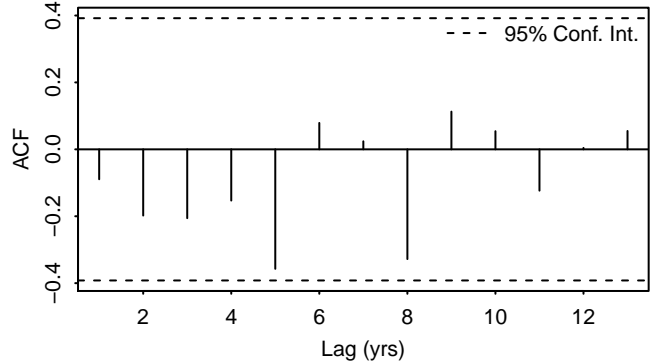
d) Tukey–Anscombe plot



e) Normal Q–Q plot



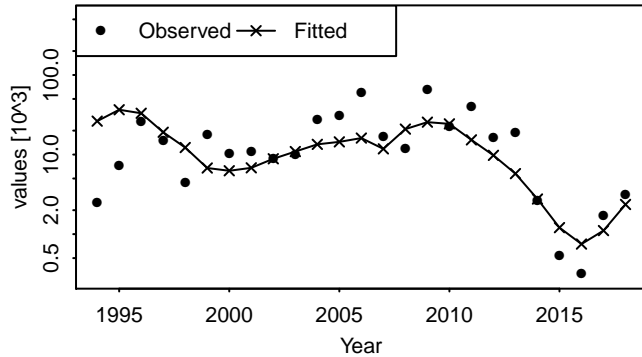
f) Autocorrelation of Residuals



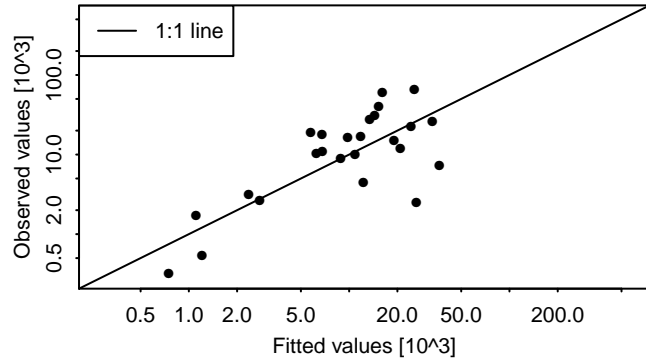


# Herring in Vla (combined) and VIIbc Diagnostics – IBTS\_Q1, age 9

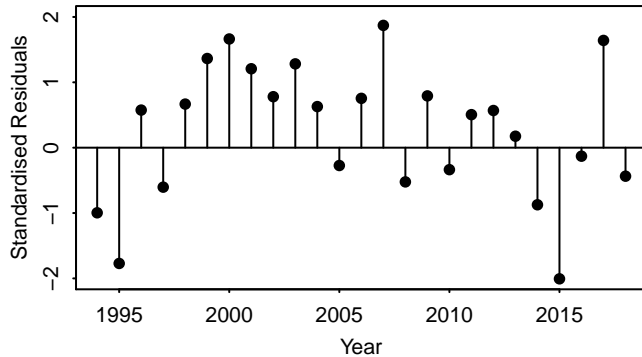
a) Observed and fitted values time series



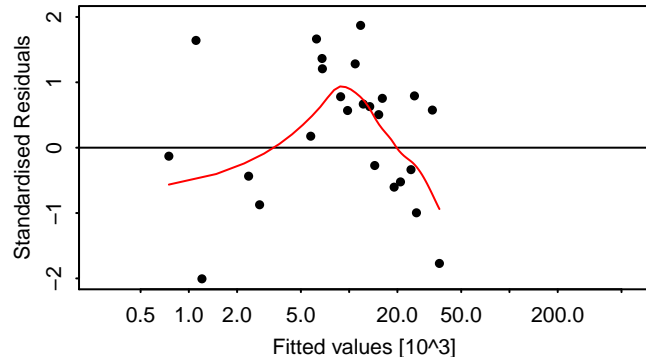
b) Observed vs fitted values



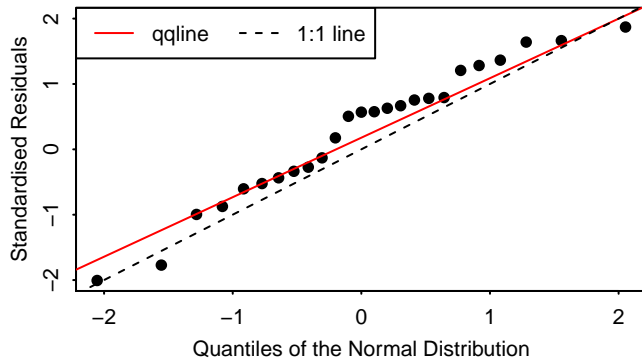
c) Standardised residuals over time



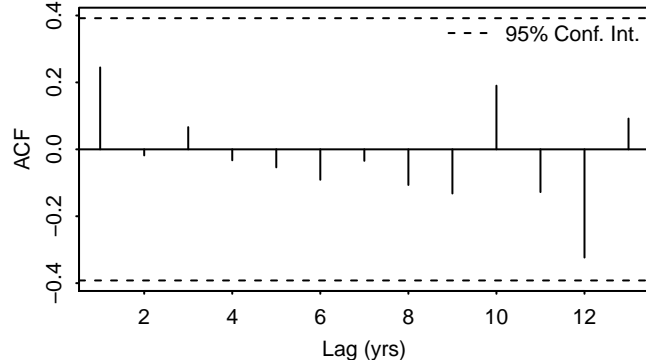
d) Tukey–Anscombe plot



e) Normal Q–Q plot

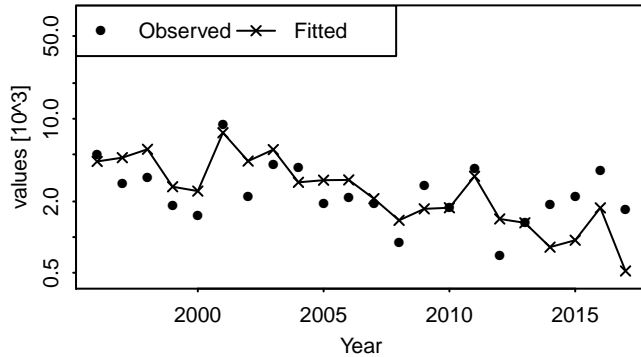


f) Autocorrelation of Residuals

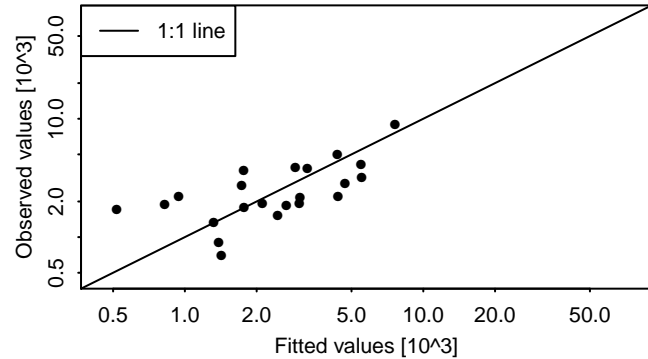


# Herring in Vla (combined) and VIIbc Diagnostics – IBTS\_Q4, age 2

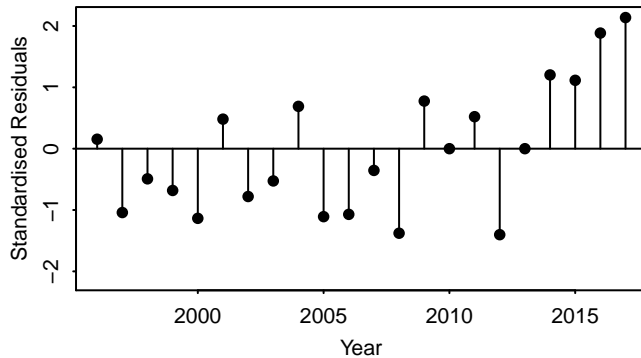
a) Observed and fitted values time series



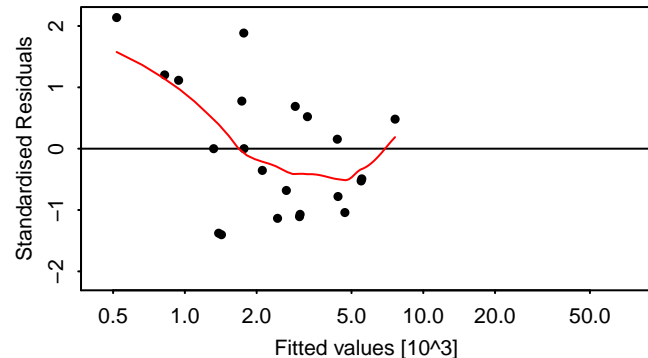
b) Observed vs fitted values



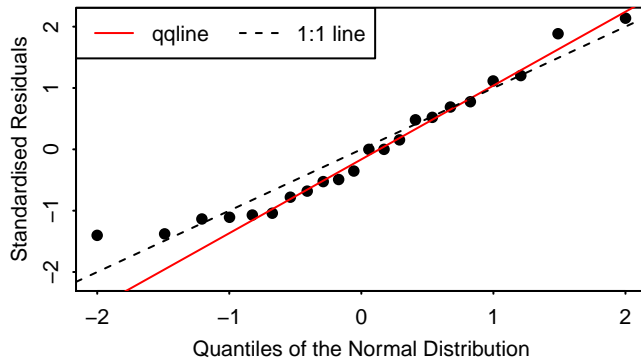
c) Standardised residuals over time



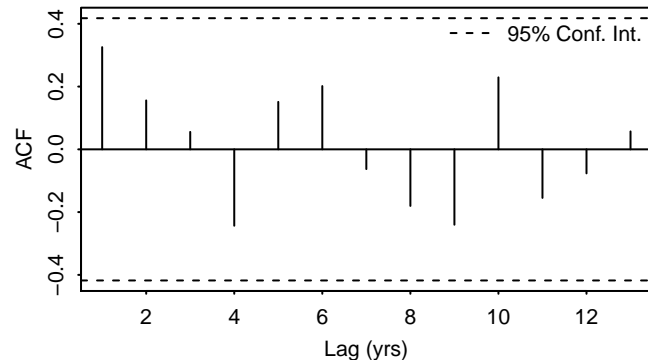
d) Tukey–Anscombe plot



e) Normal Q–Q plot

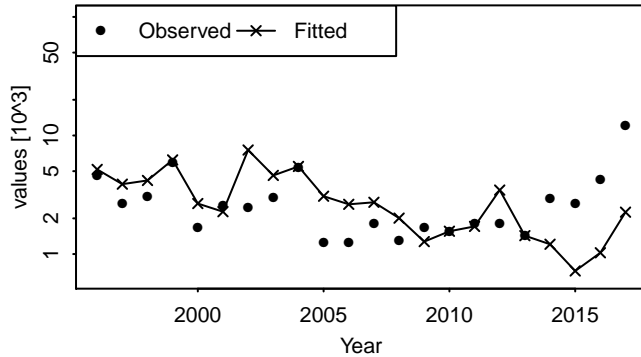


f) Autocorrelation of Residuals

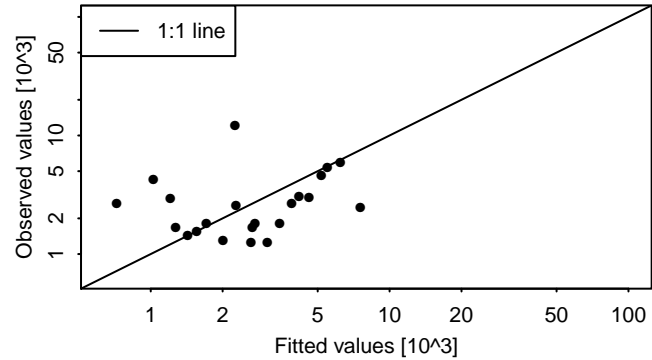


# Herring in Vla (combined) and VIIbc Diagnostics – IBTS\_Q4, age 3

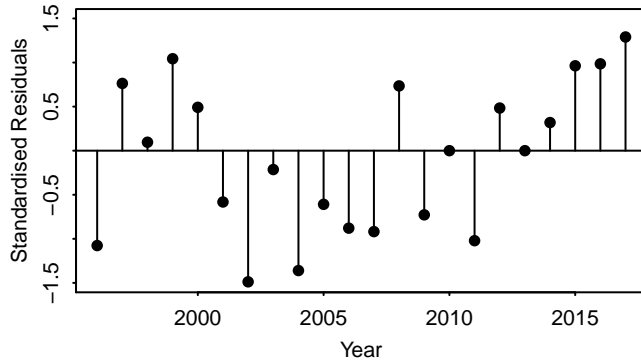
a) Observed and fitted values time series



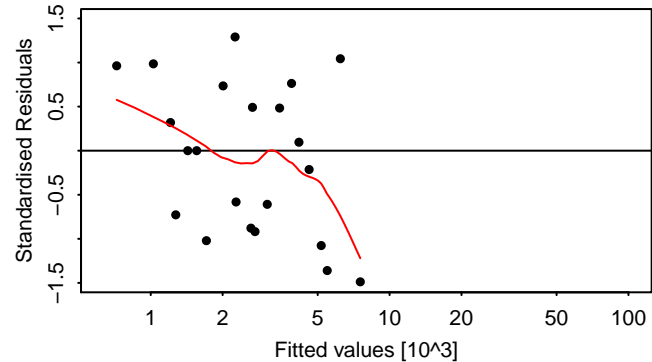
b) Observed vs fitted values



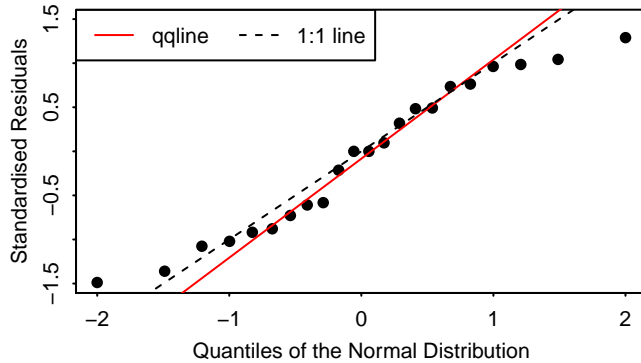
c) Standardised residuals over time



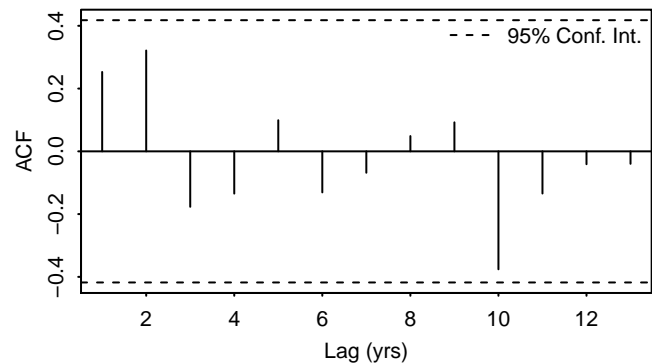
d) Tukey–Anscombe plot



e) Normal Q–Q plot

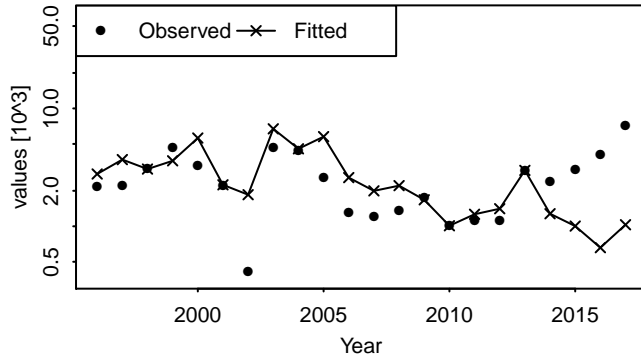


f) Autocorrelation of Residuals

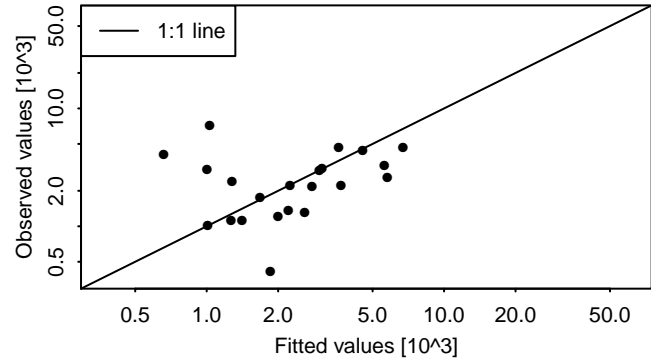


# Herring in Vla (combined) and VIIbc Diagnostics – IBTS\_Q4, age 4

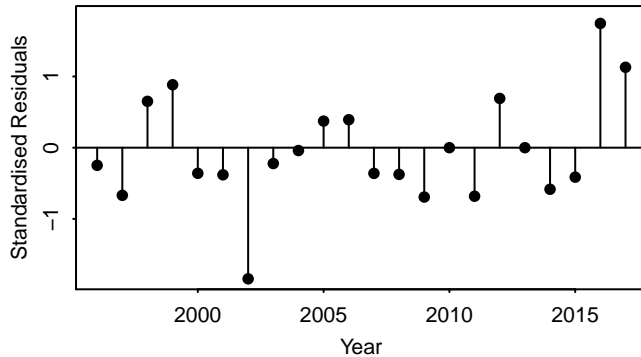
a) Observed and fitted values time series



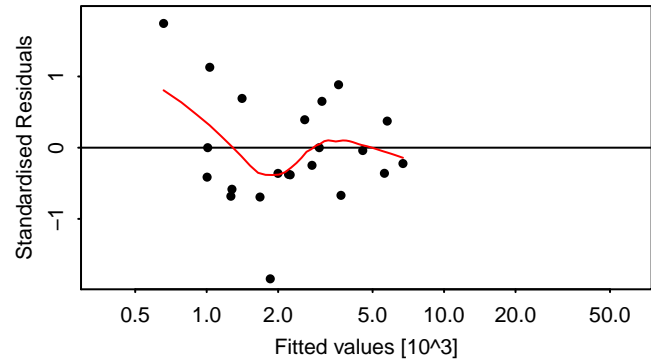
b) Observed vs fitted values



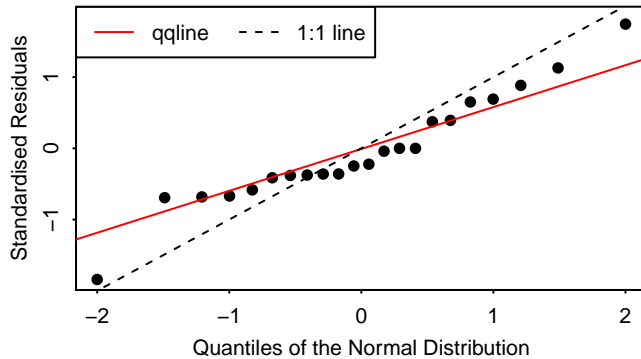
c) Standardised residuals over time



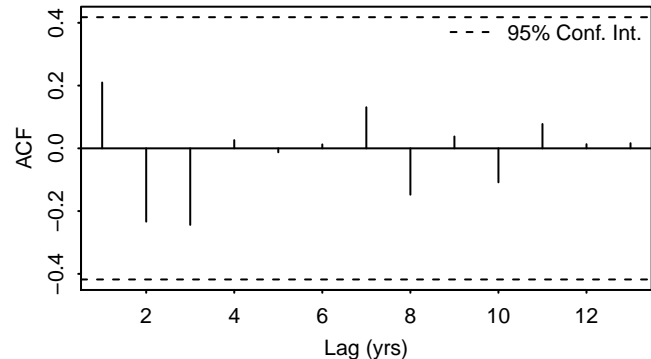
d) Tukey–Anscombe plot



e) Normal Q–Q plot

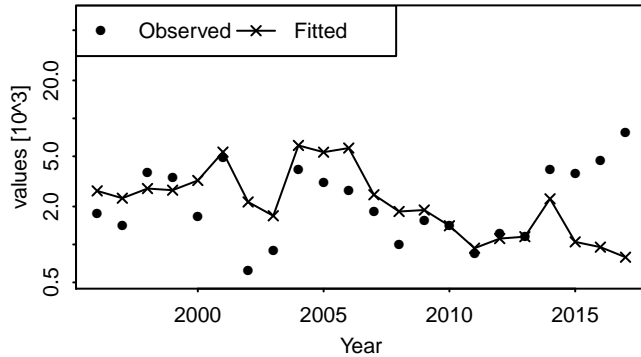


f) Autocorrelation of Residuals

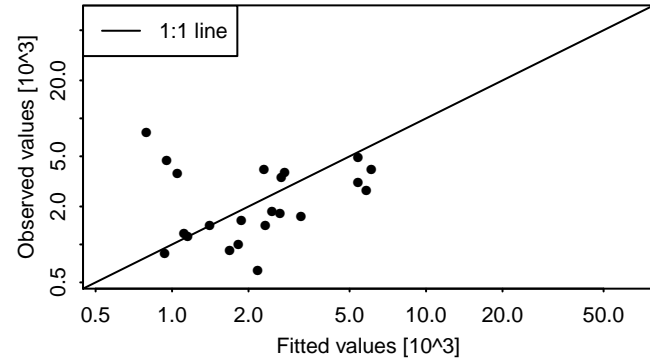


# Herring in Vla (combined) and VIIbc Diagnostics – IBTS\_Q4, age 5

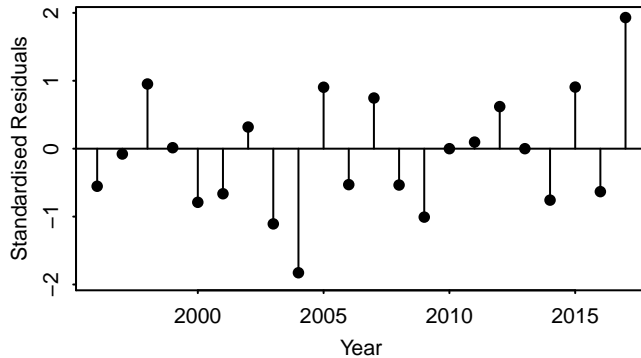
a) Observed and fitted values time series



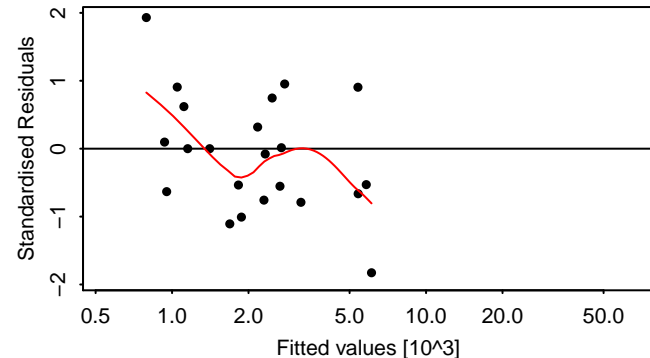
b) Observed vs fitted values



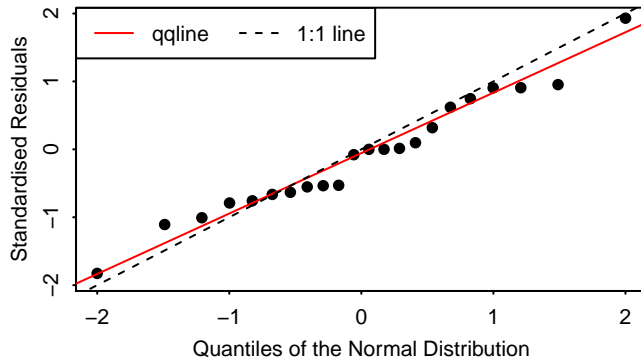
c) Standardised residuals over time



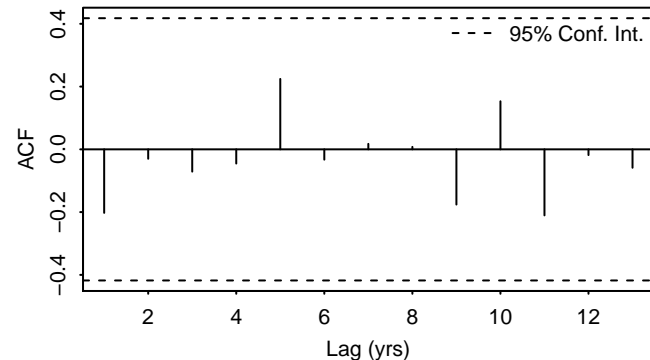
d) Tukey–Anscombe plot



e) Normal Q–Q plot

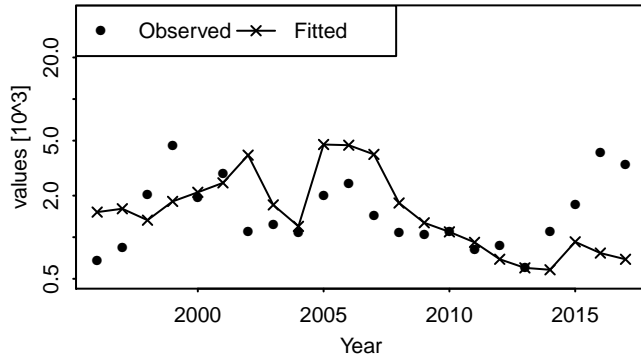


f) Autocorrelation of Residuals

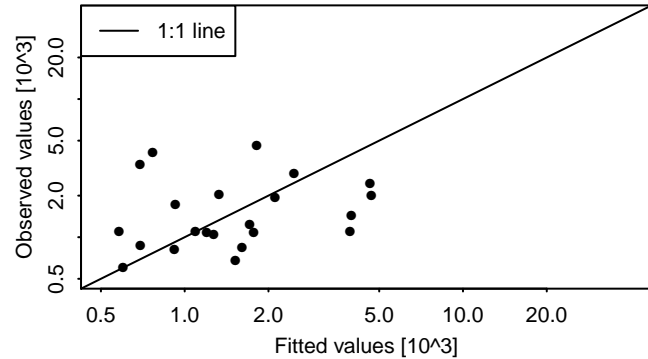


# Herring in Vla (combined) and VIIbc Diagnostics – IBTS\_Q4, age 6

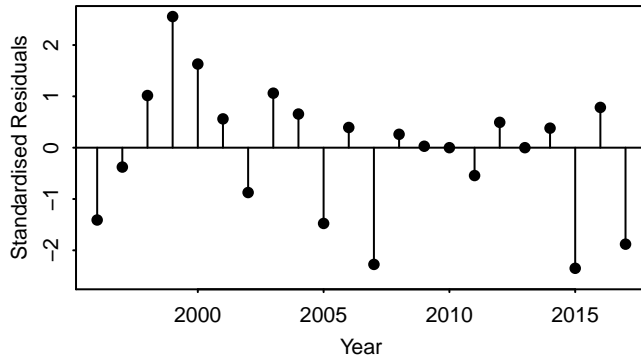
a) Observed and fitted values time series



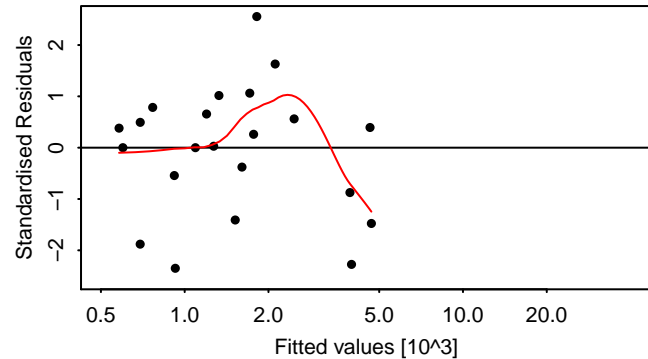
b) Observed vs fitted values



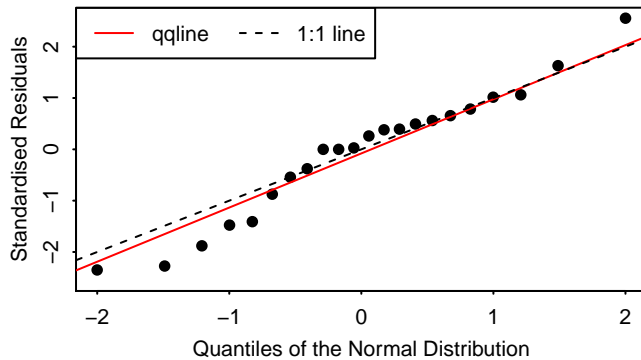
c) Standardised residuals over time



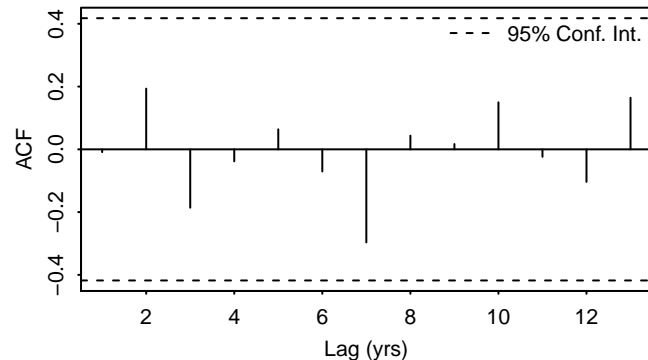
d) Tukey–Anscombe plot



e) Normal Q–Q plot

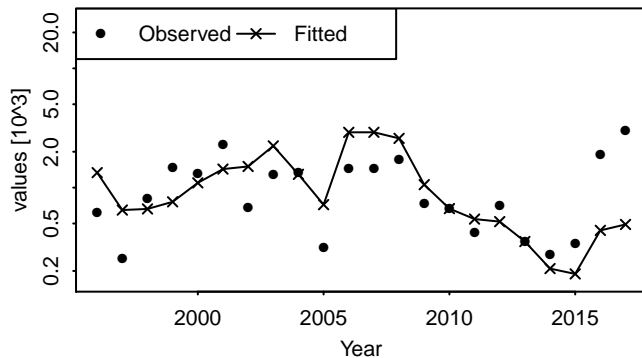


f) Autocorrelation of Residuals

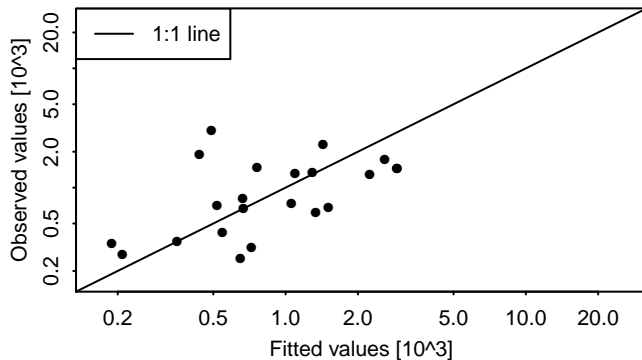


# Herring in Vla (combined) and VIIbc Diagnostics – IBTS\_Q4, age 7

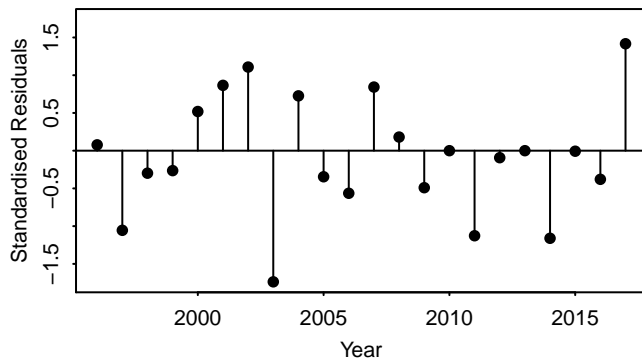
a) Observed and fitted values time series



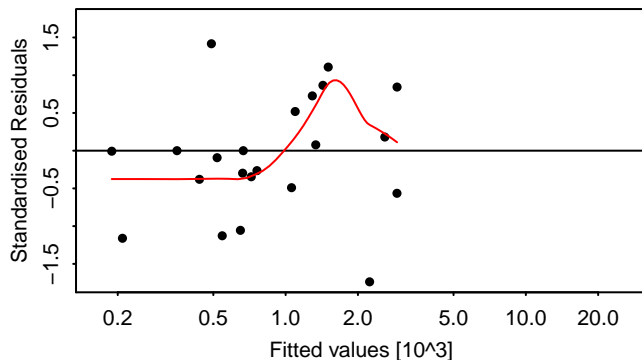
b) Observed vs fitted values



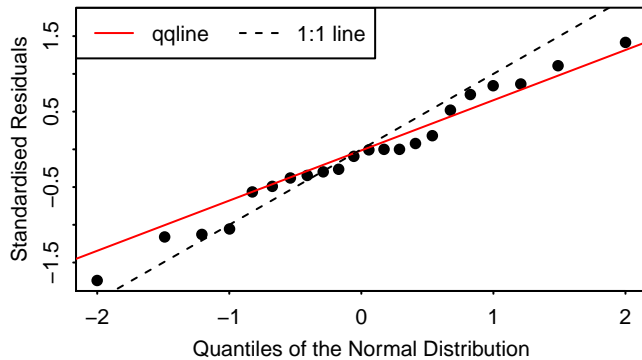
c) Standardised residuals over time



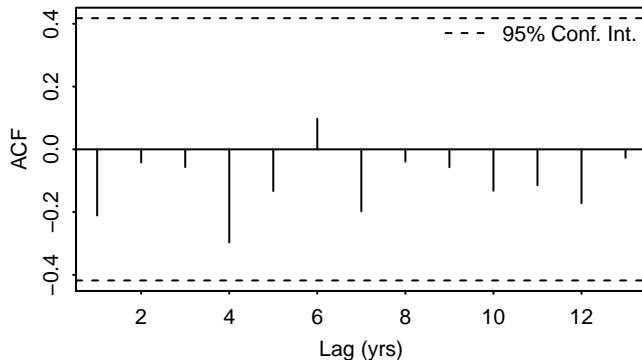
d) Tukey–Anscombe plot



e) Normal Q–Q plot

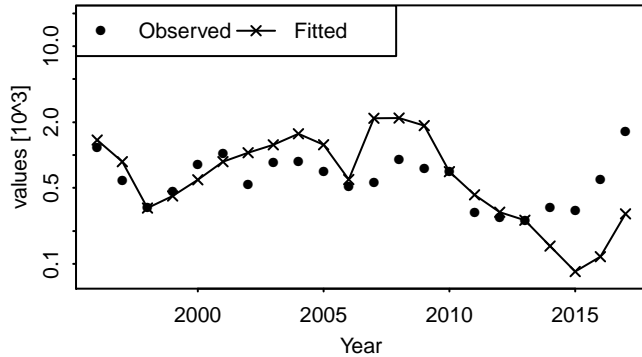


f) Autocorrelation of Residuals

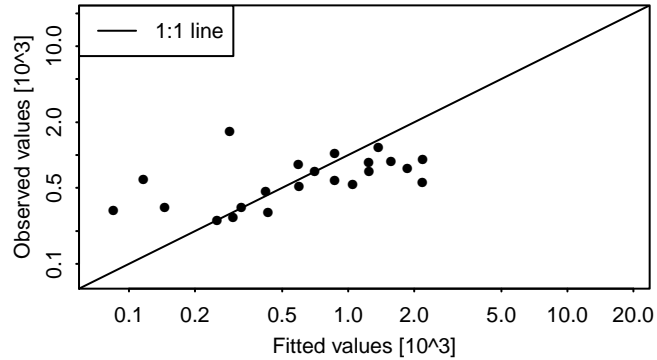


# Herring in Vla (combined) and VIIbc Diagnostics – IBTS\_Q4, age 8

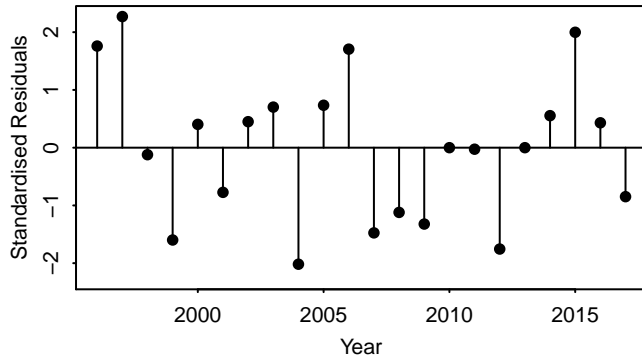
a) Observed and fitted values time series



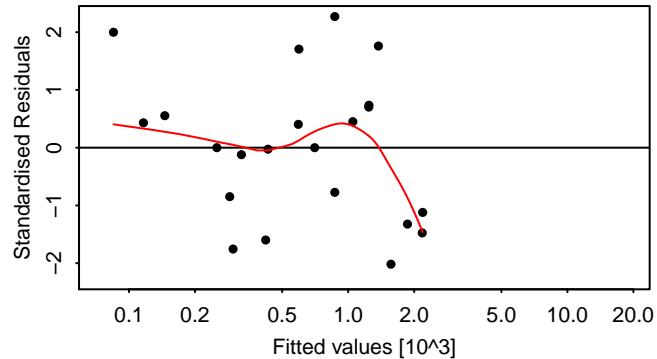
b) Observed vs fitted values



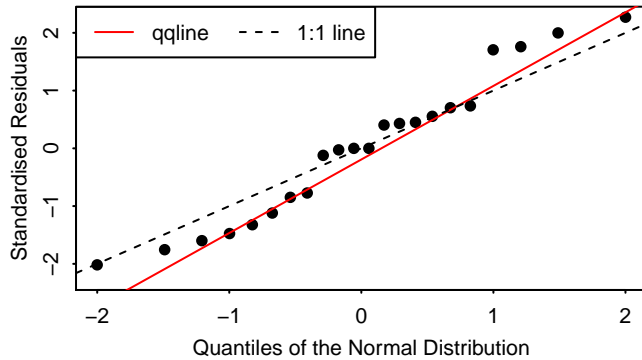
c) Standardised residuals over time



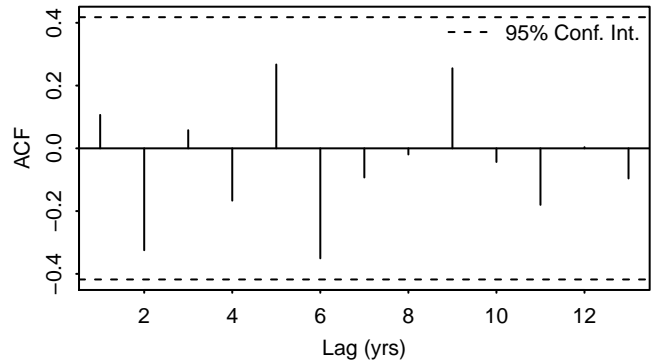
d) Tukey–Anscombe plot



e) Normal Q–Q plot



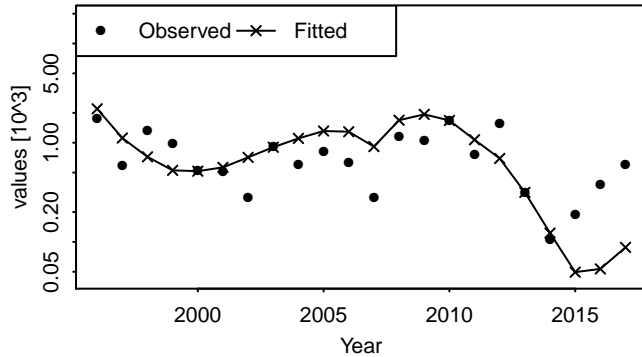
f) Autocorrelation of Residuals



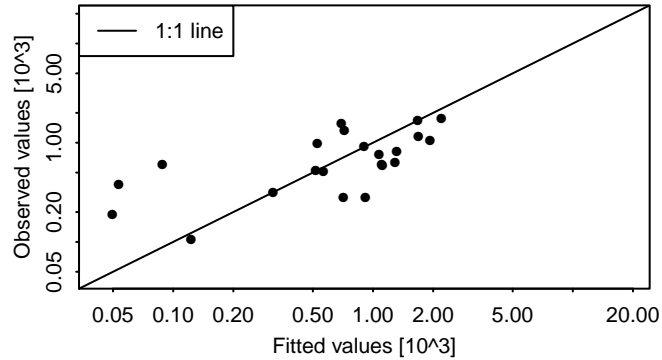


# Herring in Vla (combined) and VIIbc Diagnostics – IBTS\_Q4, age 9

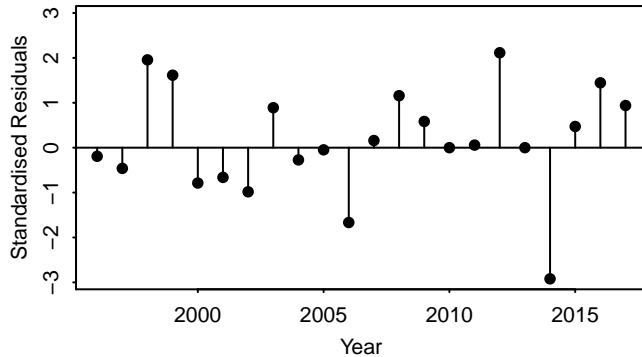
a) Observed and fitted values time series



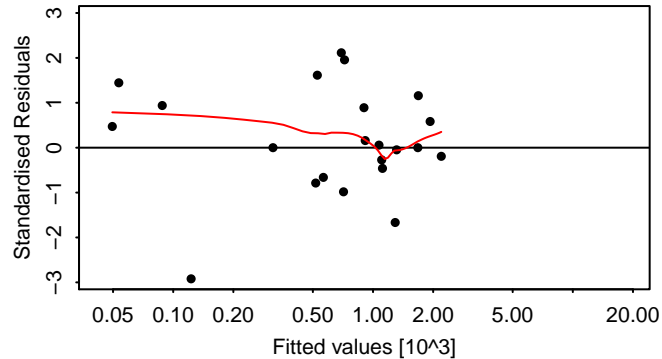
b) Observed vs fitted values



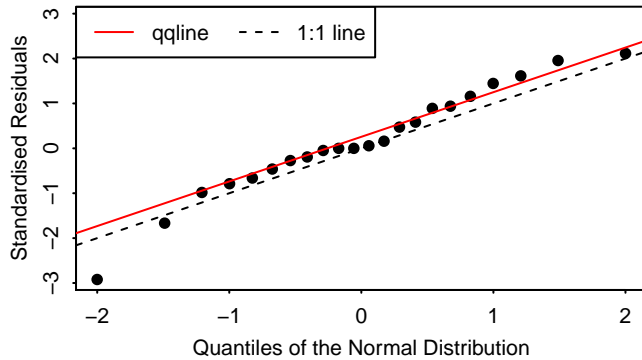
c) Standardised residuals over time



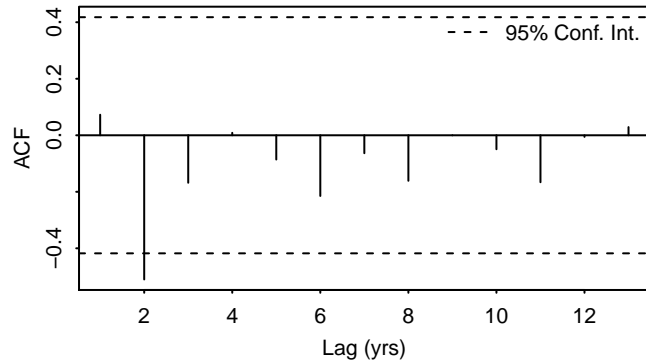
d) Tukey–Anscombe plot



e) Normal Q–Q plot

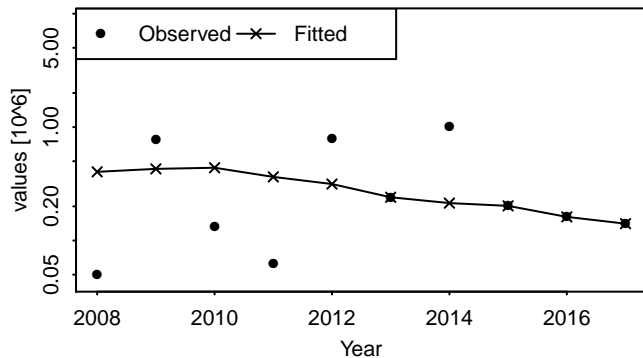


f) Autocorrelation of Residuals

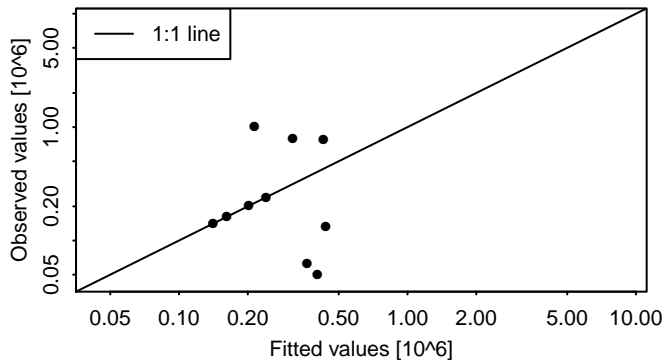


# Herring in Vla (combined) and VIIbc Diagnostics – MS HERAS, age 1

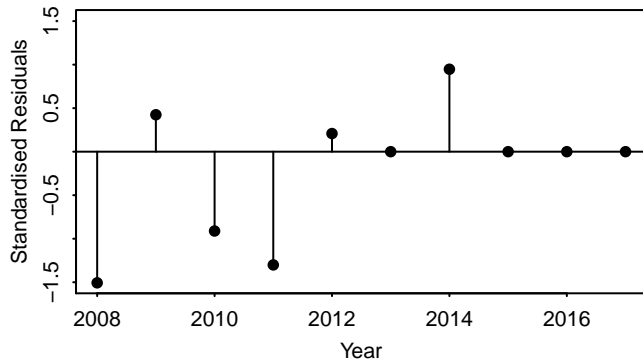
a) Observed and fitted values time series



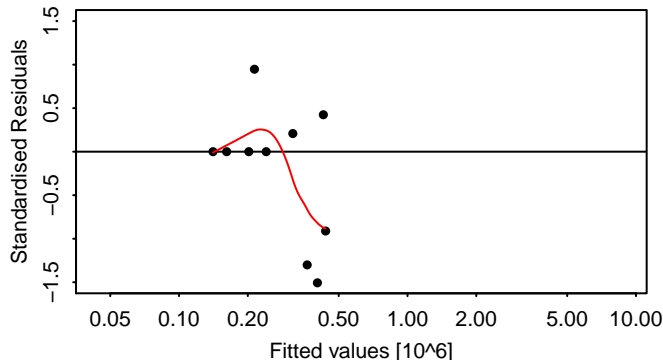
b) Observed vs fitted values



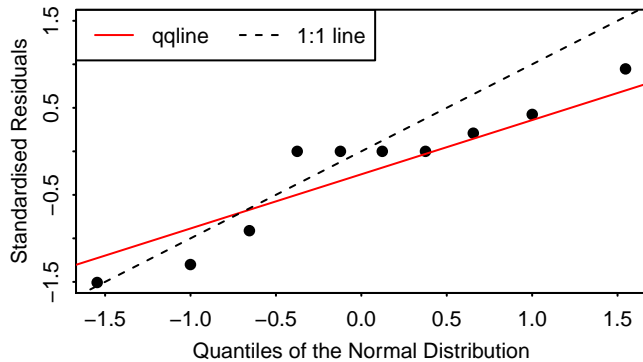
c) Standardised residuals over time



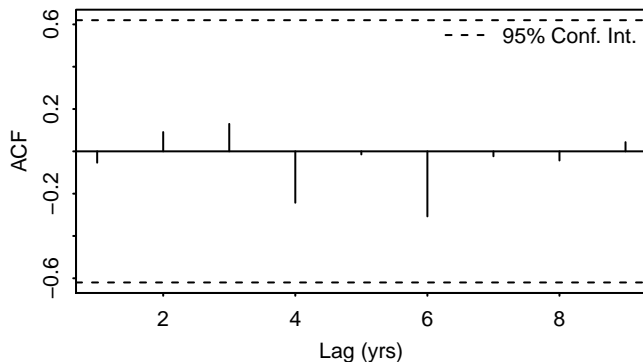
d) Tukey–Anscombe plot



e) Normal Q–Q plot

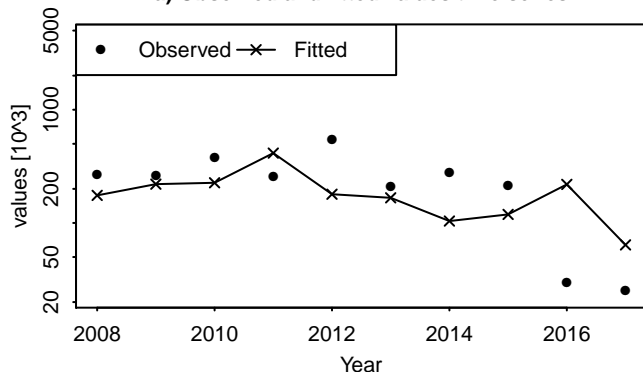


f) Autocorrelation of Residuals

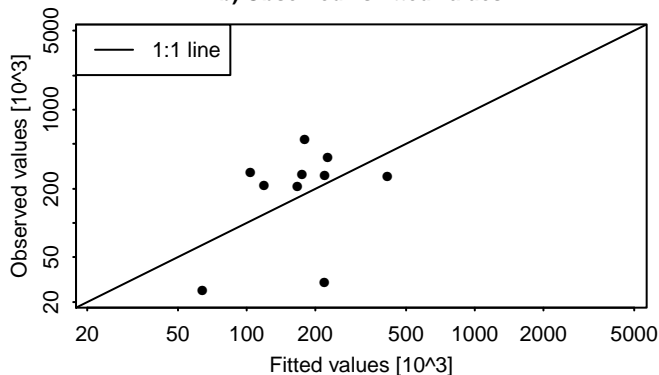


# Herring in Vla (combined) and VIIbc Diagnostics – MS HERAS, age 2

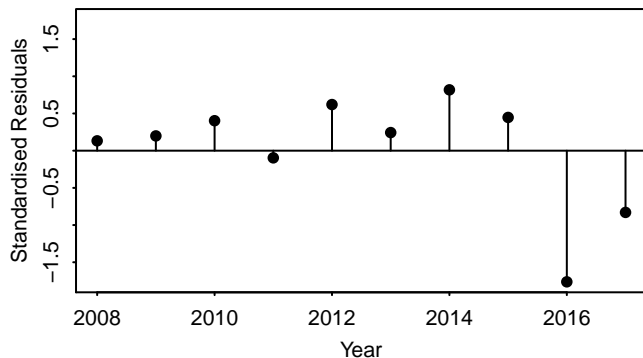
a) Observed and fitted values time series



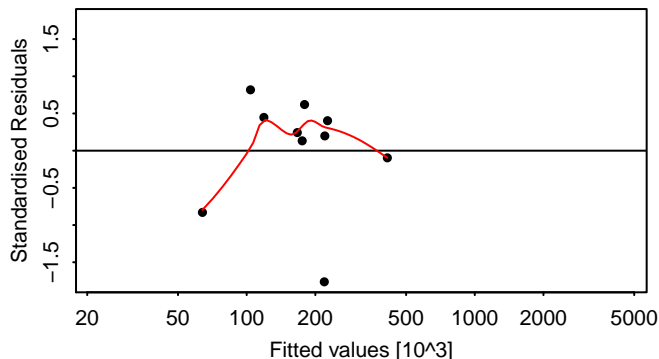
b) Observed vs fitted values



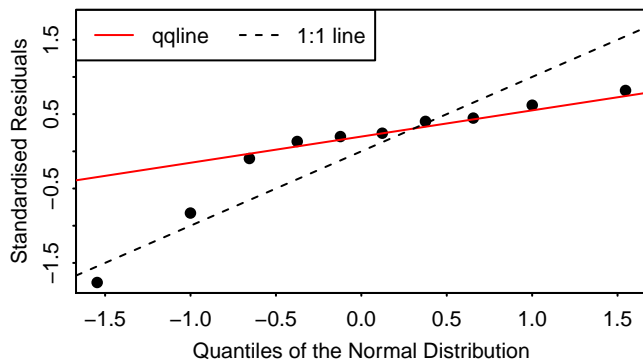
c) Standardised residuals over time



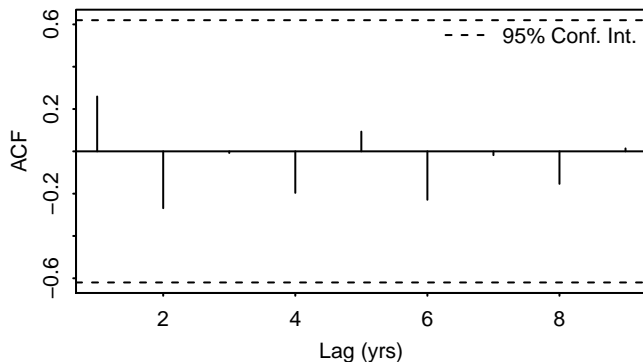
d) Tukey–Anscombe plot



e) Normal Q–Q plot

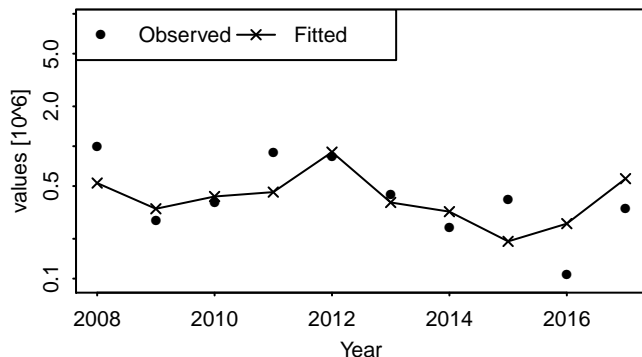


f) Autocorrelation of Residuals

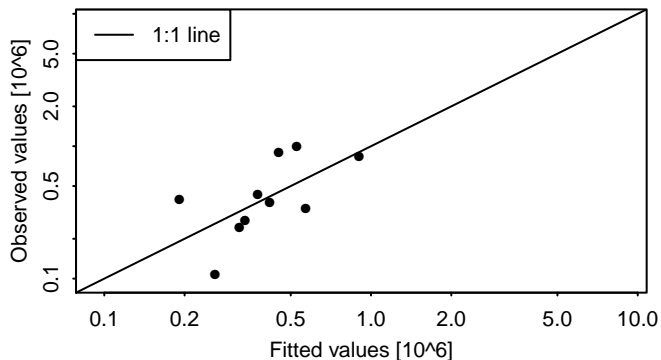


# Herring in V1a (combined) and VIIbc Diagnostics – MS HERAS, age 3

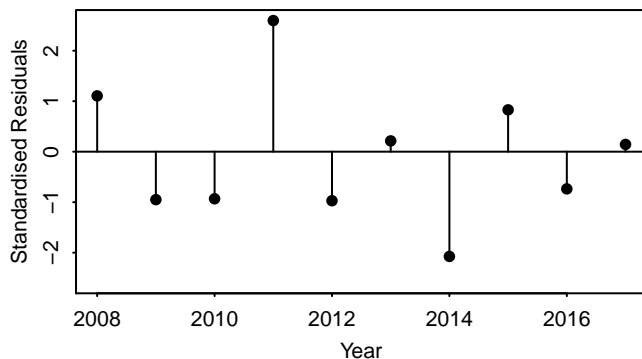
a) Observed and fitted values time series



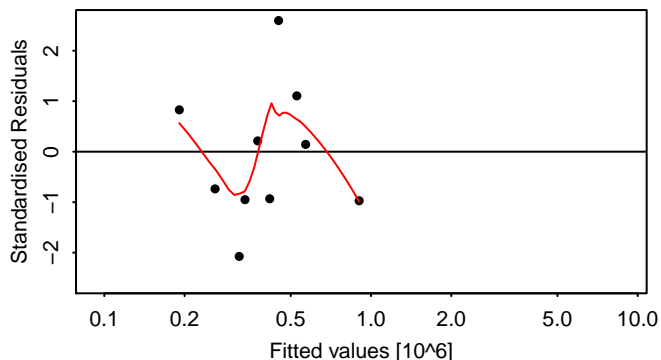
b) Observed vs fitted values



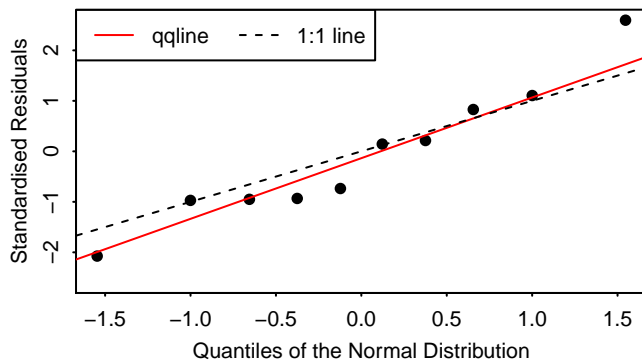
c) Standardised residuals over time



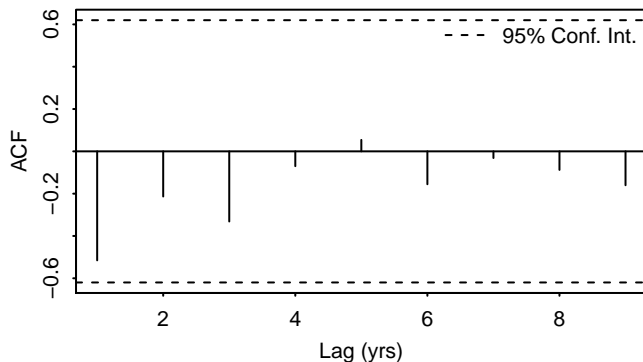
d) Tukey–Anscombe plot



e) Normal Q–Q plot

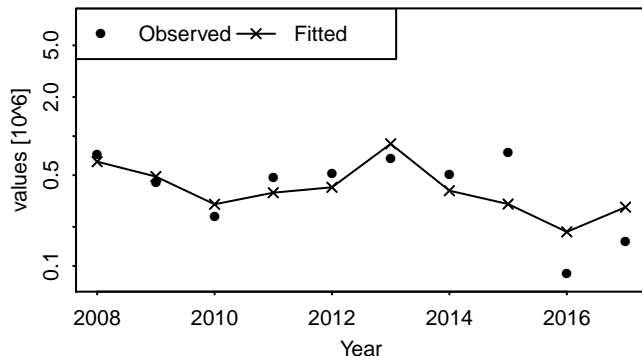


f) Autocorrelation of Residuals

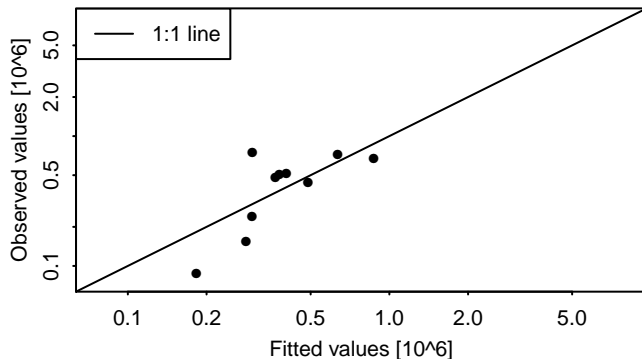


# Herring in Vla (combined) and VIIbc Diagnostics – MS HERAS, age 4

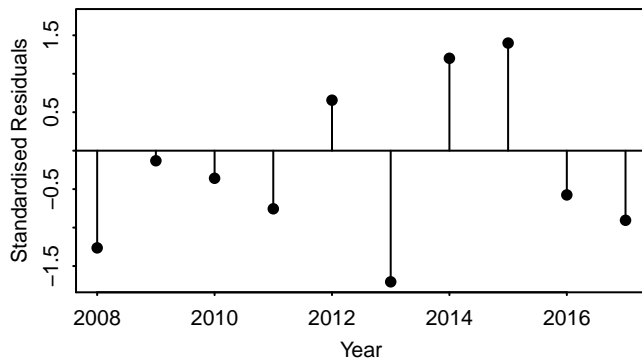
a) Observed and fitted values time series



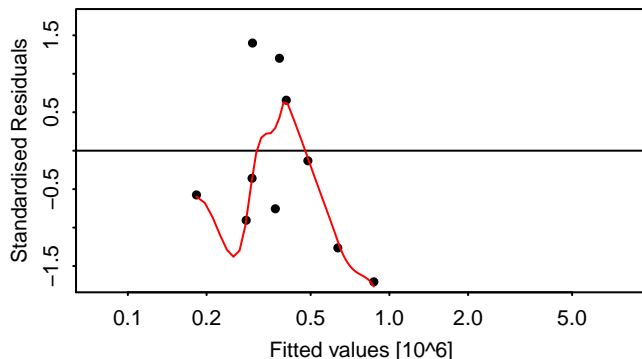
b) Observed vs fitted values



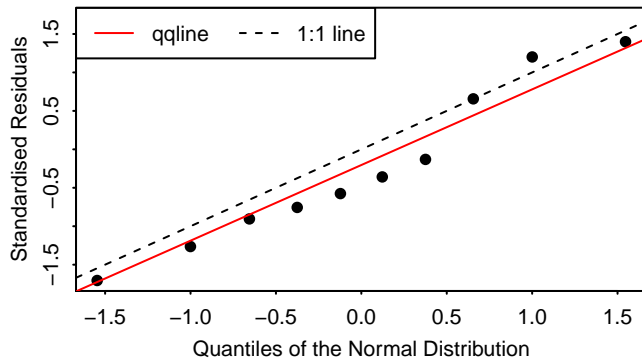
c) Standardised residuals over time



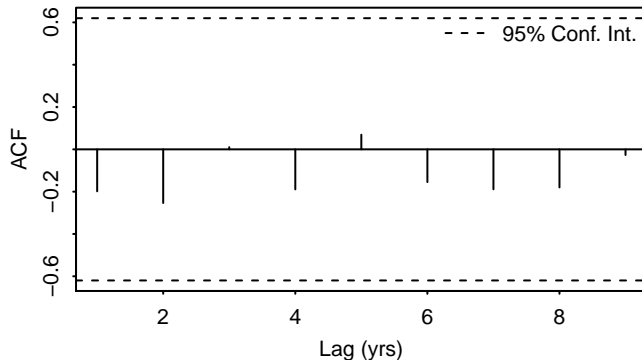
d) Tukey–Anscombe plot



e) Normal Q–Q plot

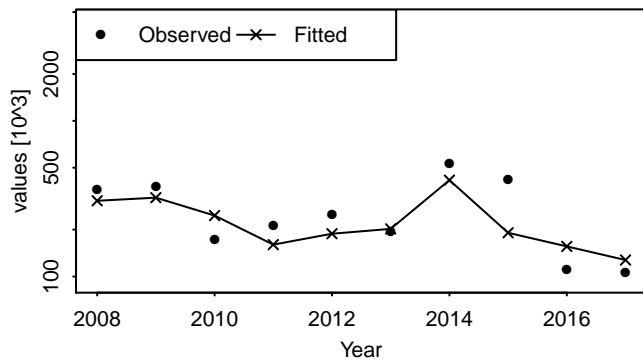


f) Autocorrelation of Residuals

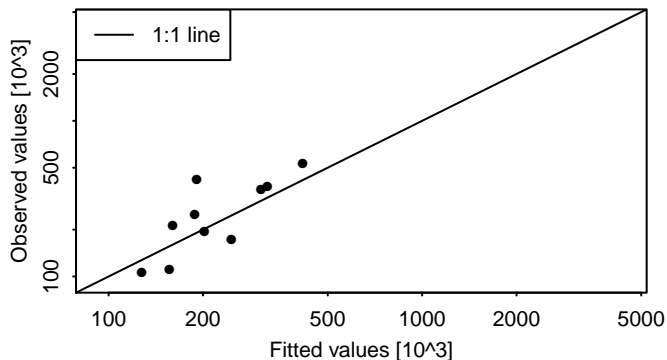


# Herring in Vla (combined) and VIIbc Diagnostics – MS HERAS, age 5

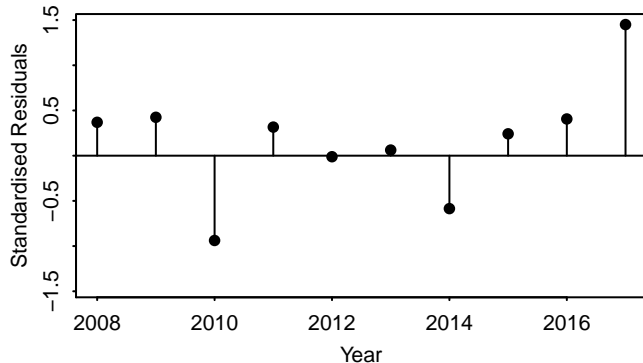
a) Observed and fitted values time series



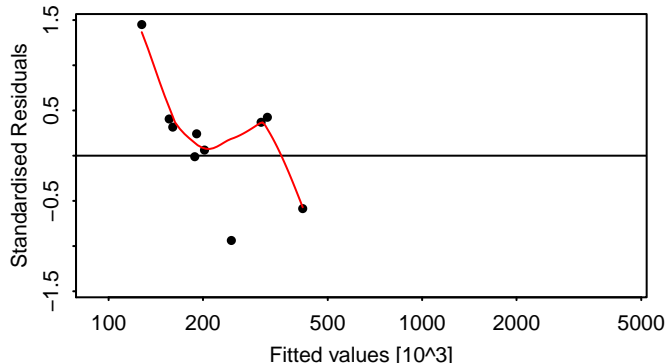
b) Observed vs fitted values



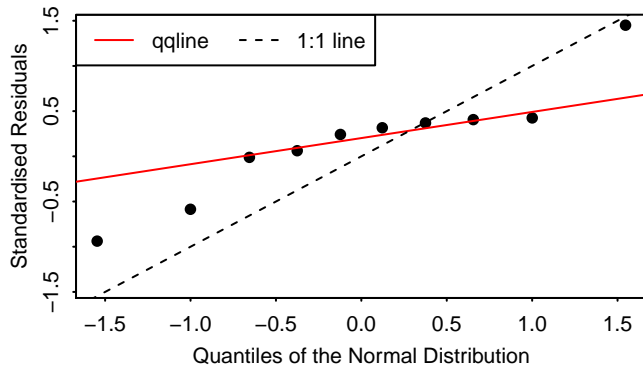
c) Standardised residuals over time



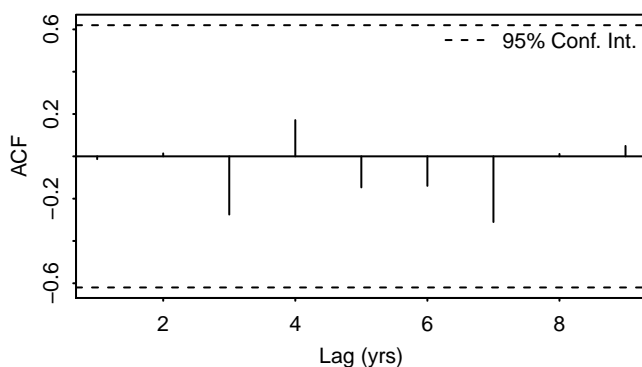
d) Tukey–Anscombe plot



e) Normal Q–Q plot

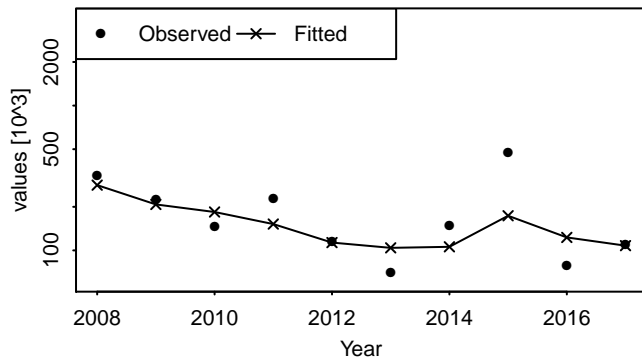


f) Autocorrelation of Residuals

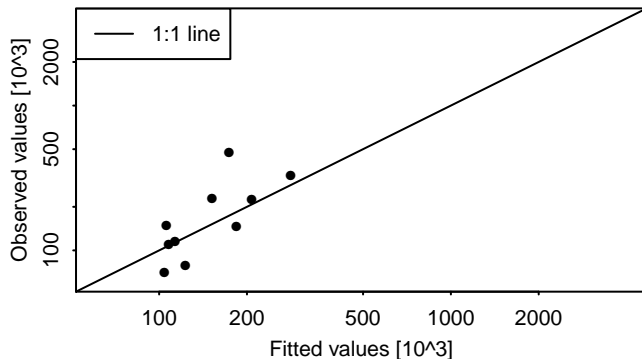


# Herring in Vla (combined) and VIIbc Diagnostics – MS HERAS, age 6

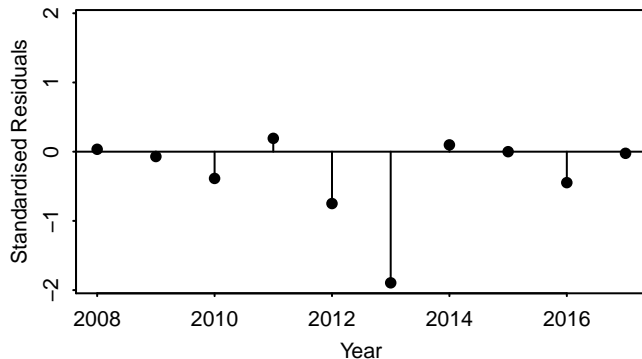
a) Observed and fitted values time series



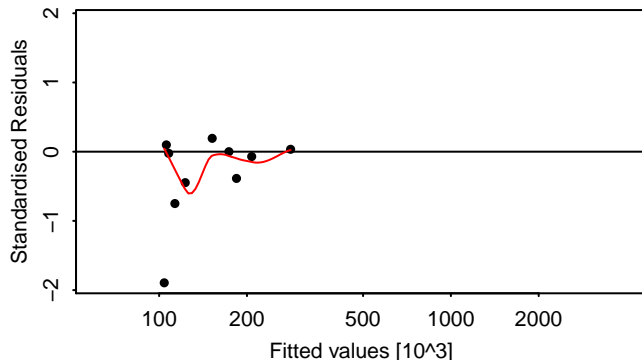
b) Observed vs fitted values



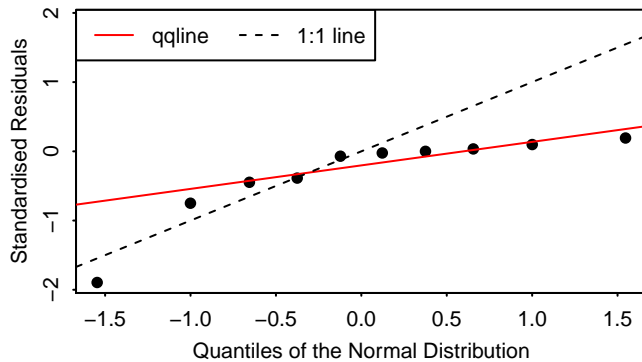
c) Standardised residuals over time



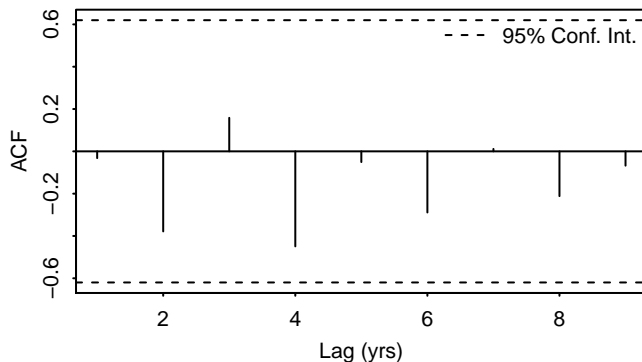
d) Tukey–Anscombe plot



e) Normal Q–Q plot

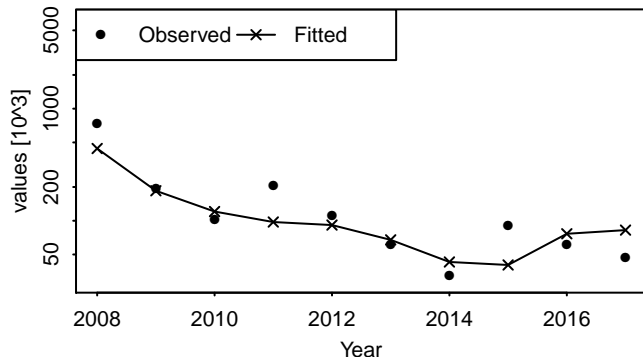


f) Autocorrelation of Residuals

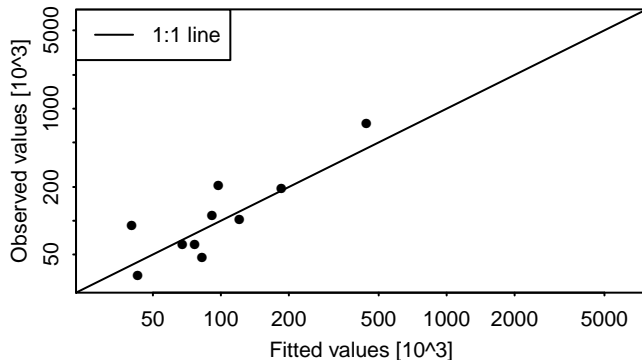


# Herring in V1a (combined) and VIIbc Diagnostics – MS HERAS, age 7

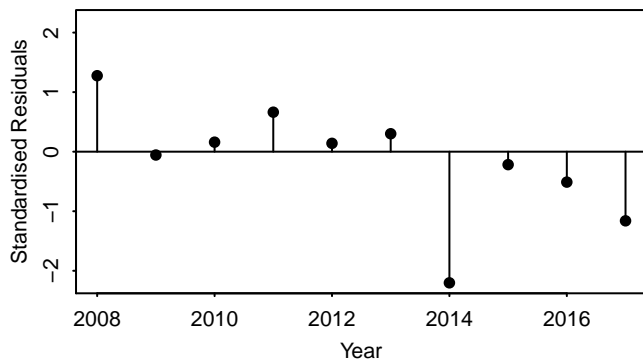
a) Observed and fitted values time series



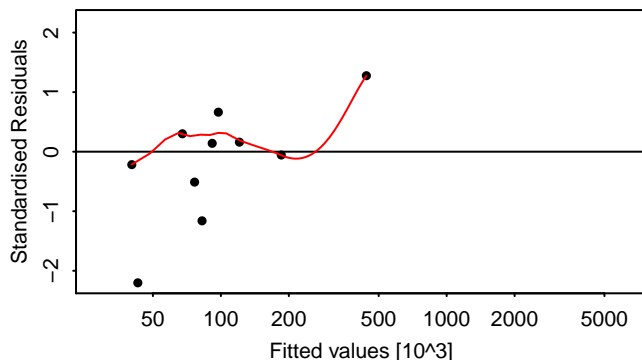
b) Observed vs fitted values



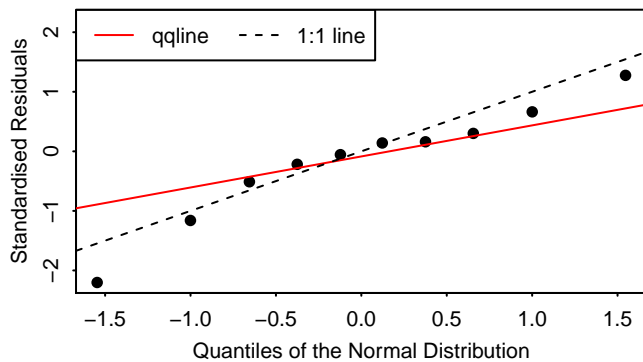
c) Standardised residuals over time



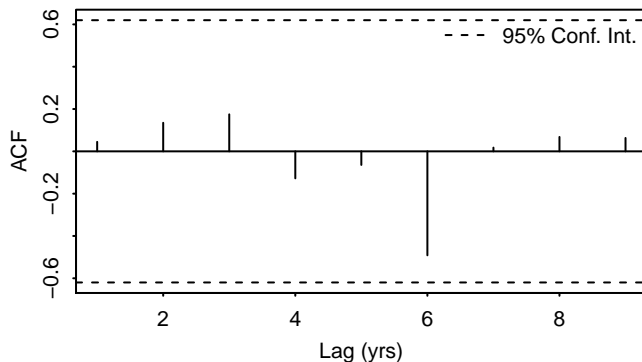
d) Tukey–Anscombe plot



e) Normal Q–Q plot



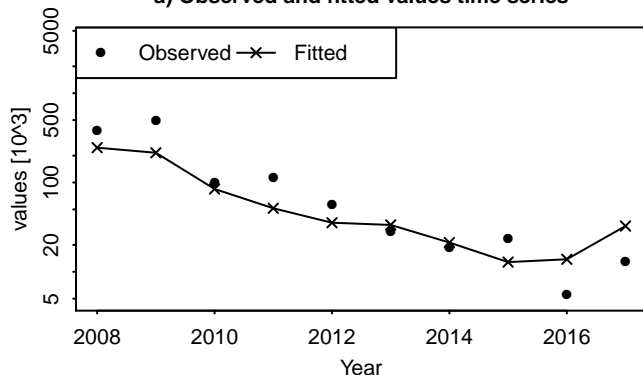
f) Autocorrelation of Residuals



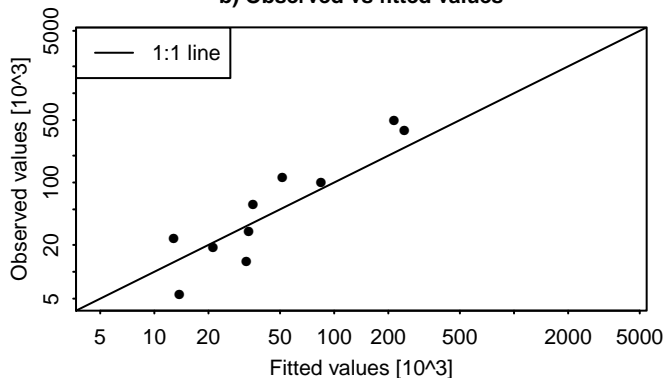


# Herring in V1a (combined) and VIIbc Diagnostics – MS HERAS, age 8

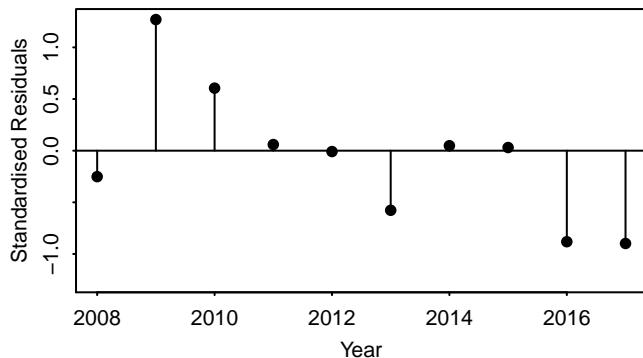
a) Observed and fitted values time series



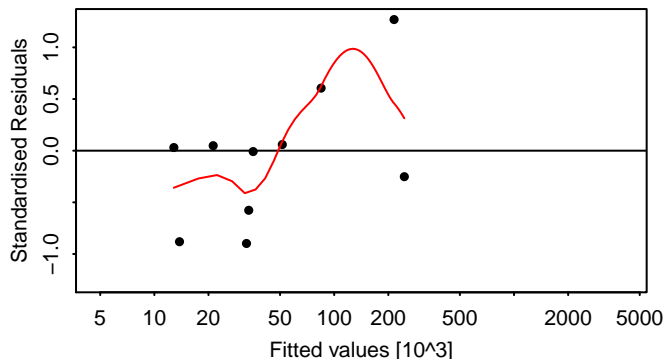
b) Observed vs fitted values



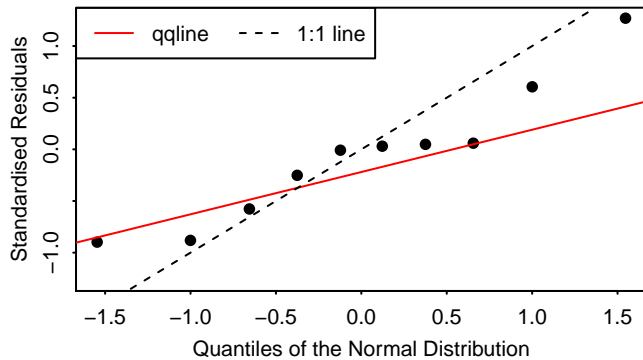
c) Standardised residuals over time



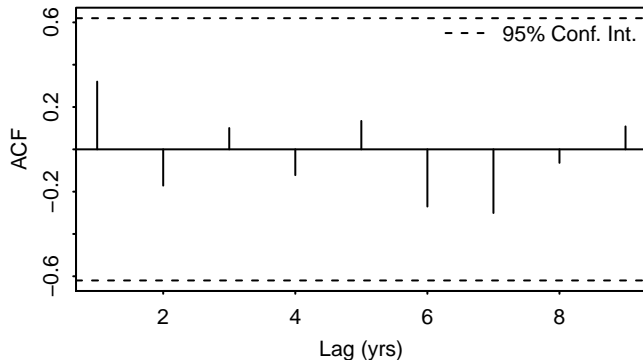
d) Tukey–Anscombe plot



e) Normal Q–Q plot

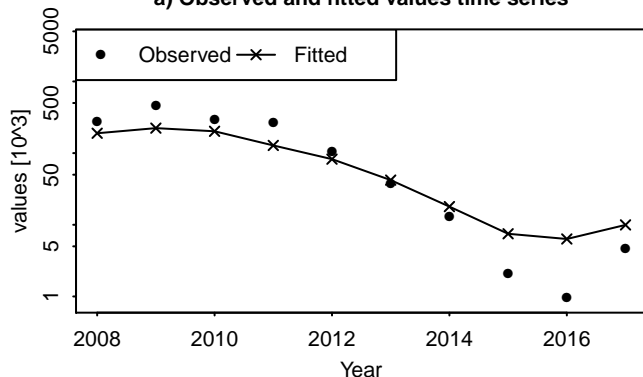


f) Autocorrelation of Residuals

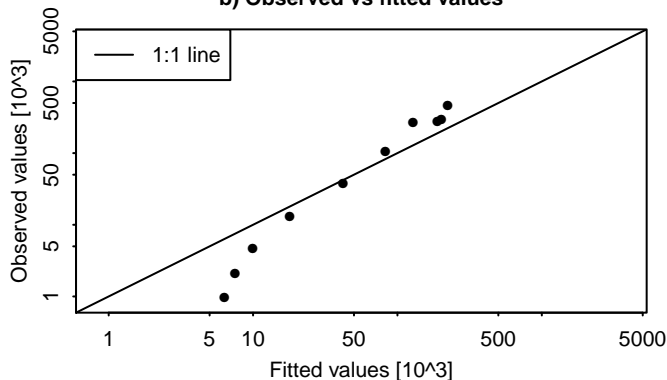


# Herring in Vla (combined) and VIIbc Diagnostics – MS HERAS, age 9

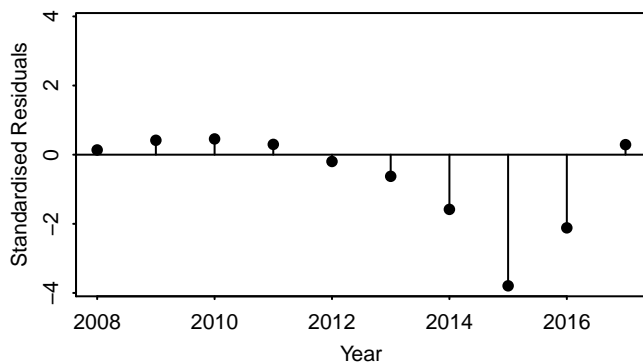
a) Observed and fitted values time series



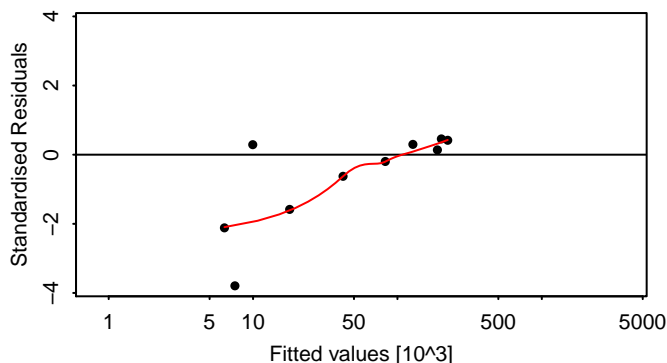
b) Observed vs fitted values



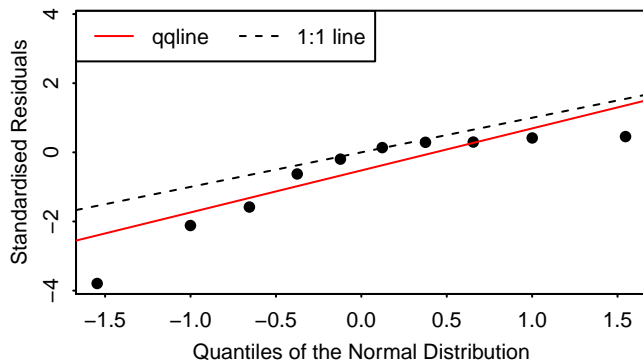
c) Standardised residuals over time



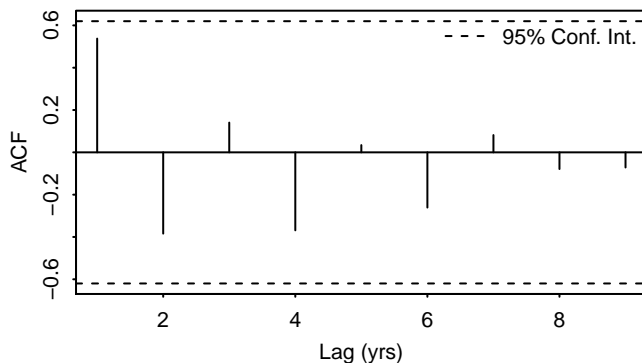
d) Tukey–Anscombe plot



e) Normal Q–Q plot

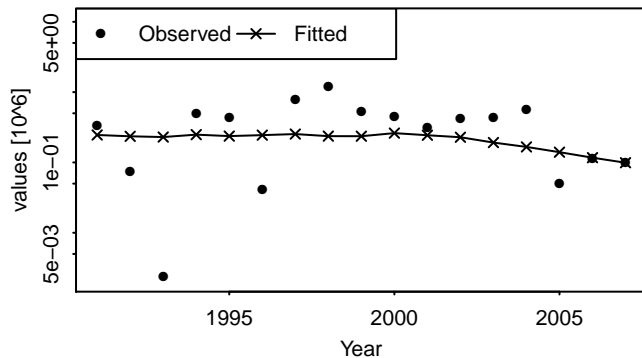


f) Autocorrelation of Residuals

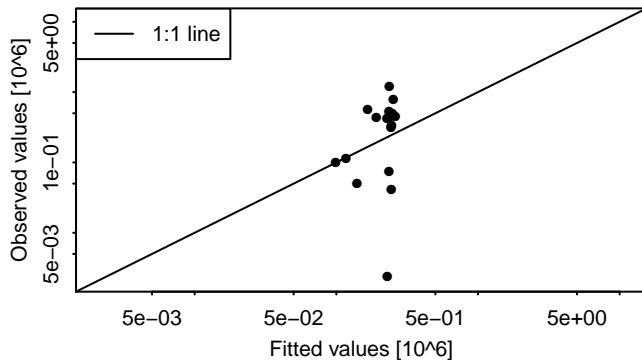


# Herring in V1a (combined) and V1b Diagnostics – WoS HERAS, age 1

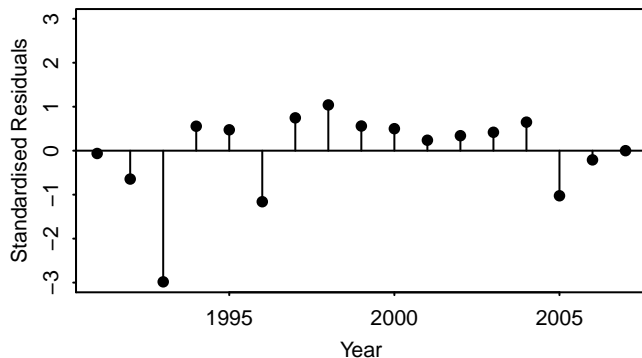
a) Observed and fitted values time series



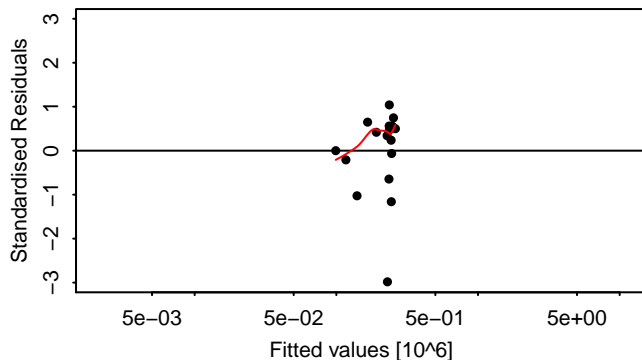
b) Observed vs fitted values



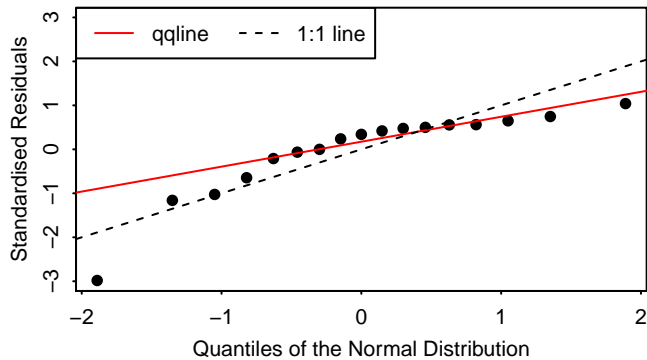
c) Standardised residuals over time



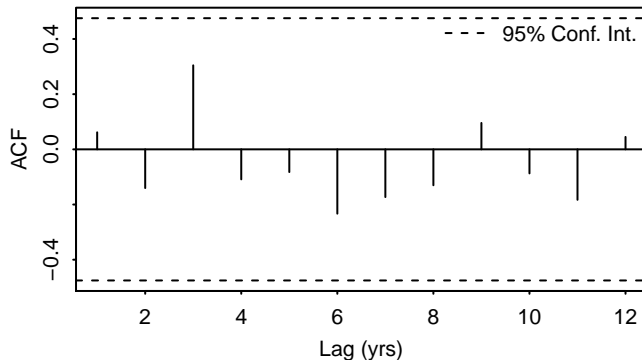
d) Tukey–Anscombe plot



e) Normal Q–Q plot

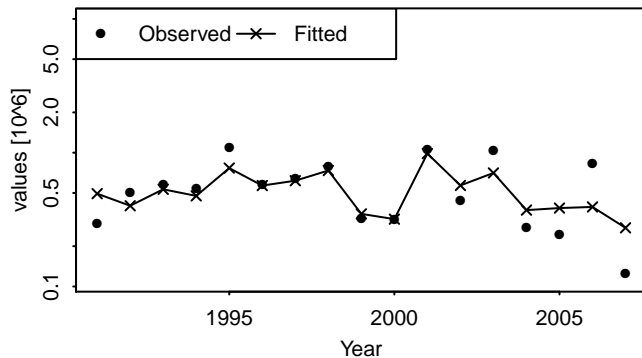


f) Autocorrelation of Residuals

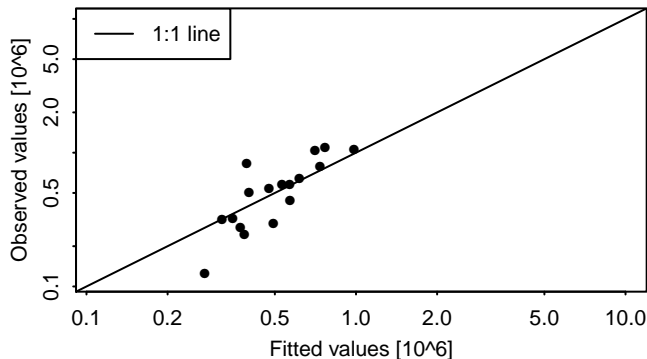


# Herring in Vla (combined) and VIIbc Diagnostics – WoS HERAS, age 2

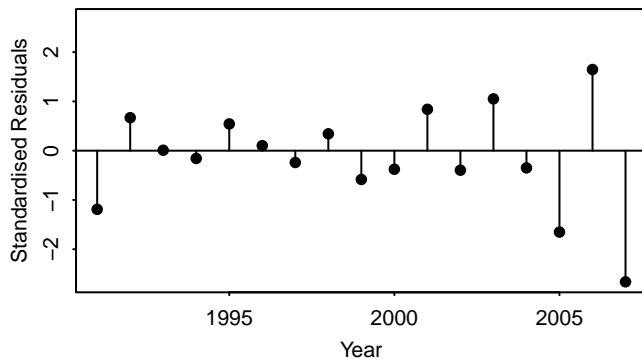
a) Observed and fitted values time series



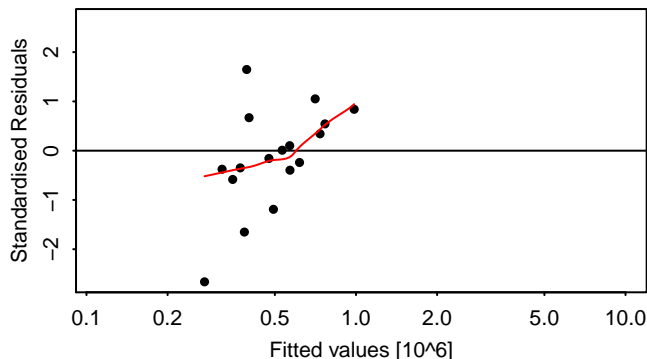
b) Observed vs fitted values



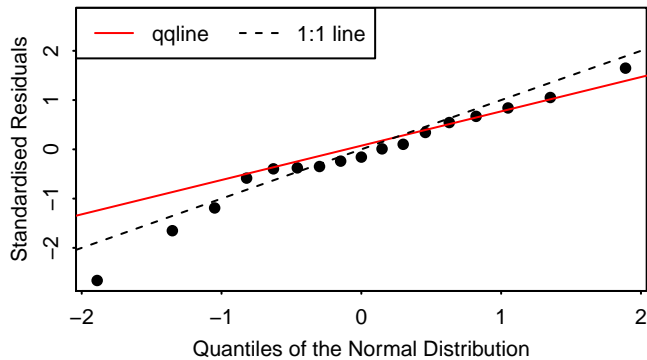
c) Standardised residuals over time



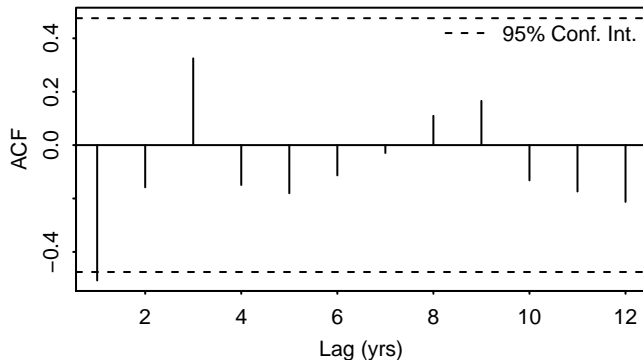
d) Tukey–Anscombe plot



e) Normal Q–Q plot

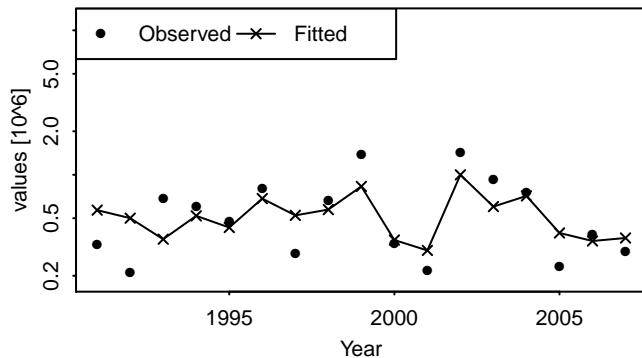


f) Autocorrelation of Residuals

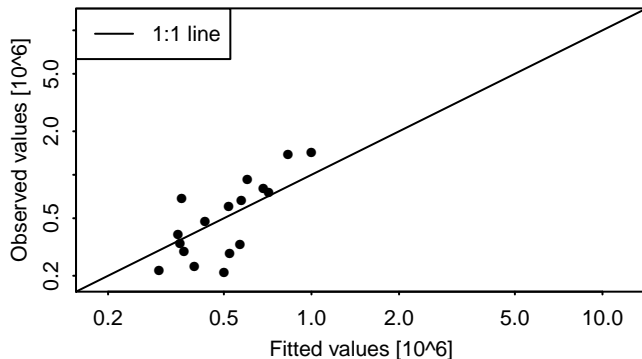


# Herring in Vla (combined) and VIIbc Diagnostics – WoS HERAS, age 3

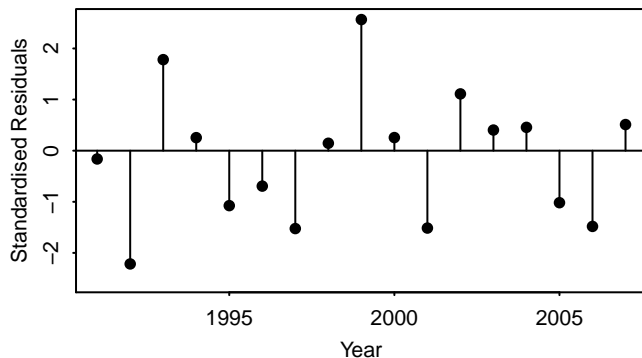
a) Observed and fitted values time series



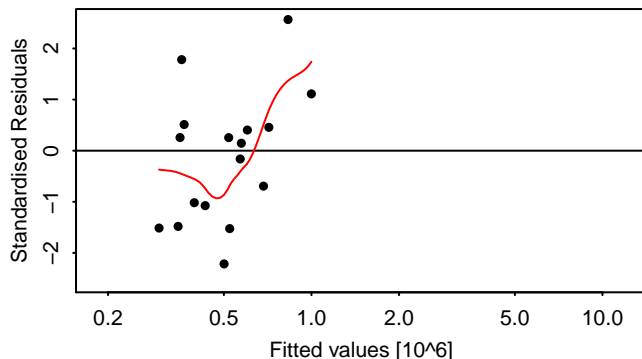
b) Observed vs fitted values



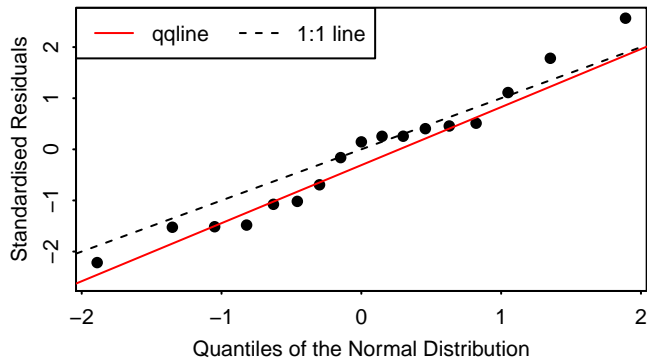
c) Standardised residuals over time



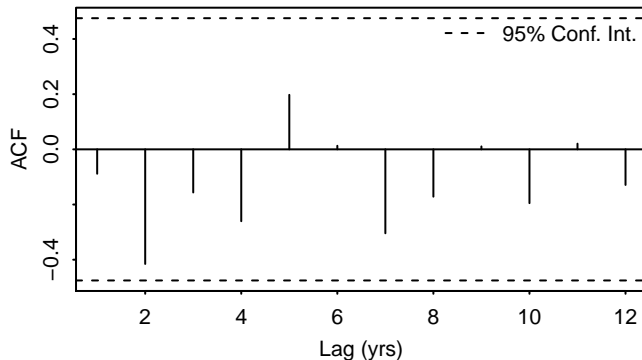
d) Tukey–Anscombe plot



e) Normal Q–Q plot

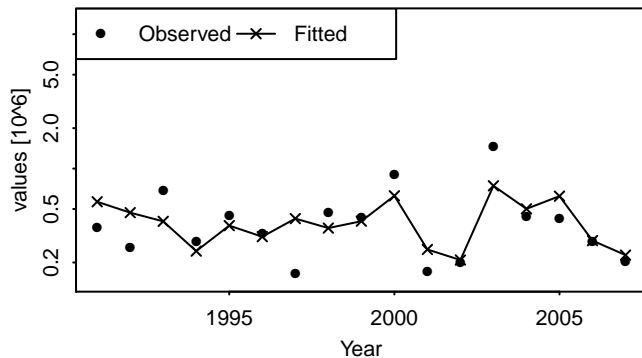


f) Autocorrelation of Residuals

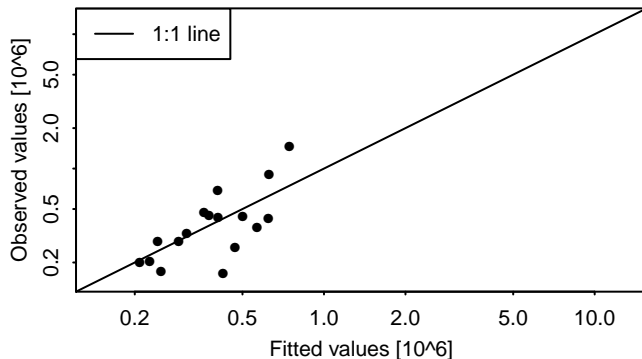


# Herring in Vla (combined) and VIIbc Diagnostics – WoS HERAS, age 4

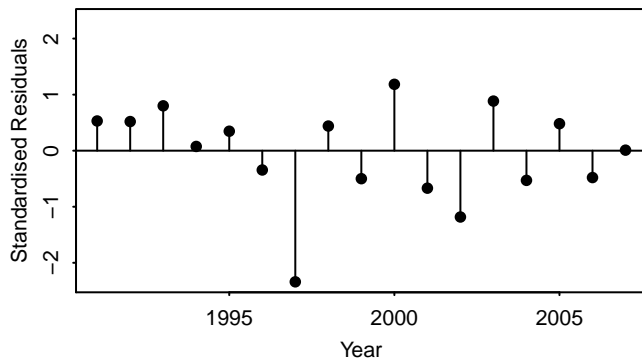
a) Observed and fitted values time series



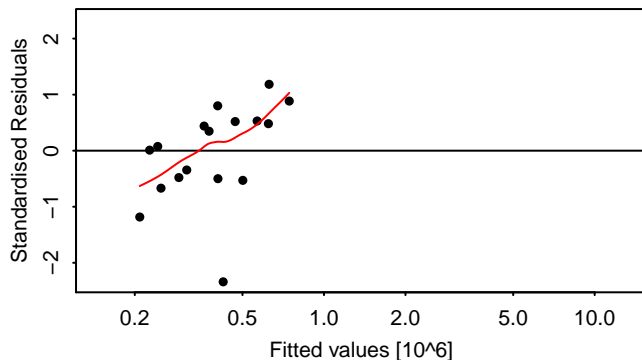
b) Observed vs fitted values



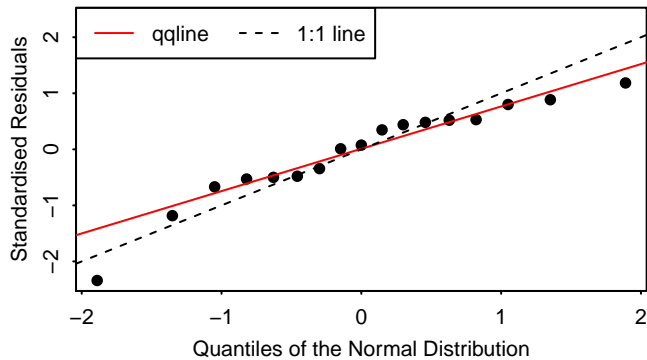
c) Standardised residuals over time



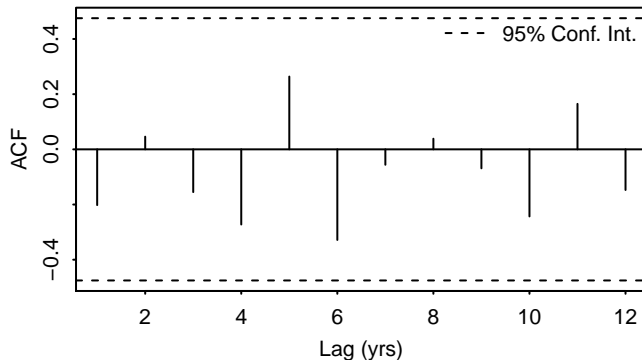
d) Tukey–Anscombe plot



e) Normal Q–Q plot

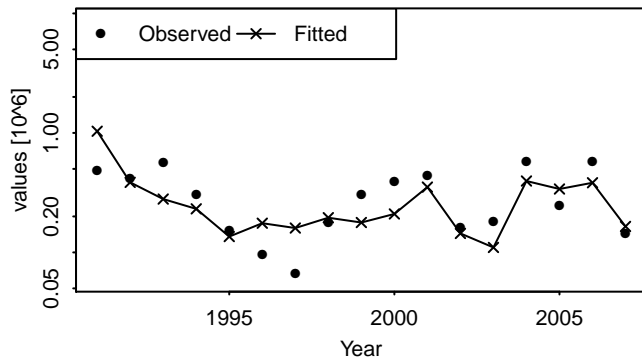


f) Autocorrelation of Residuals

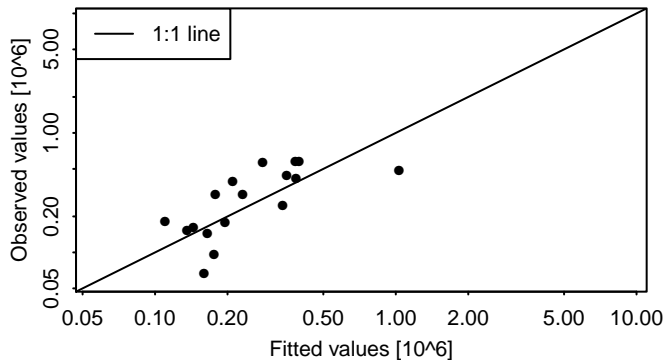


# Herring in Vla (combined) and VIIbc Diagnostics – WoS HERAS, age 5

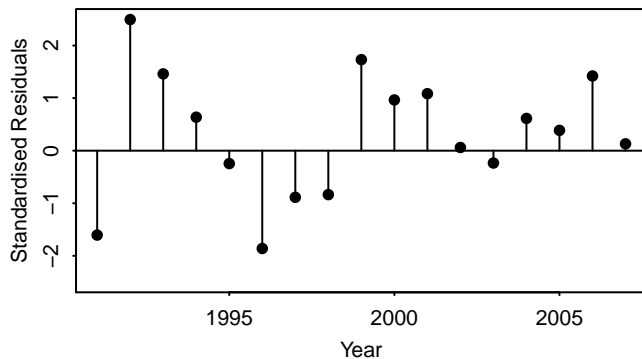
a) Observed and fitted values time series



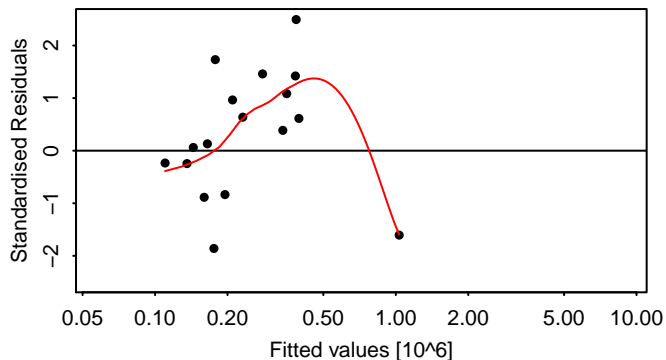
b) Observed vs fitted values



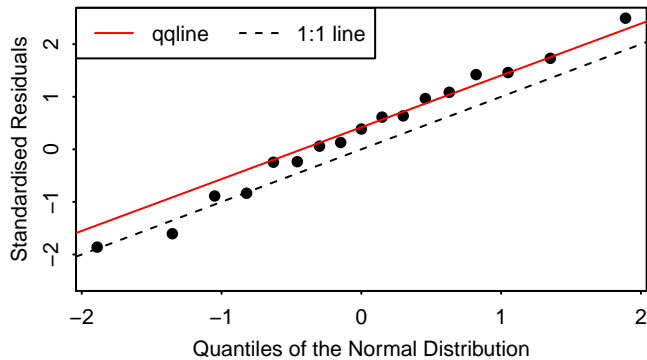
c) Standardised residuals over time



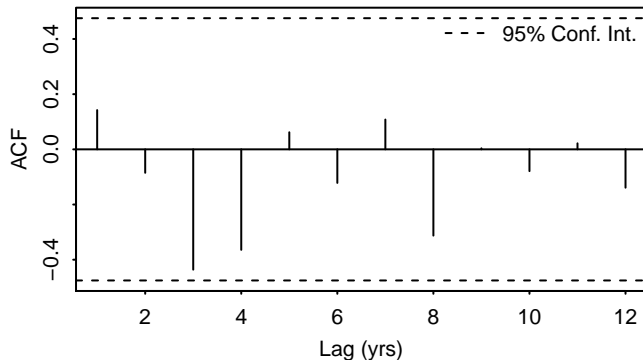
d) Tukey–Anscombe plot



e) Normal Q–Q plot

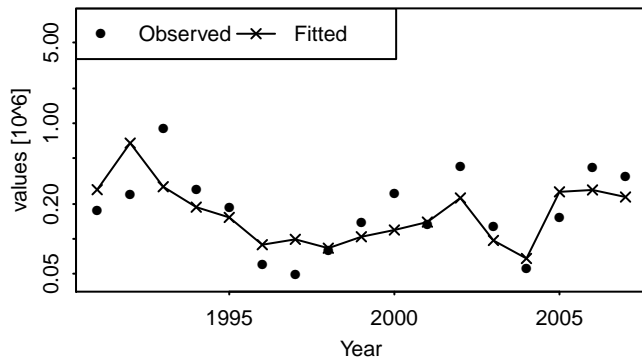


f) Autocorrelation of Residuals

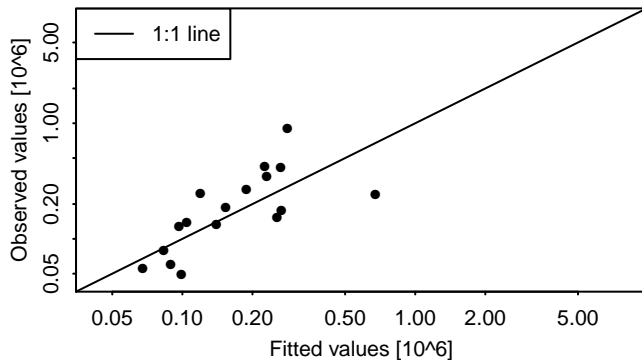


# Herring in Vla (combined) and VIIbc Diagnostics – WoS HERAS, age 6

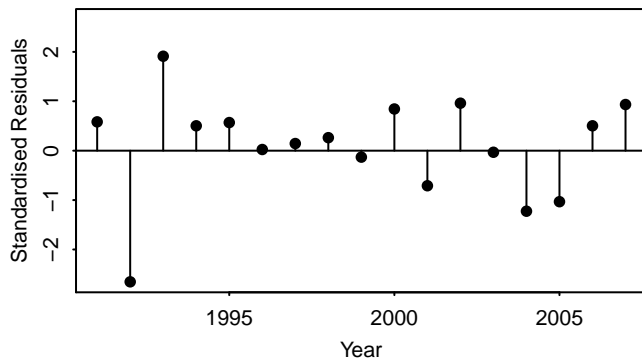
a) Observed and fitted values time series



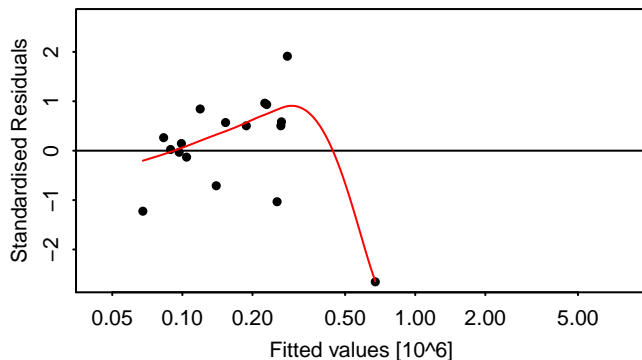
b) Observed vs fitted values



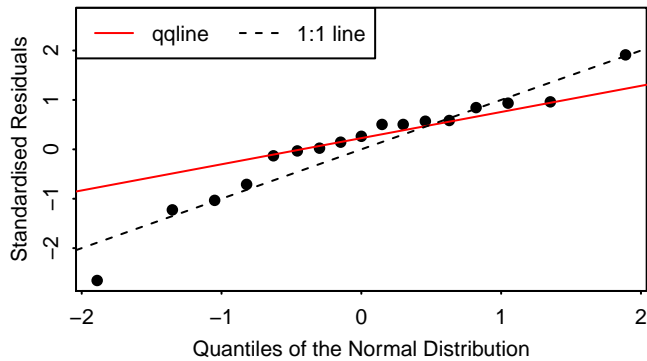
c) Standardised residuals over time



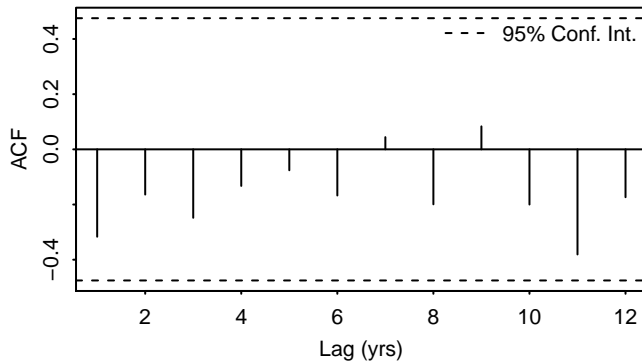
d) Tukey–Anscombe plot



e) Normal Q–Q plot



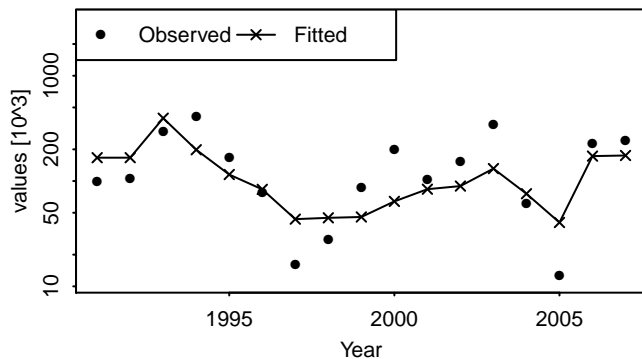
f) Autocorrelation of Residuals



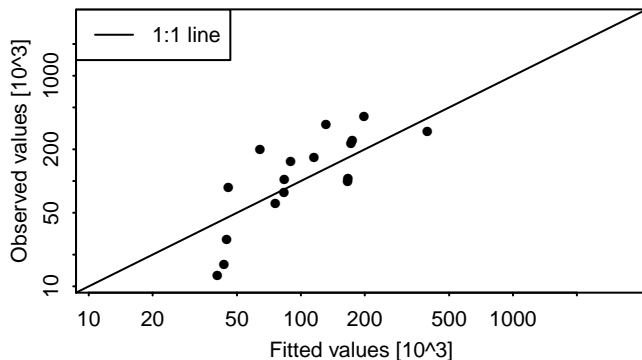


# Herring in Vla (combined) and VIIbc Diagnostics – WoS HERAS, age 7

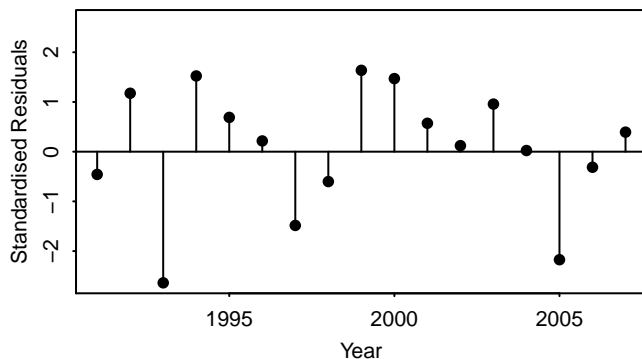
a) Observed and fitted values time series



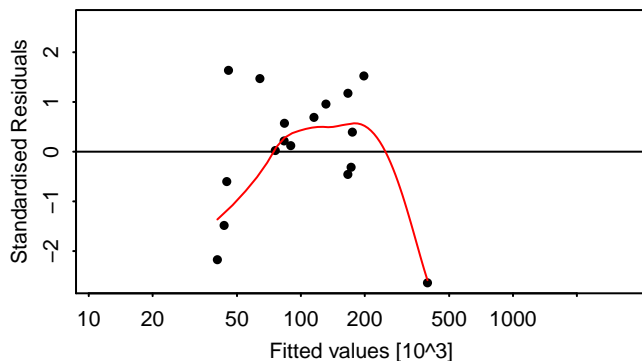
b) Observed vs fitted values



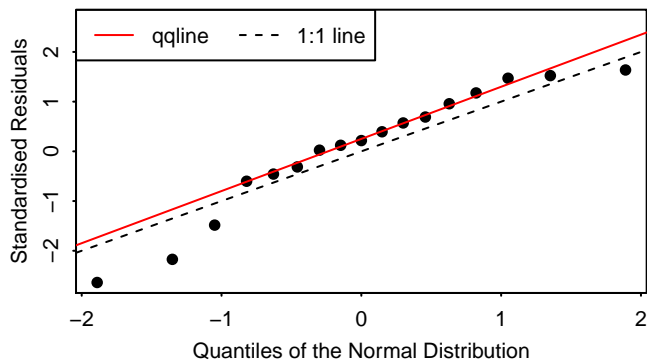
c) Standardised residuals over time



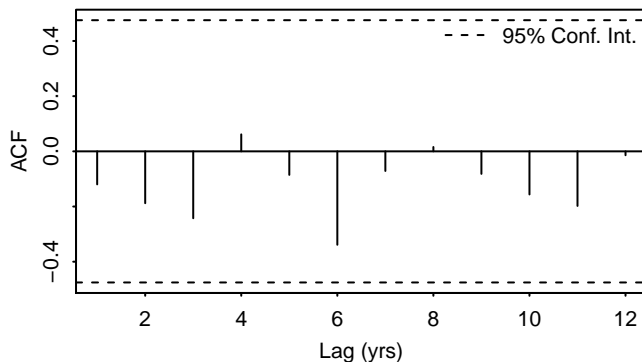
d) Tukey–Anscombe plot



e) Normal Q–Q plot

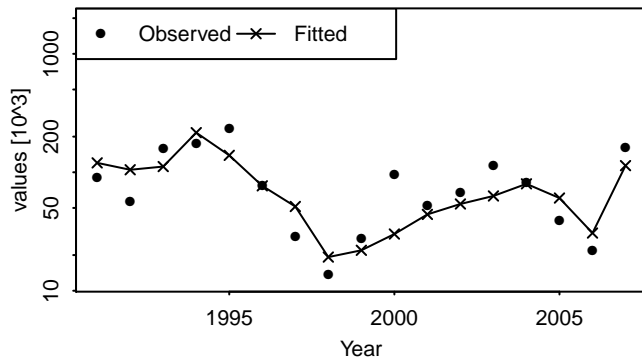


f) Autocorrelation of Residuals

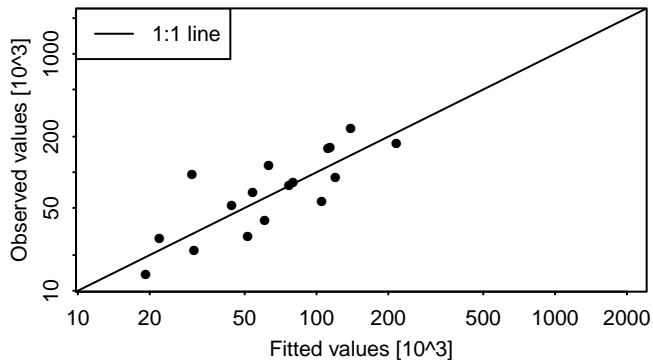


# Herring in Vla (combined) and VIIbc Diagnostics – WoS HERAS, age 8

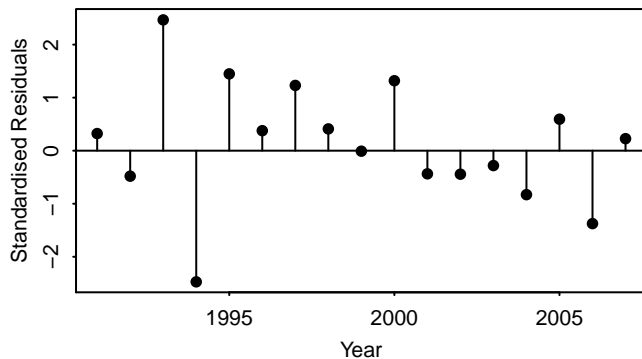
a) Observed and fitted values time series



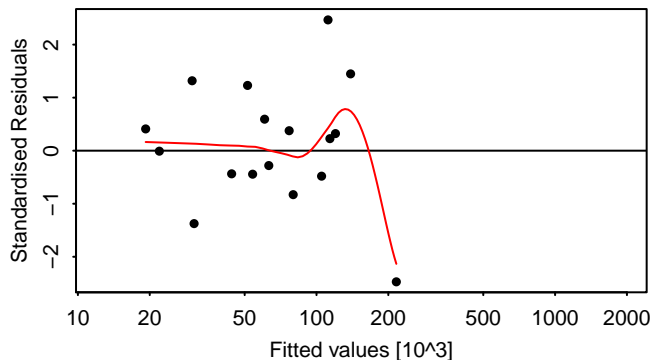
b) Observed vs fitted values



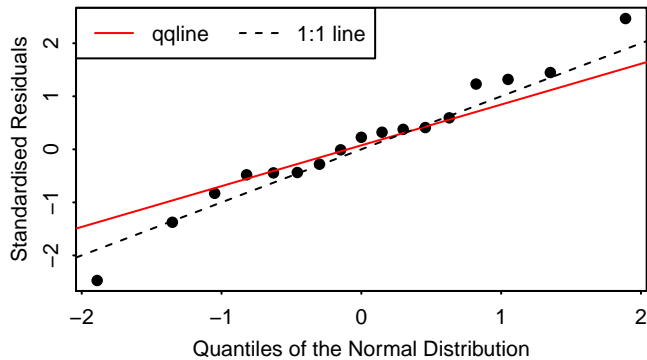
c) Standardised residuals over time



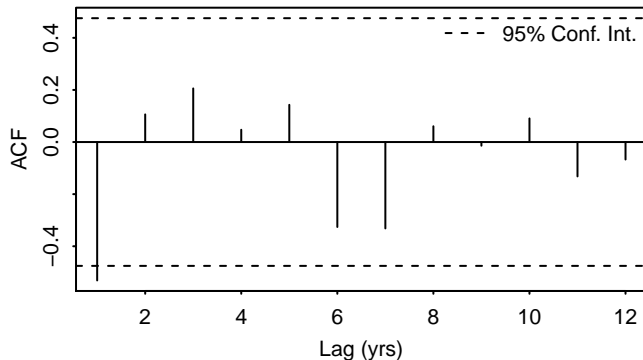
d) Tukey–Anscombe plot



e) Normal Q–Q plot

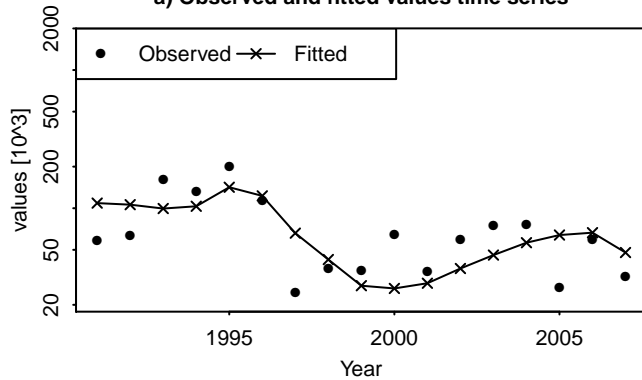


f) Autocorrelation of Residuals

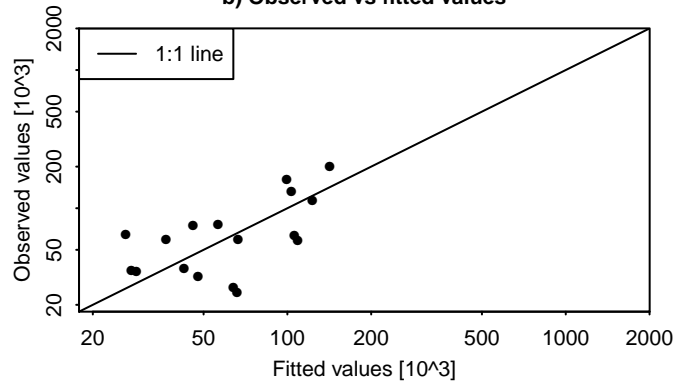


# Herring in Vla (combined) and VIIbc Diagnostics – WoS HERAS, age 9

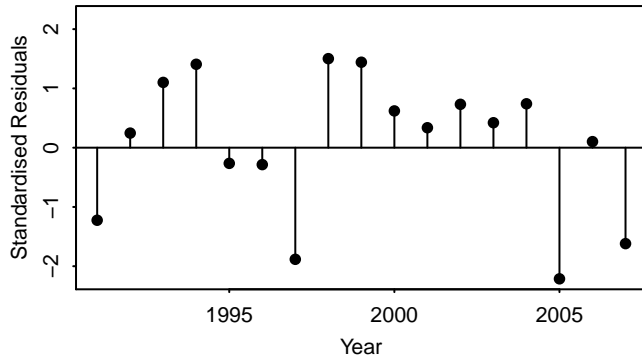
a) Observed and fitted values time series



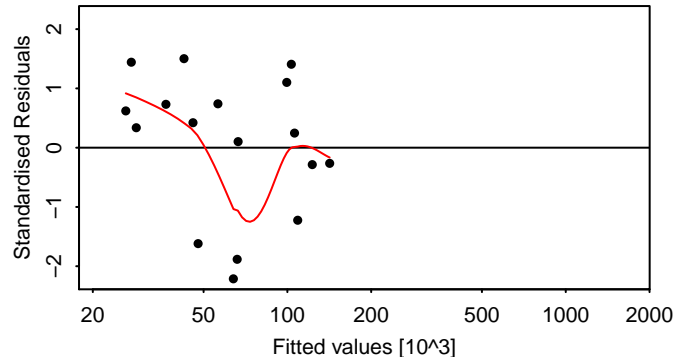
b) Observed vs fitted values



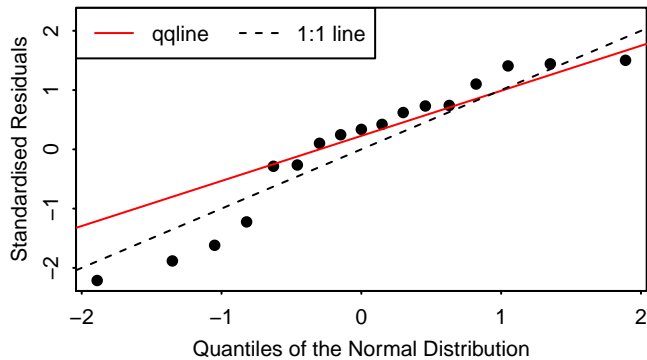
c) Standardised residuals over time



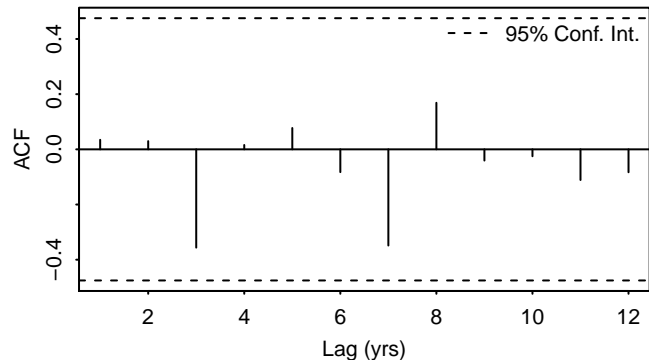
d) Tukey–Anscombe plot



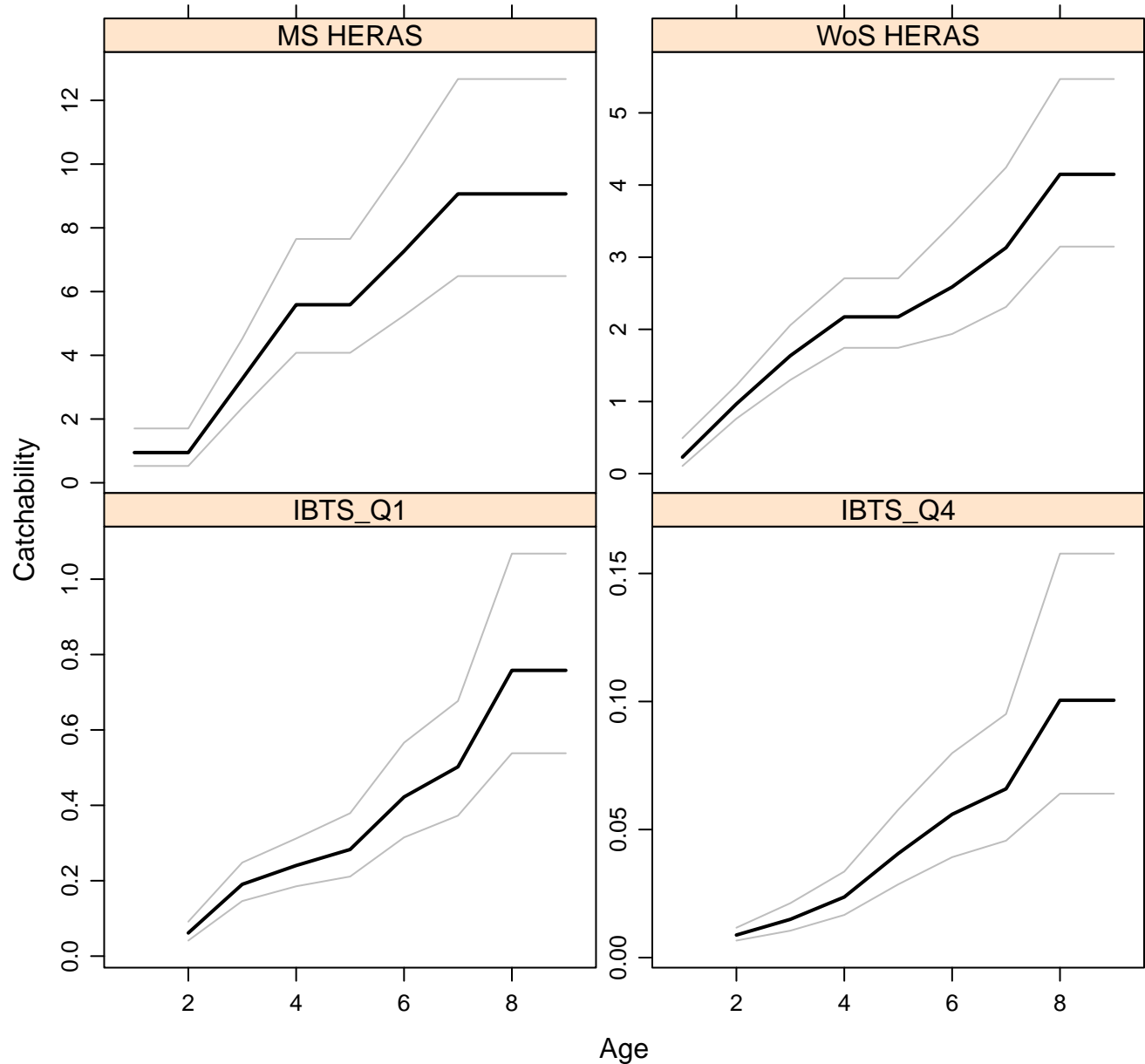
e) Normal Q–Q plot



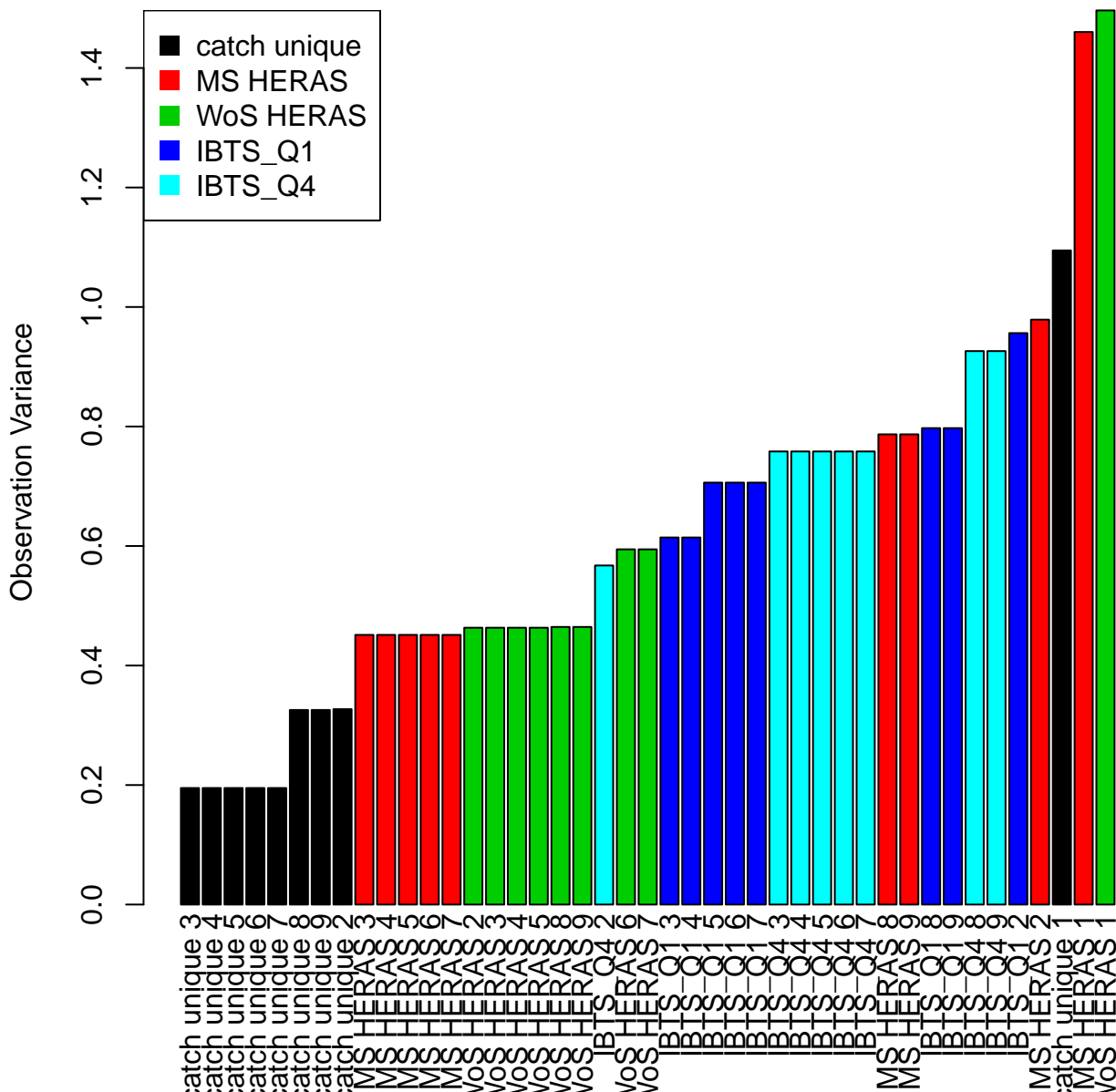
f) Autocorrelation of Residuals



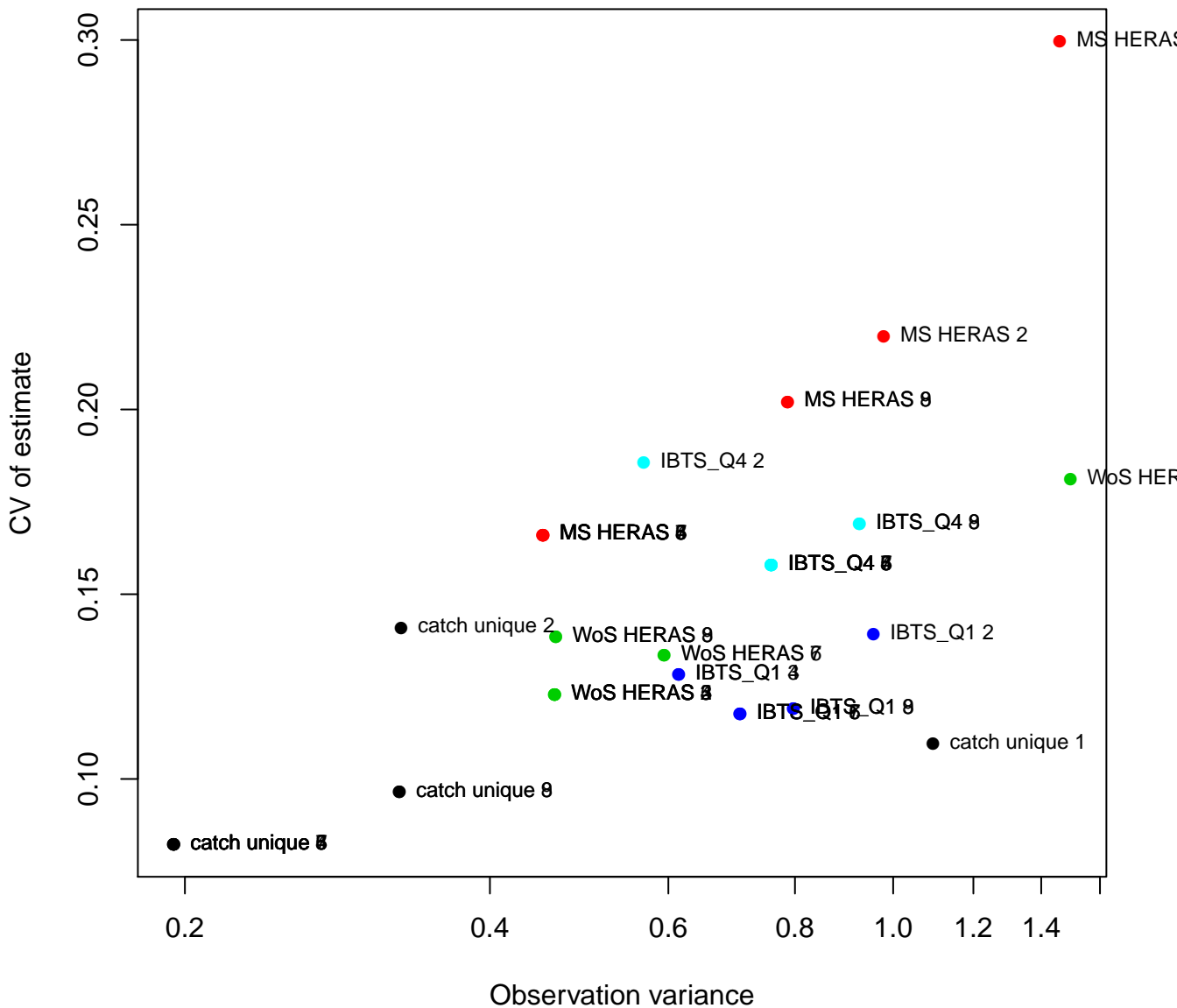
# Survey catchability parameters



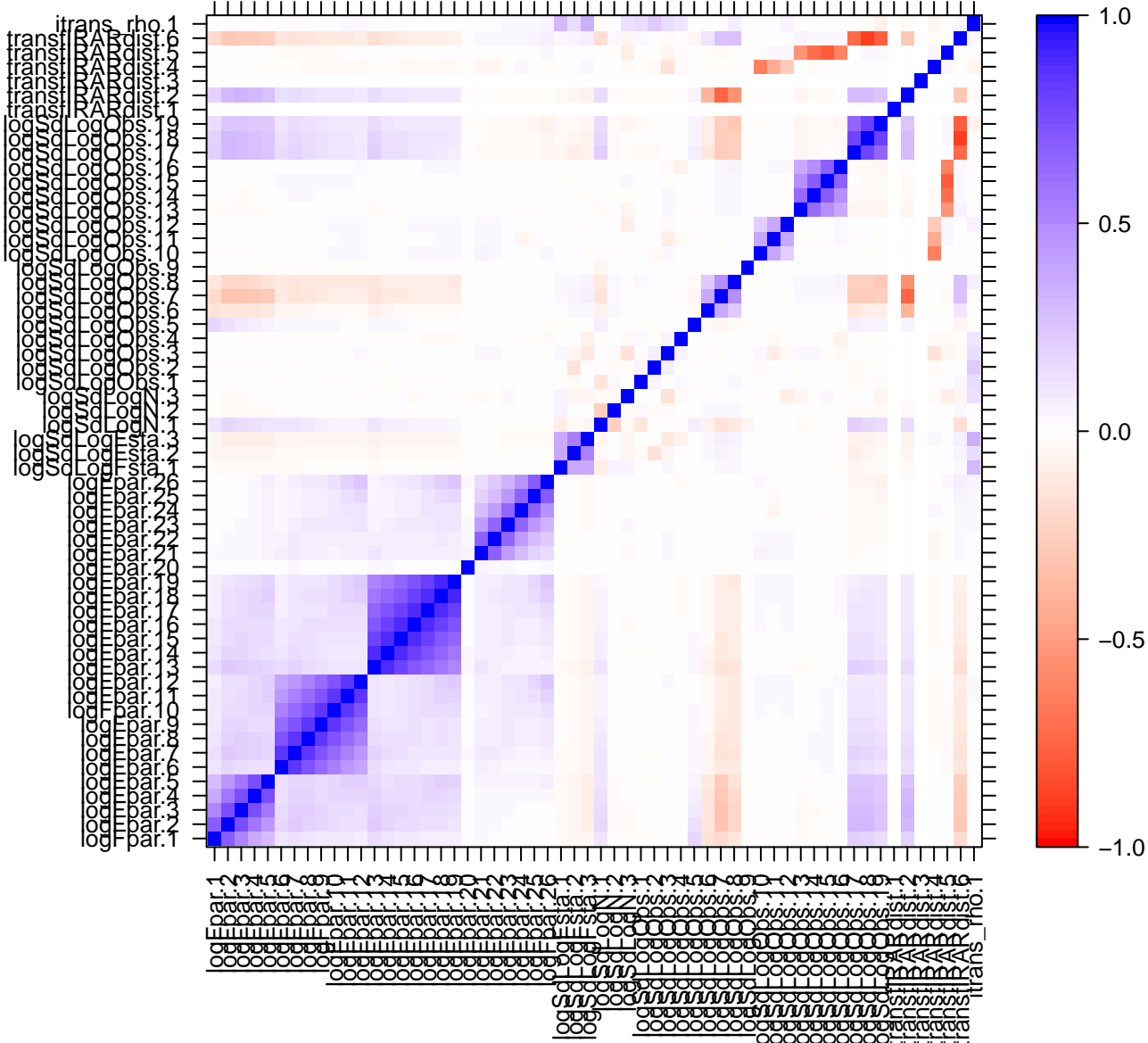
# Observation variances by data source



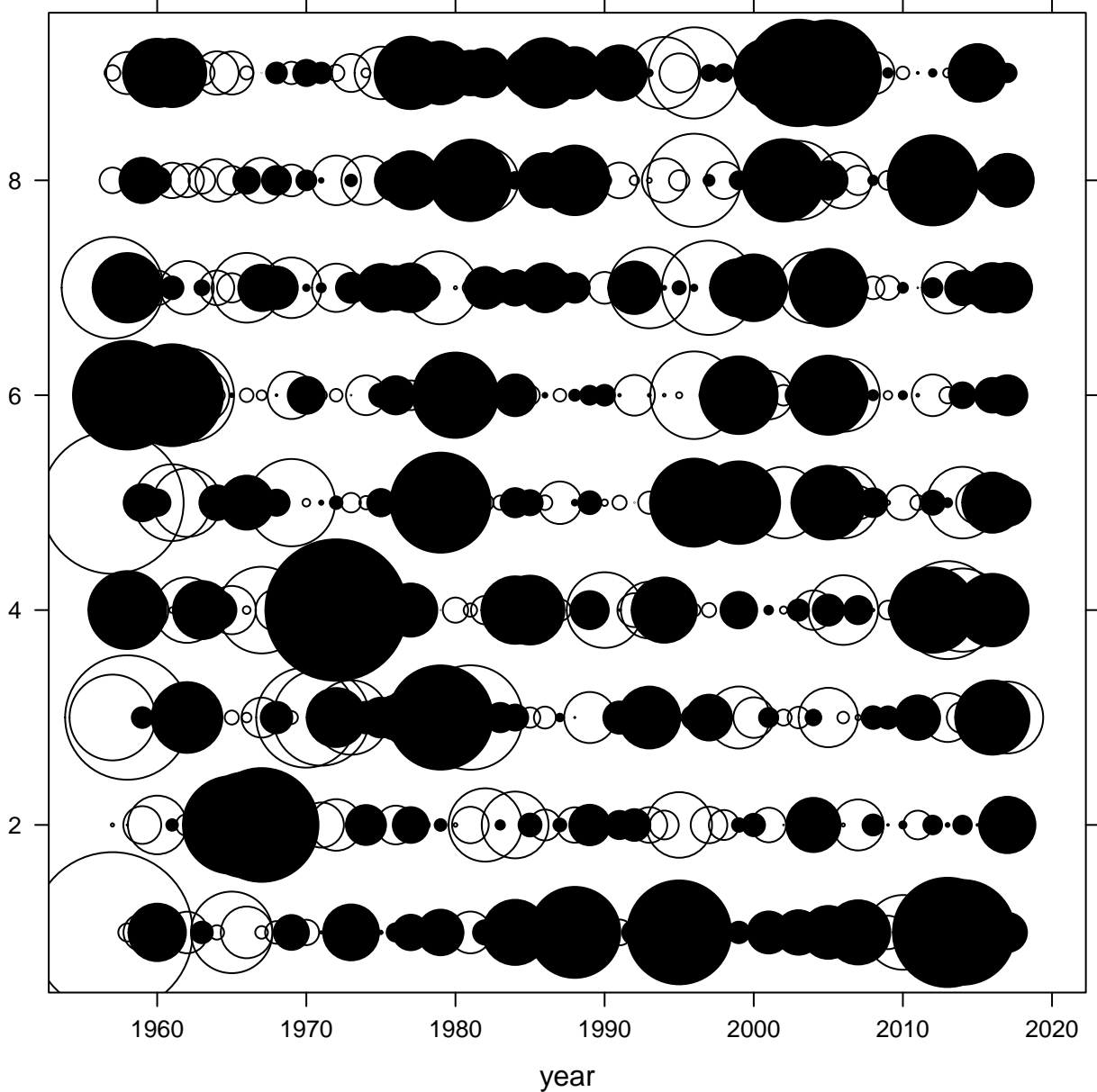
# Observation variance vs uncertainty



# Herring in Vla (combined) and VIIbc

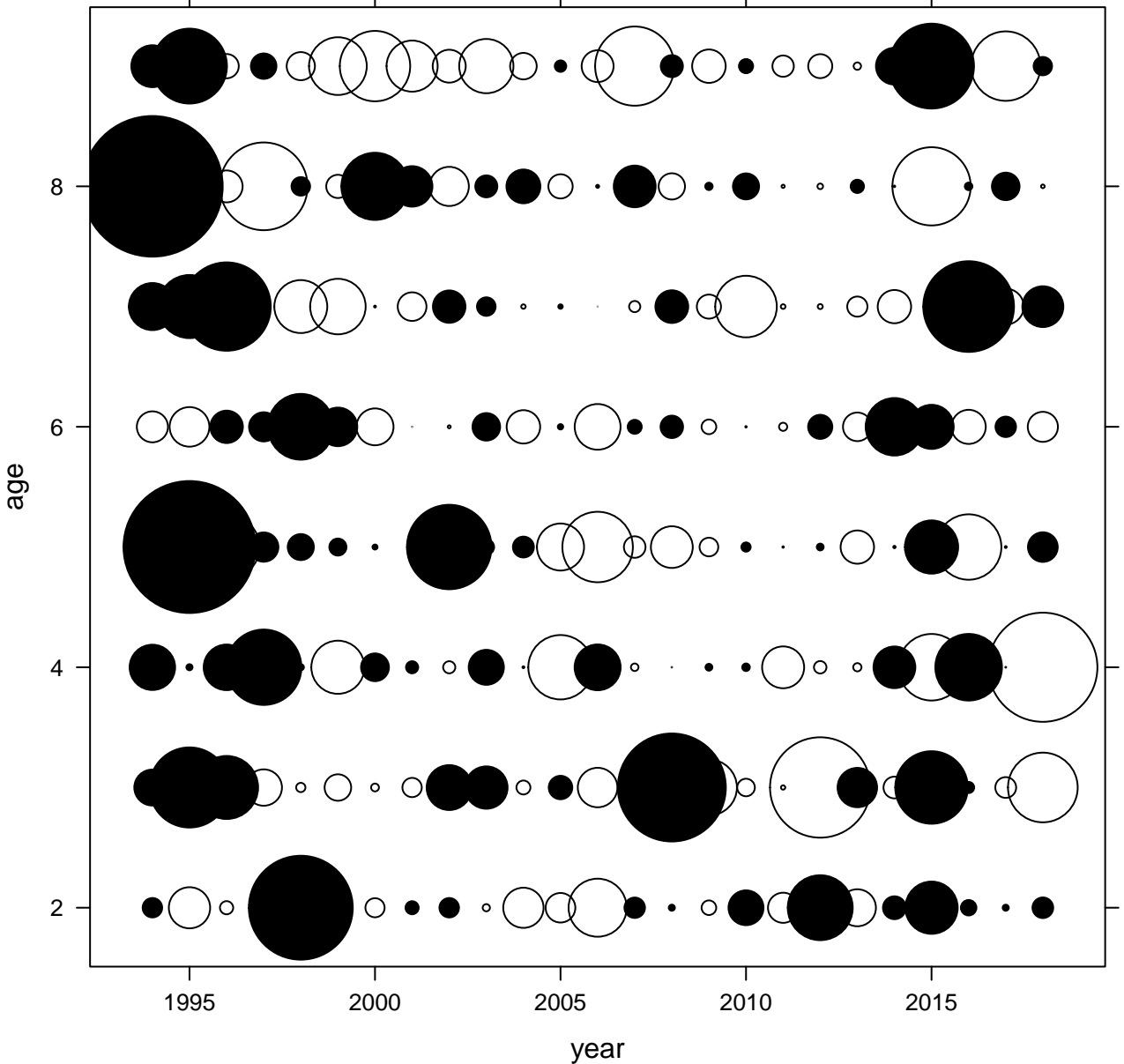


### Residuals by year Catch

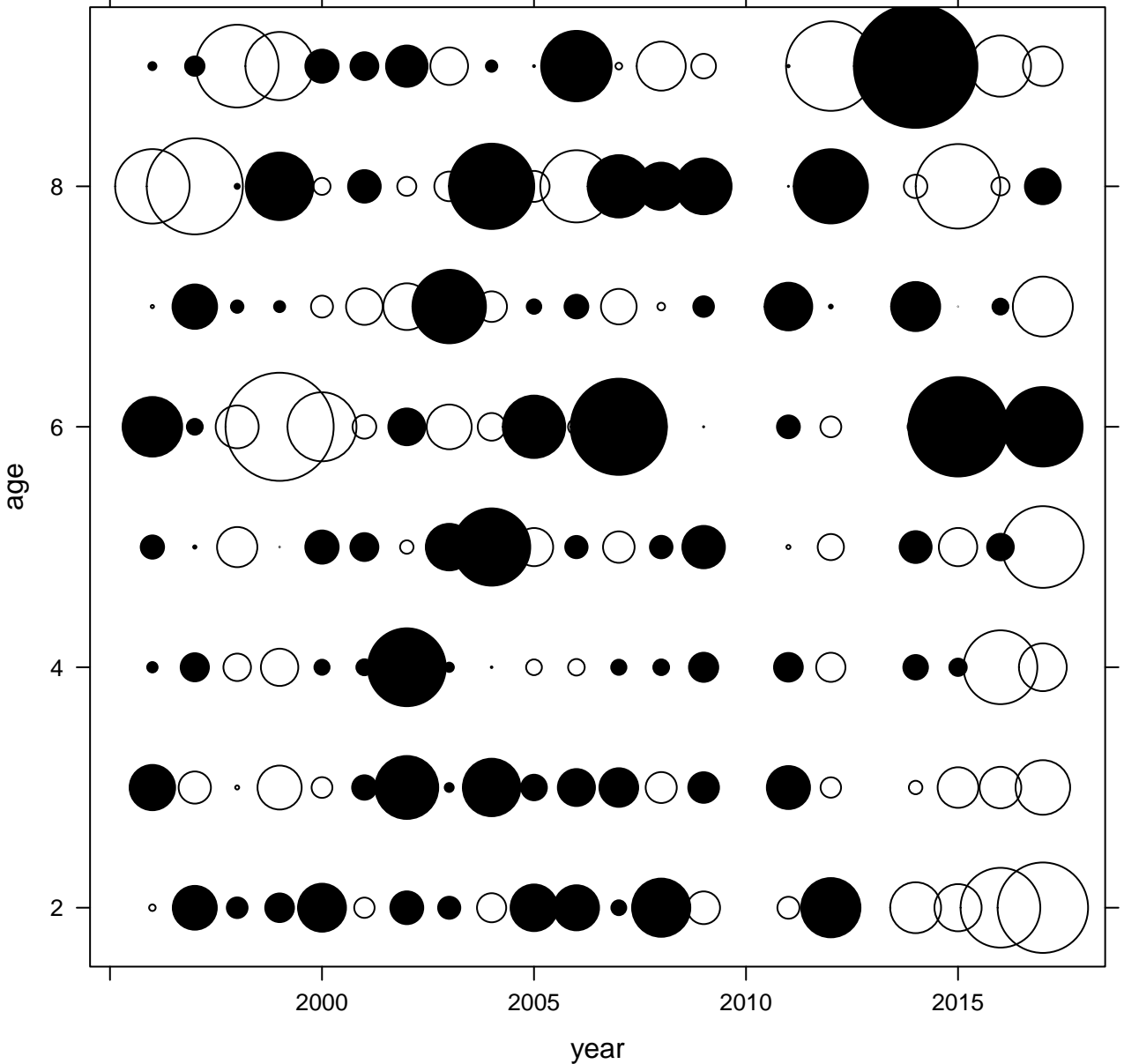




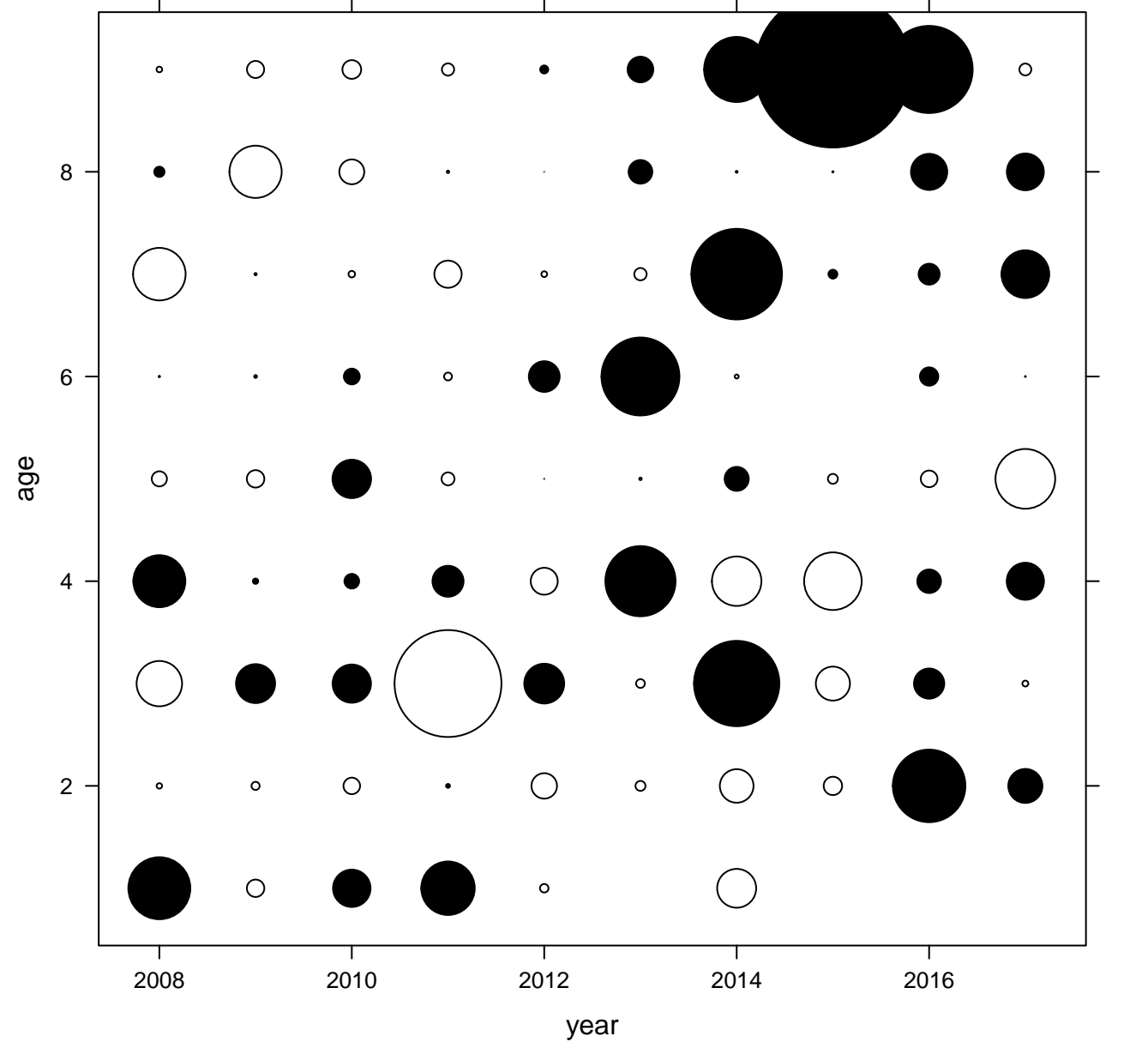
Residuals by year IBTS\_Q1



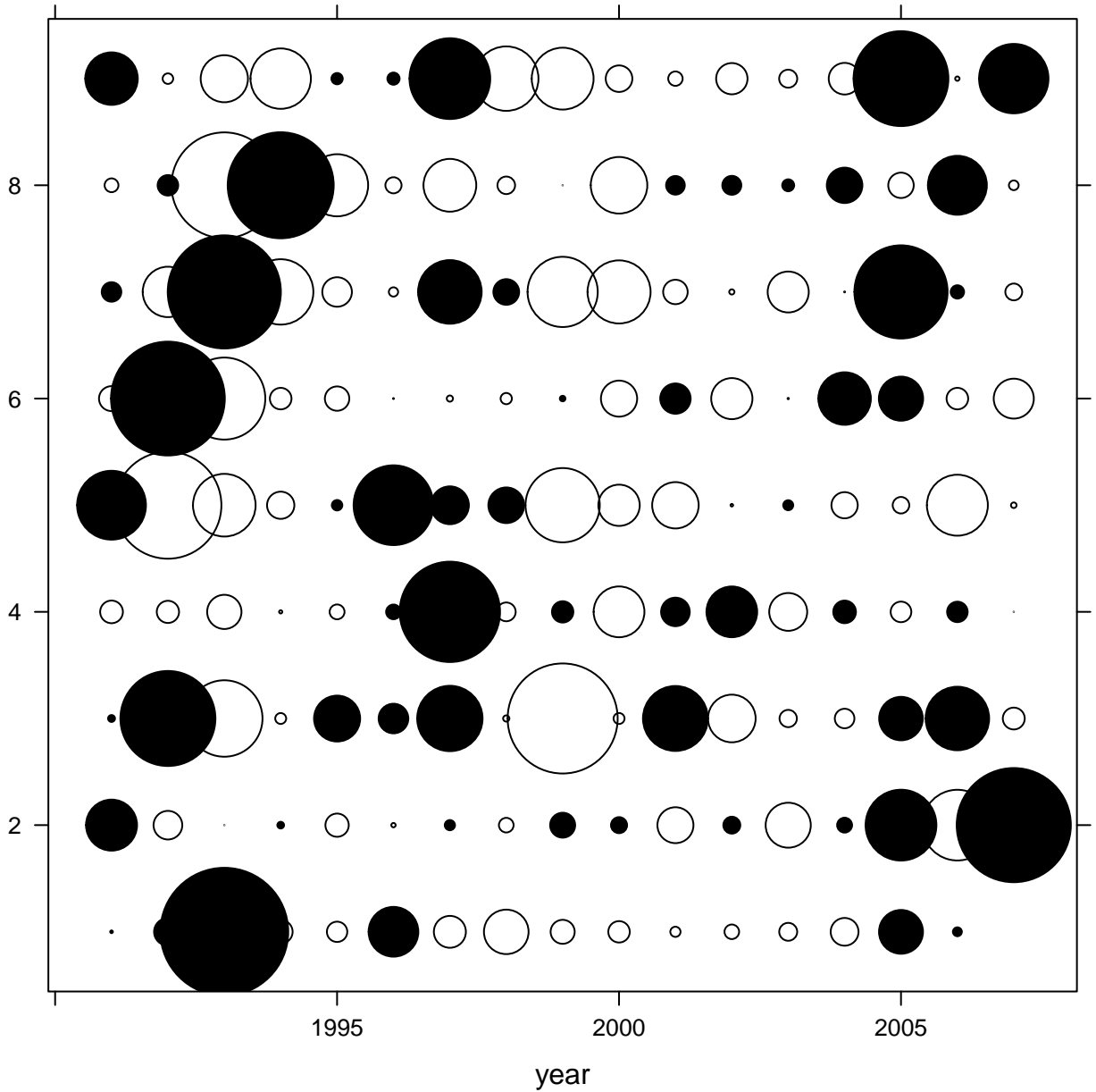
Residuals by year IBTS\_Q4



# Residuals by year MS HERAS

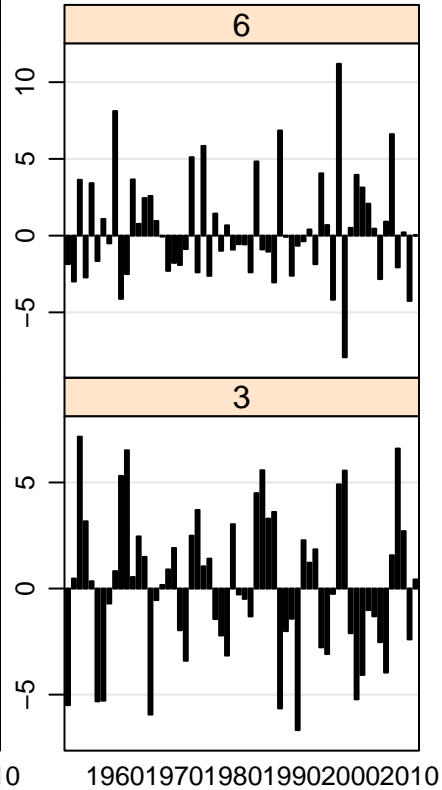
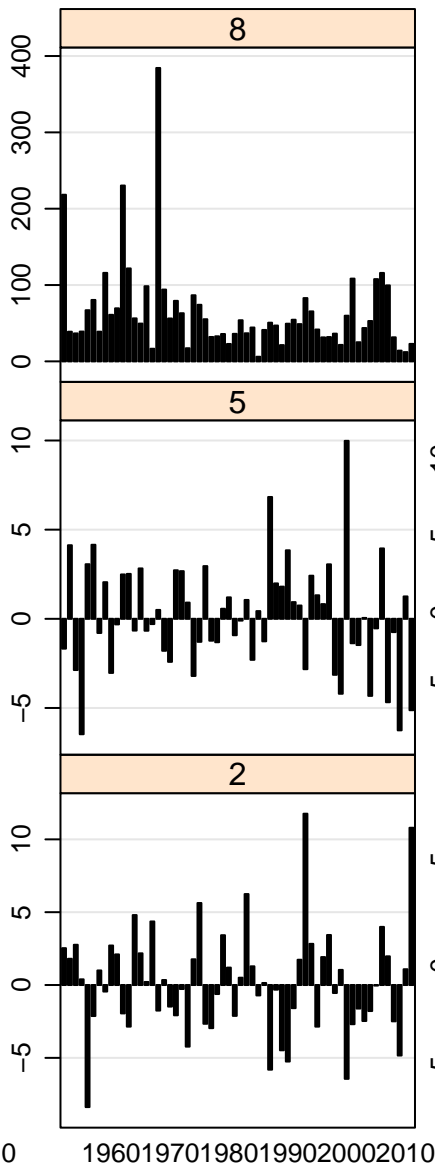
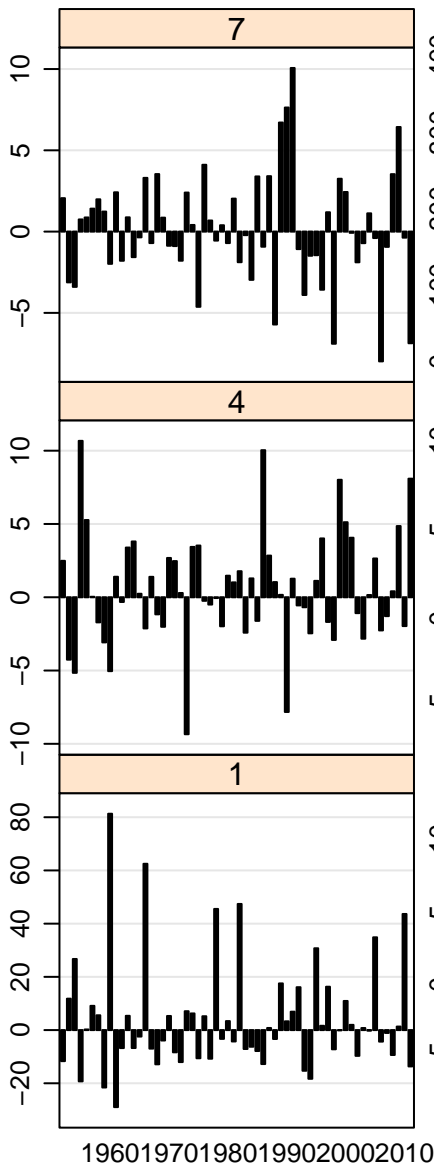


Residuals by year WoS HERAS

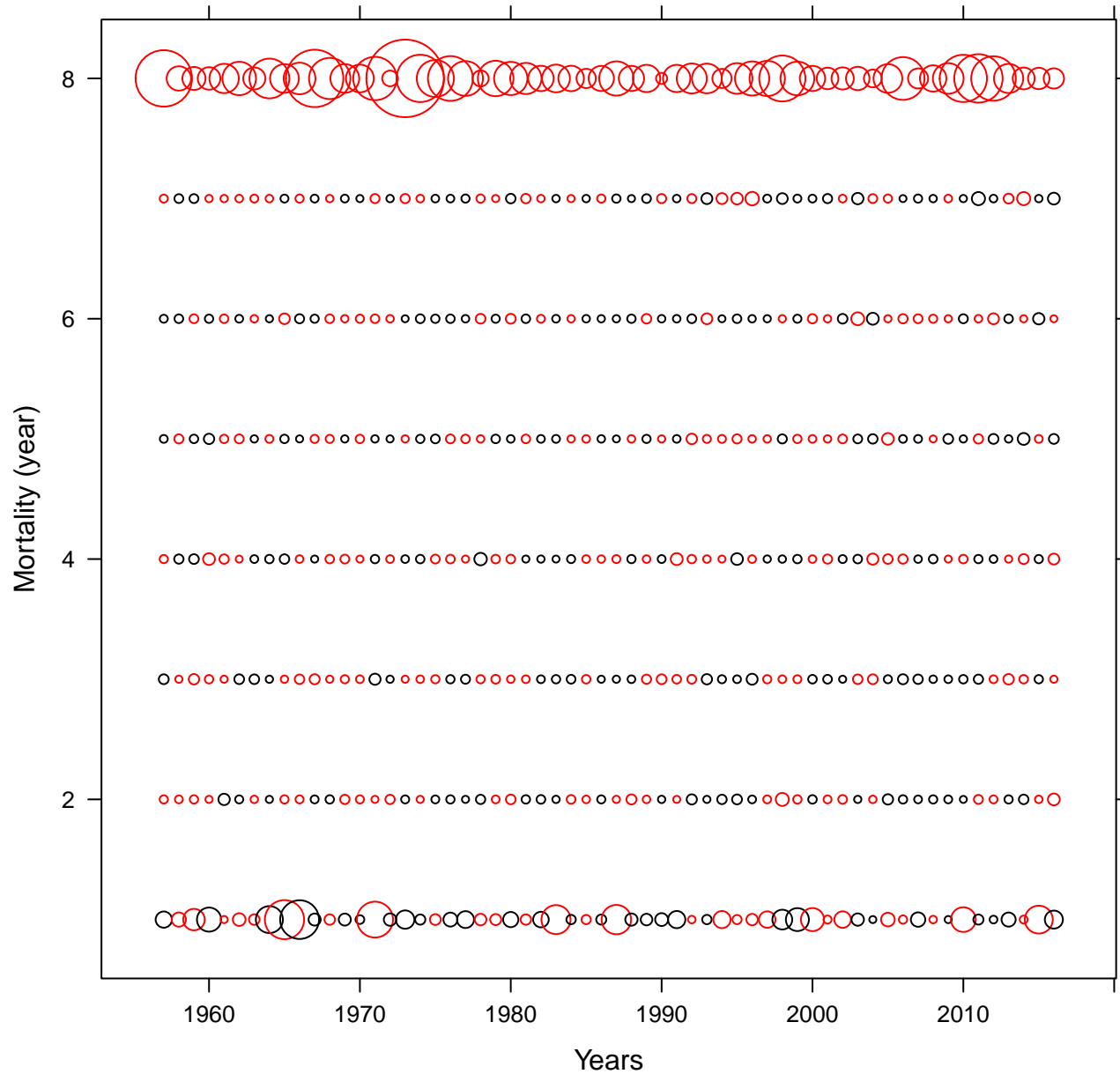


# Process error deviation in N

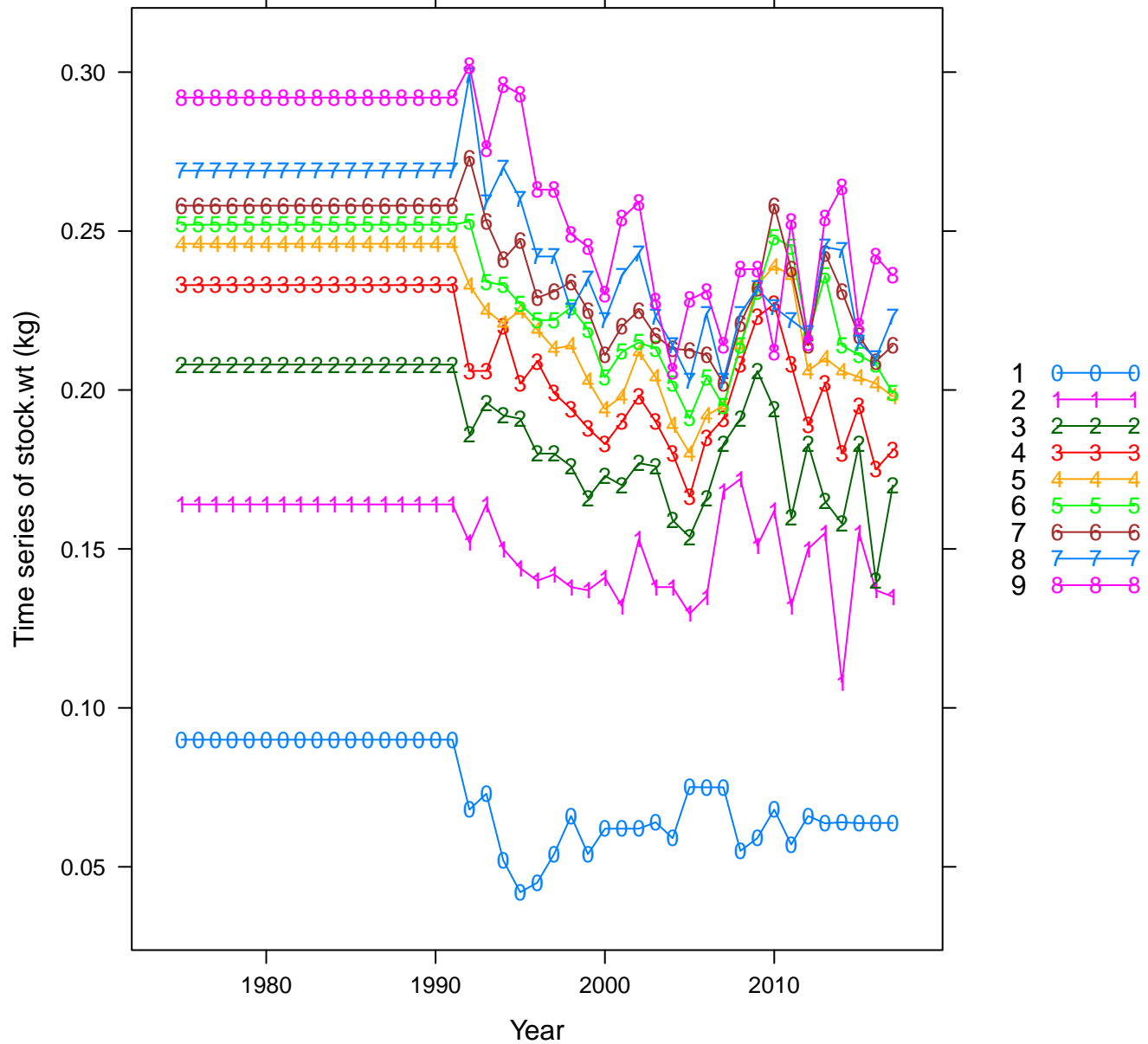
% difference numbers at age



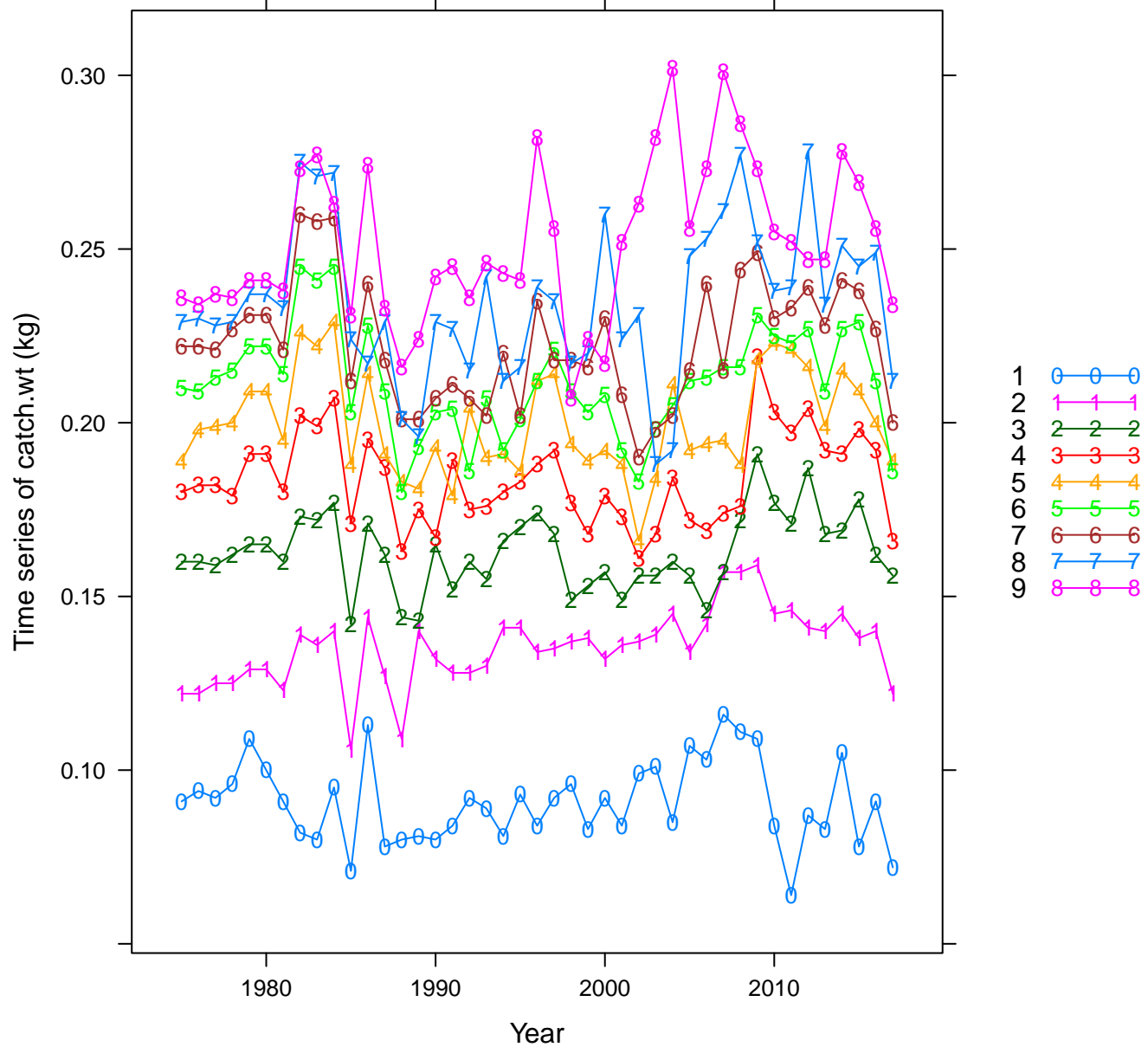
# Process error deviation in M



# Herring in Vla (combined) and VIIbc timeseries of stock.wt

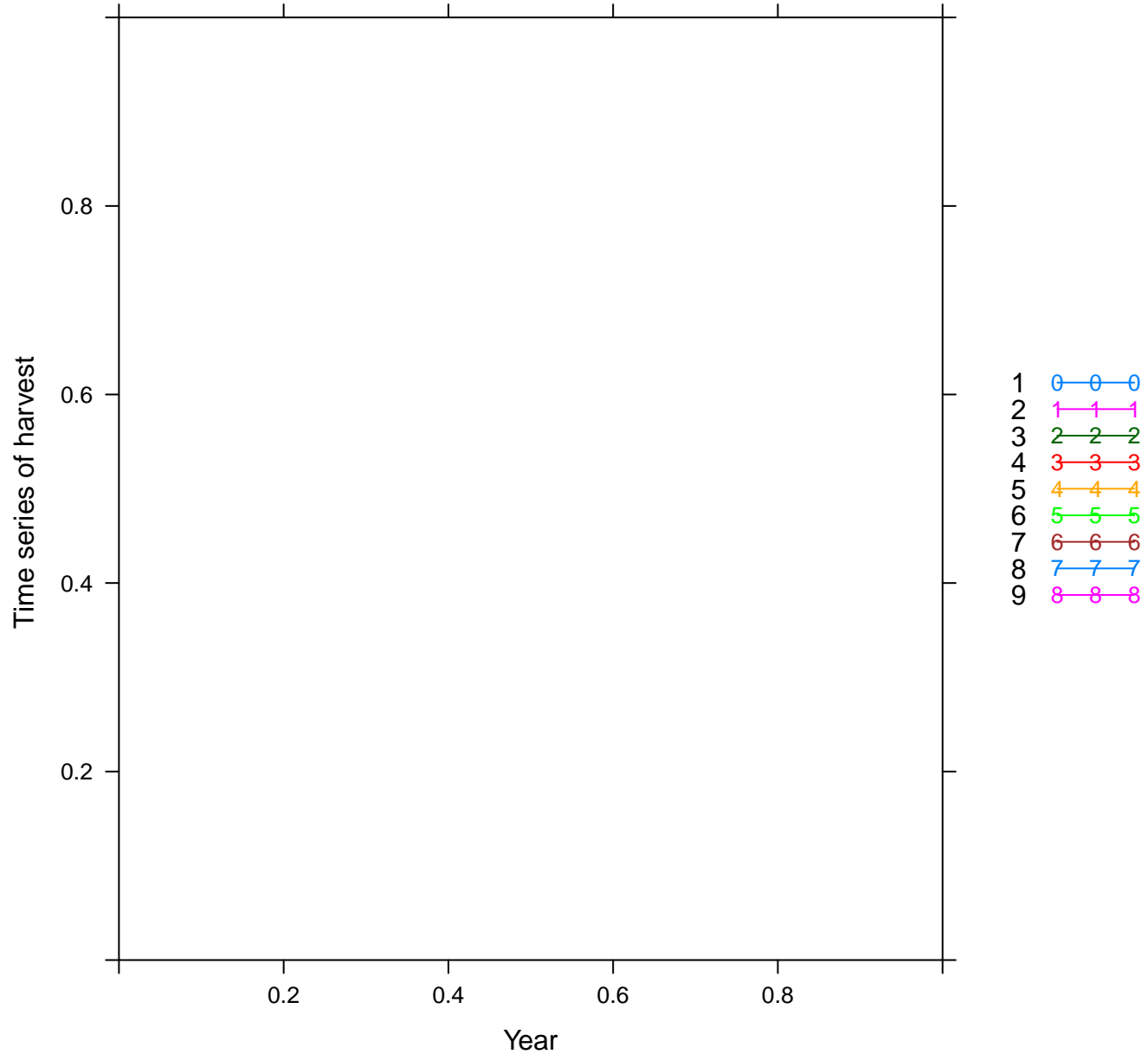


# Herring in Vla (combined) and VIIbc timeseries of catch.wt

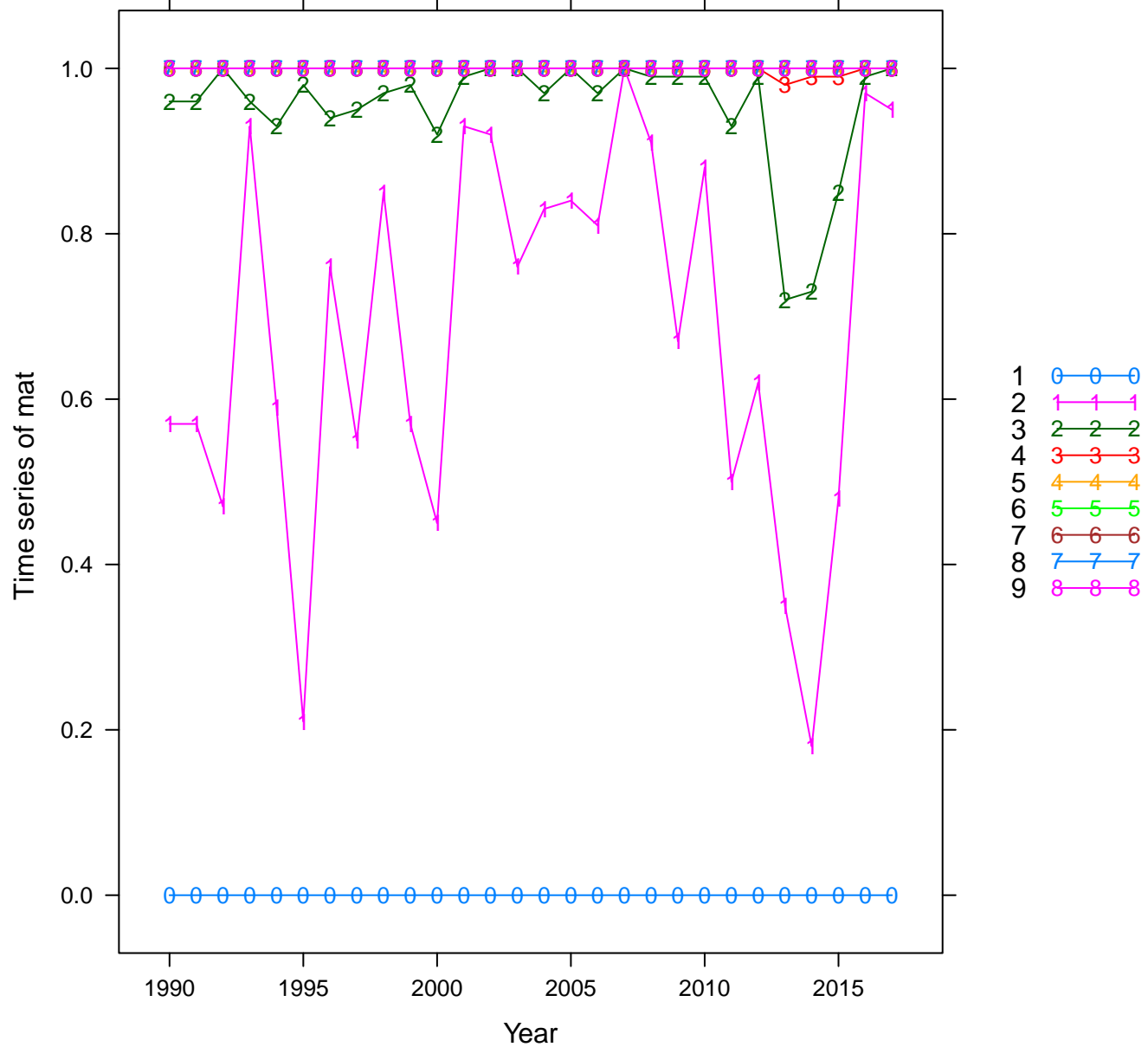




# Herring in Vla (combined) and VIIbc timeseries of harvest



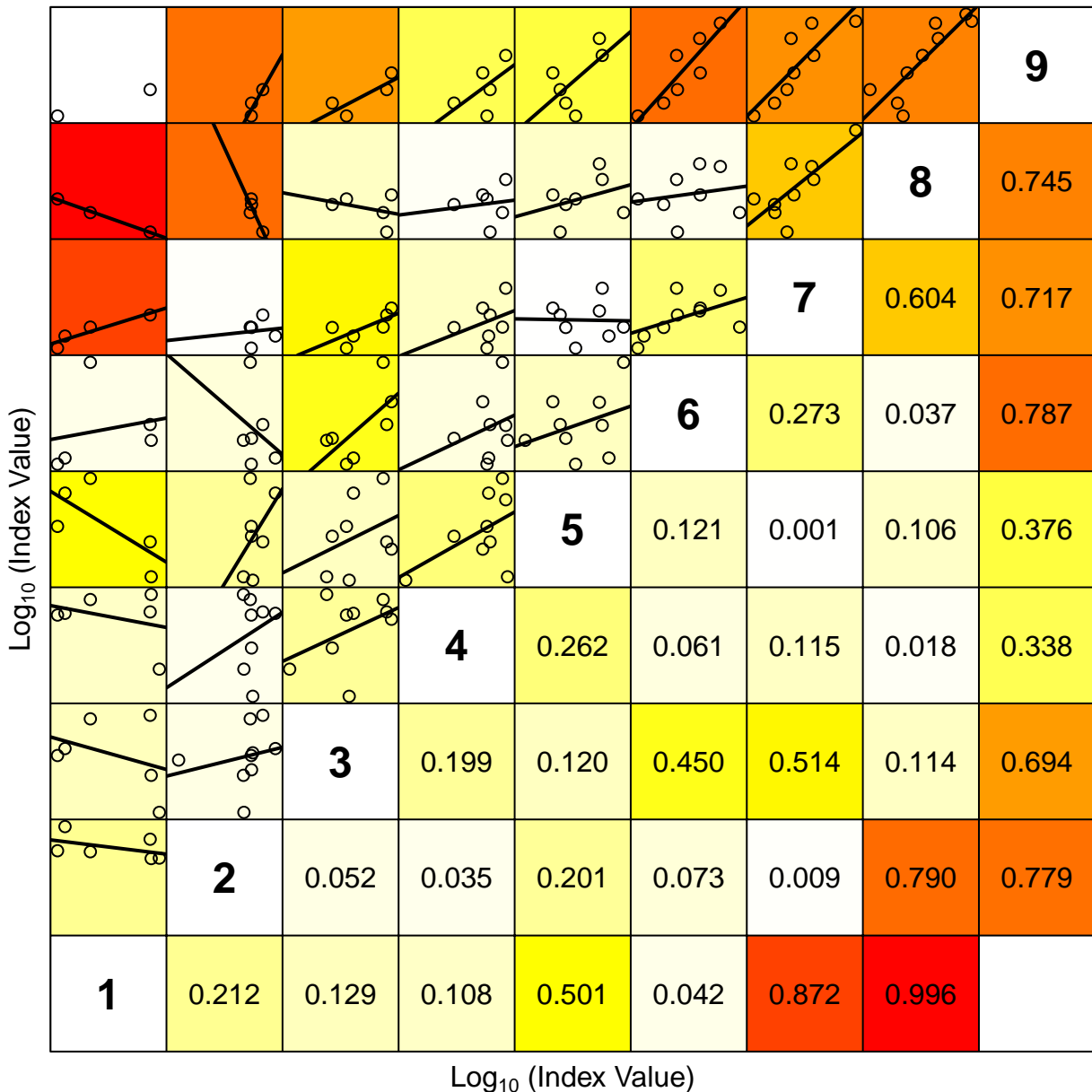
## Herring in Vla (combined) and VIIbc timeseries of mat



# Herring in Vla (combined) and VIIbc timeseries of m

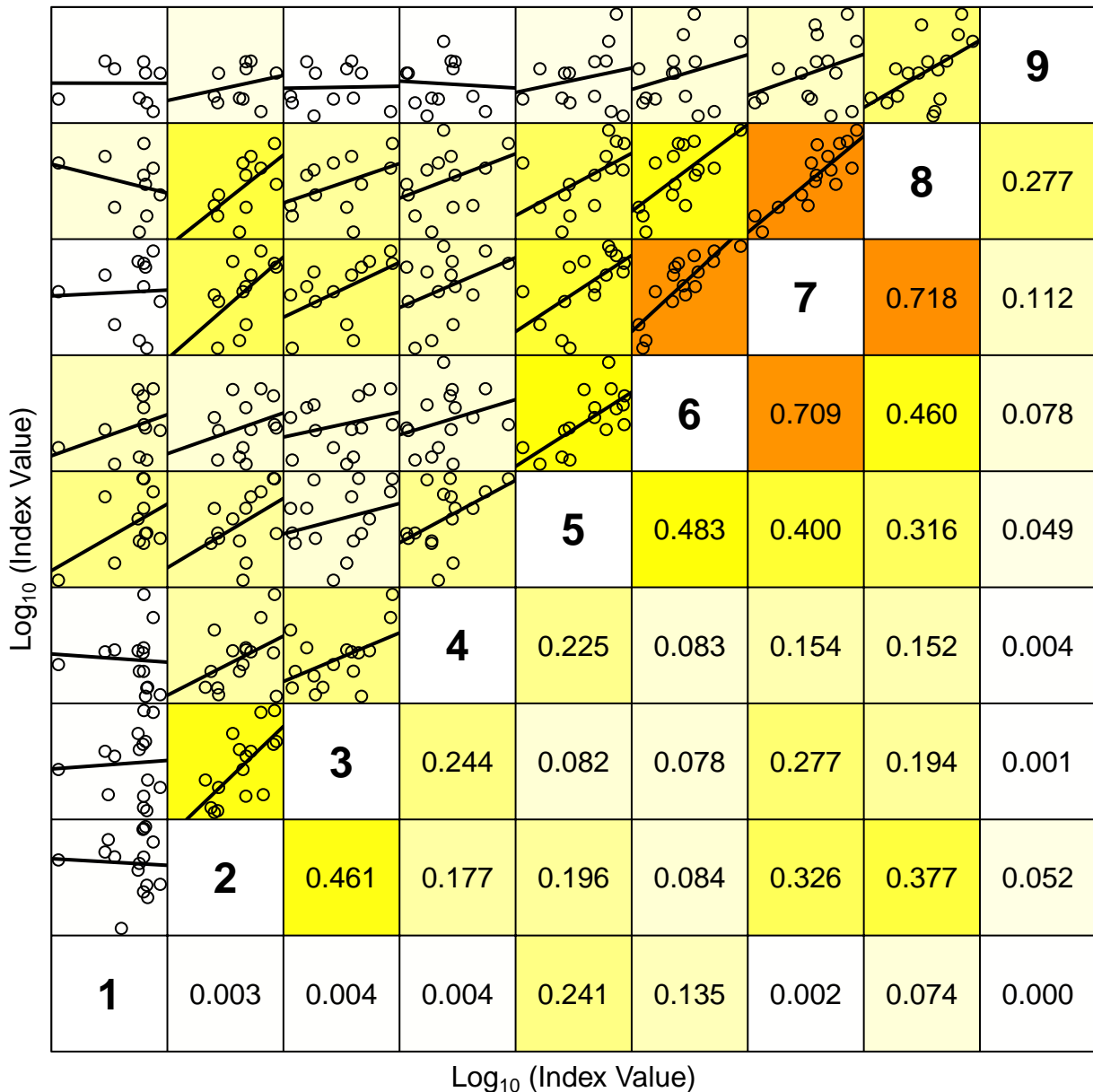


# MS HERAS



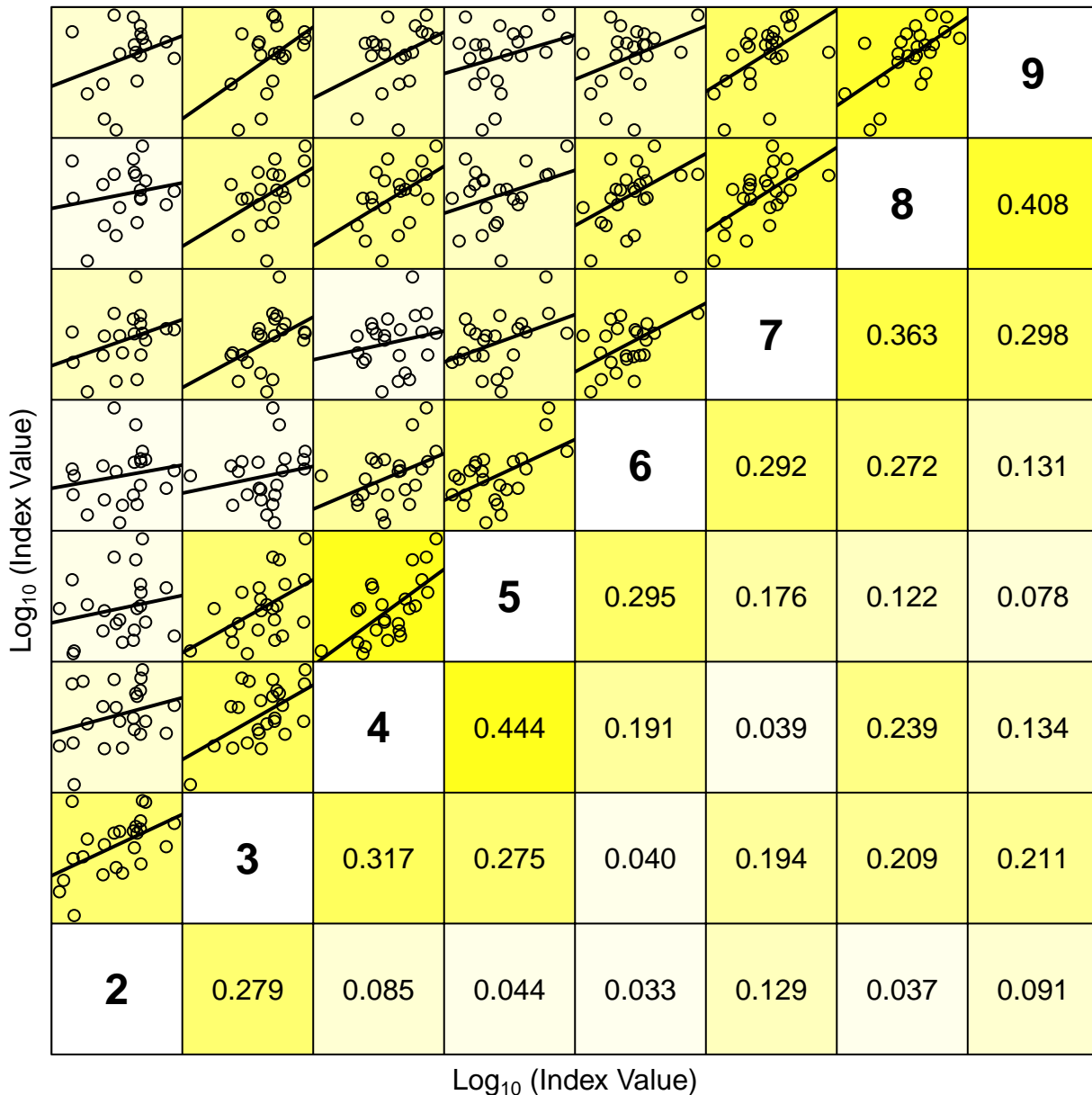
Lower right panels show the Coefficient of Determination ( $r^2$ )

# WoS HERAS



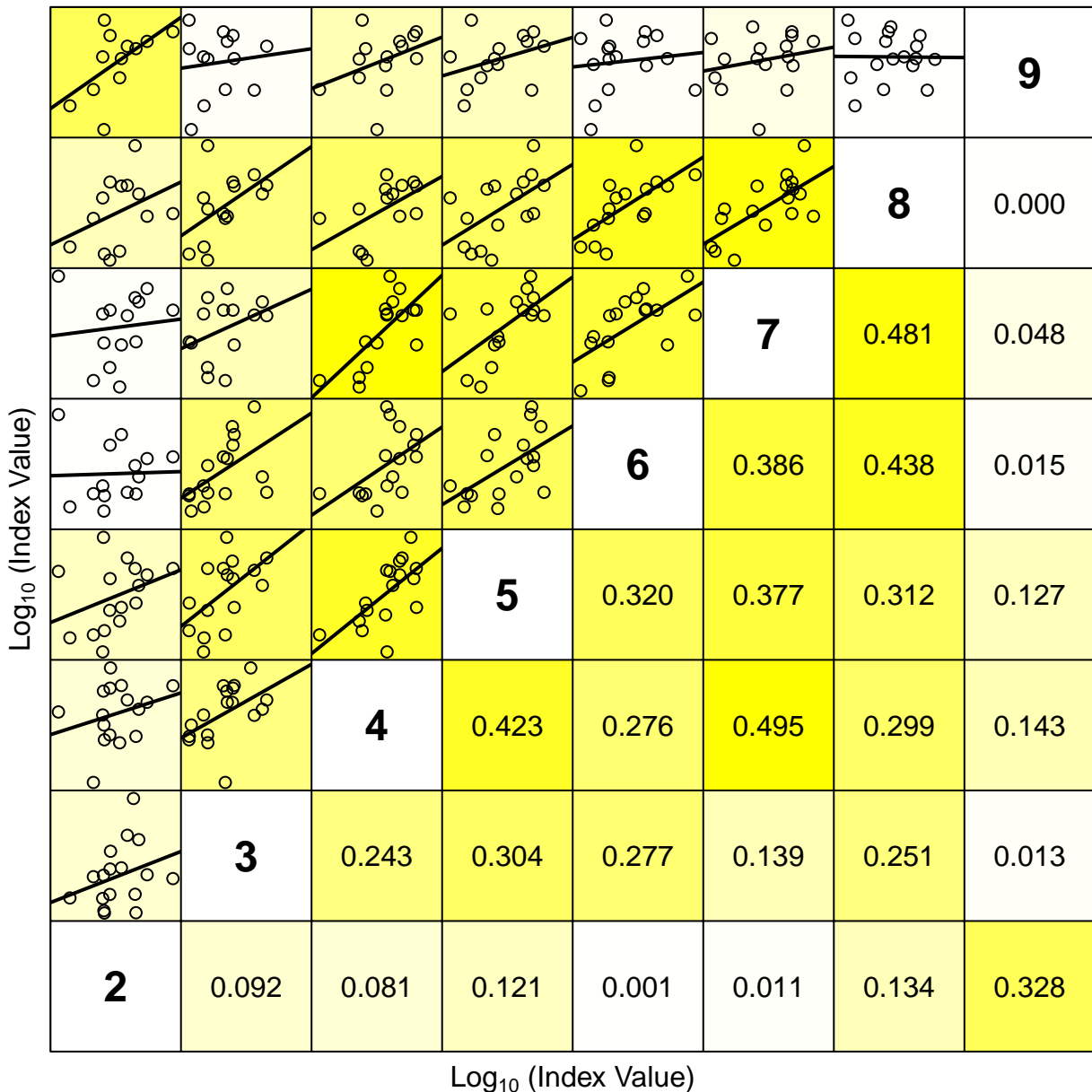
Lower right panels show the Coefficient of Determination ( $r^2$ )

# IBTS-Q1

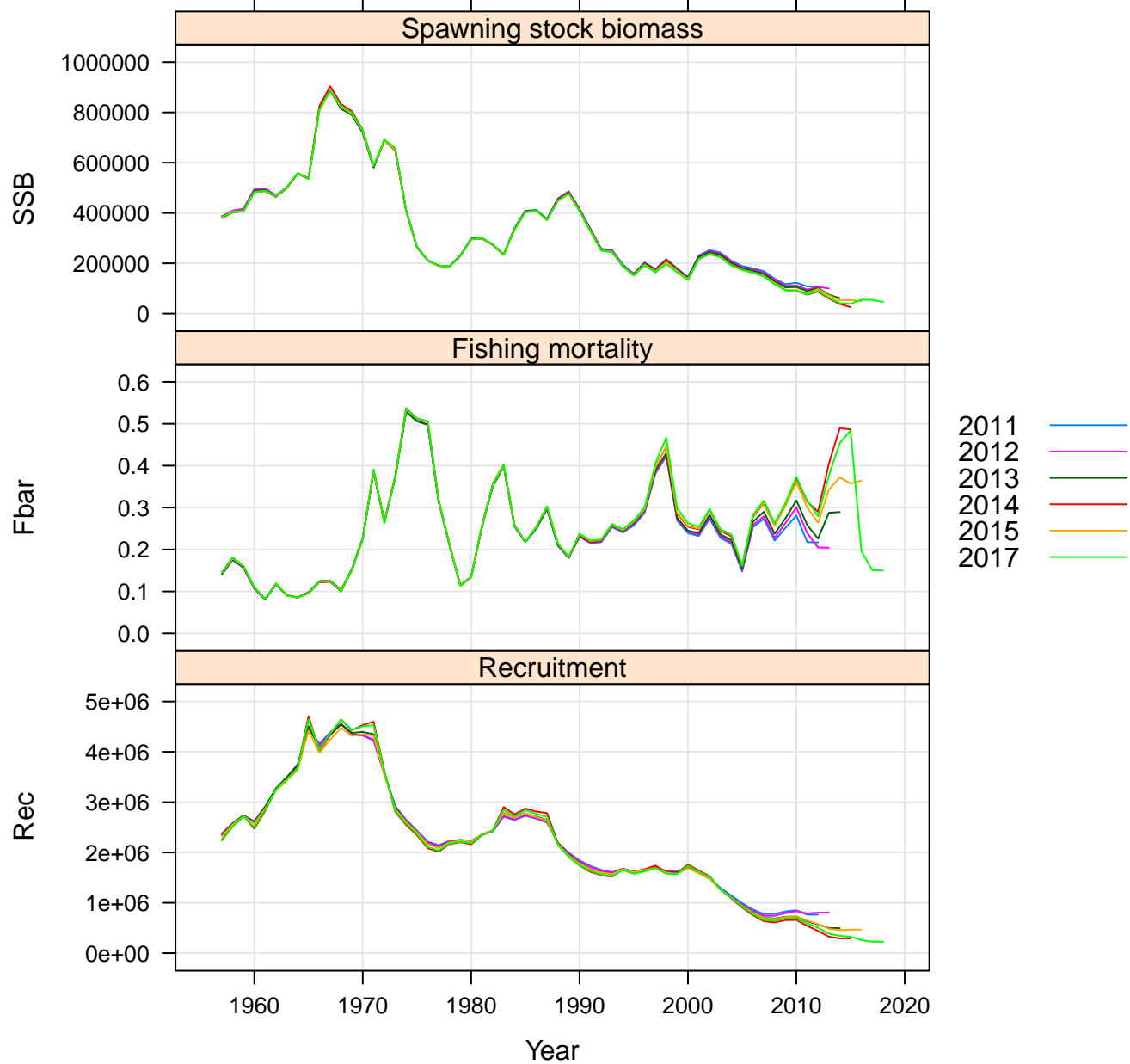


Lower right panels show the Coefficient of Determination ( $r^2$ )

# IBTS-Q4

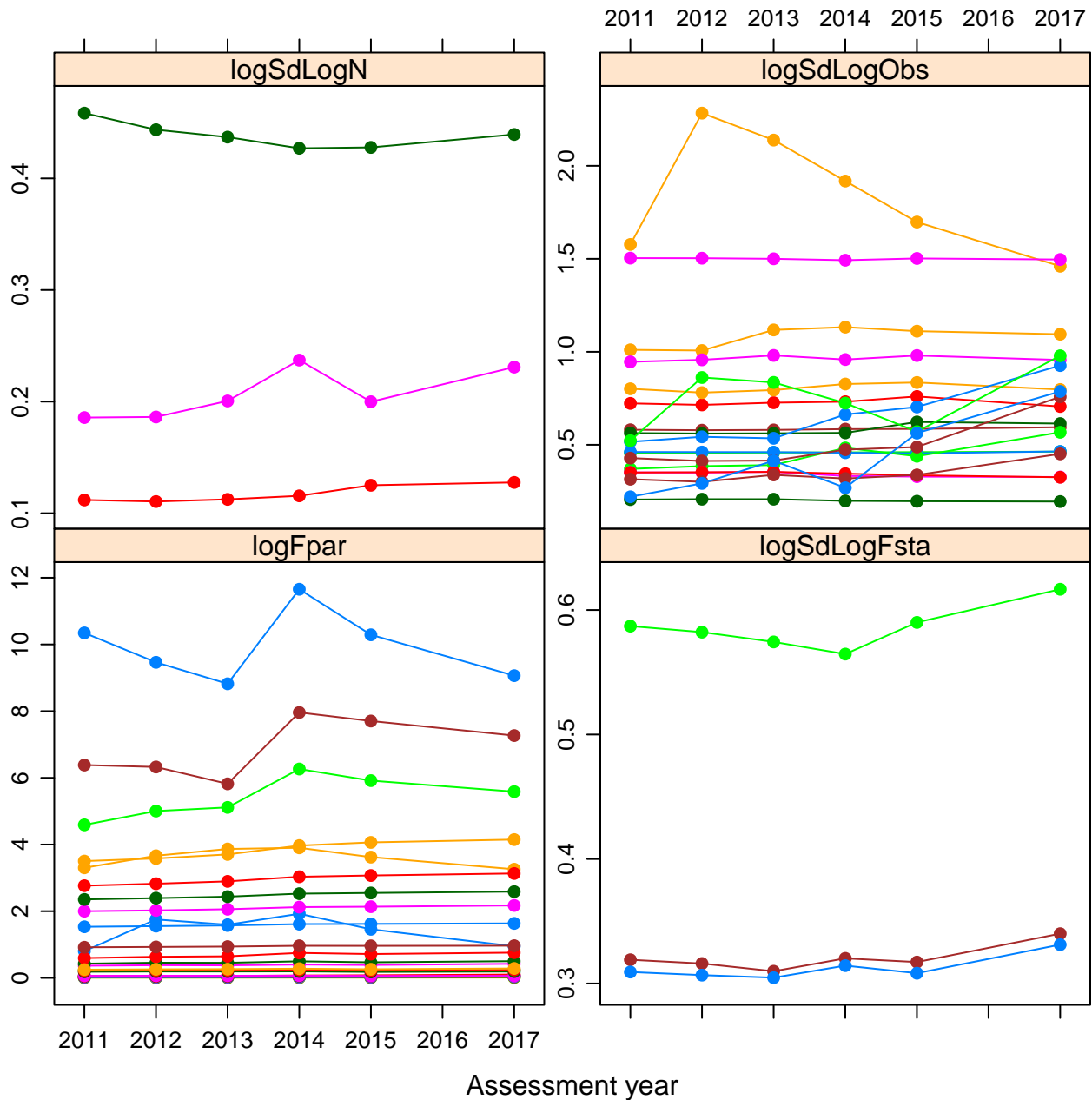


Lower right panels show the Coefficient of Determination ( $r^2$ )





Parameter value



# Retrospective pattern in F at age

