Tables of GAM results in paper

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```
# root dir
knitr::opts_knit$set(root.dir =
#                       "D:/Cloudstor/Virtual Experiments/VirtExp")
                      "C:/Users/rver4657/ownCloud/Virtual Experiments/VirtExp")
knitr::opts_chunk$set(echo = TRUE)
# LOAD REQUIRED PACKAGES # #####
library(pander)
library(tidyr)
library(xts)
library(zoo)
library(Kendall)
library(mgcv)
```

This rmarkdown document and the resulting pdf are stored on Zenodo. All directories (apart from the root working directory) refer to the directories in the underlying github repository.

Introduction

This document is related to the manuscript "Disentangling climate change trends in Australian streamflow" (vervoort et al.), submitted.

This document is a further component on the analysis of the streamflow data using Generalised Additive models (GAM) testing for a trend in the data , or testing for a trend in the residuals (part 3 of the series, 3.GAMmodelTests.pdf). This document, part 3A, only creates table 4, 5, 6 in the Manuscript and back transforms the trends. For the back transformation we use : $BackTransformedTrend = exp(Trend) - 1$ see 3B.InterpretationOfSlopeExplantion.pdf The data for this document has been generated in document 3 and was stored in a temporary directory called **"../projectdata"**, so one directory up and then a directory called "projectdata". This directory is not included on github, as this data can be regenerated using document 3. Only the results using the precipitation data from the gridded rainfall is used here as the results from the station rainfall are not different.

Table 4

This table combines the results of model 1 and model 2, or the simple trend analysis for flow (Q) and precipitation (P).

```
# read in the flow data (a data frame called Store2)
load("../projectdata/Store2_TrendOnlyAnalysis.RData")
```

```
Flow <- do.call(rbind, lapply(1:length(Store2), function(i) rbind(Store2[[i]][[2]])))

# read in the Precipitation data (a data frame called Store_Rain)
load("../projectdata/StoreGridRain_TrendAnalysis.RData")
Rain <- do.call(rbind, lapply(1:length(Store_GridRain),
                    function(i) rbind(Store_GridRain[[i]][[2]])))

# create a data frame that combines the relevant columns
# if p.value < 0.1 do not calculate the annual trend
Table4 <- data.frame(Station = Flow$Station,
                    Qtrend = Flow$Value, Qpvalue = Flow$p.value,
                    Q_percent = ifelse(Flow$p.value < 0.1,
                                       (exp(Flow$Value)-1),NA),
                    Ptrend = Rain$Value, Ppvalue = Rain$p.value,
                    P_percent = ifelse(Rain$p.value < 0.1,
                                       (exp(Rain$Value)-1),NA))
# now save the table as a csv file
write.csv(Table4, "../projectdata/Table4.csv", row.names=F)
# show table
pander(Table4, caption = "This is Table 4 in the manuscript")
```

Table 1: This is Table 4 in the manuscript

Station	Qtrend	Qpvalue	Q_percent	Ptrend	Ppvalue	P_percent
COTT	-0.0003546	0.01402	-0.0003545	-0.0001669	0.003116	-0.0001669
RUTH	-0.000799	3.137e-15	-0.0007987	-0.0001857	0.007627	-0.0001857
CORA	-0.0003226	0.01401	-0.0003226	-0.0001504	0.02484	-0.0001504
ELIZ	0.00045	0.1192	NA	8.306e-05	0.4373	NA
COCH	-1.016e-05	0.9262	NA	-7.317e-05	0.4043	NA
COEN	0.0002589	0.4821	NA	-0.0002984	0.05627	-0.0002983
SCOT	-0.0002845	0.3101	NA	-5.27e-05	0.4394	NA
HELL	-0.0001685	0.1736	NA	-4.105e-05	0.4827	NA
NIVE	-6.304e-05	0.7877	NA	-0.000108	0.03926	-0.000108
MURR	-0.0002631	4.74e-06	-0.0002631	-9.361e-05	0.1143	NA
SOUT	-0.0001576	0.004749	-0.0001575	-0.0001672	0.00117	-0.0001672
YARR	-0.0002415	0.5285	NA	-1.924e-05	0.8348	NA
DOMB	-0.0002252	0.5674	NA	-0.0001051	0.2424	NA

Table 5

This table combines the results of model 3, which is the GAMM analysis for flow (Q) taking into account the effect of precipitation (P). The AIC values are given to allow comparison with Table 6 in the manuscript.

```
# read in the results of model 3 (a data frame called Store_Fwr)
load("../projectdata/StoreFwGR_TrendAnalysis.RData")

Flow <- do.call(rbind, lapply(1:length(Store_FwGR),
                            function(i) rbind(Store_FwGR[[i]][[2]])))

# create a data frame that combines the relevant columns
```

```
# if p.value < 0.1 do not calculate the annual trend
Table5 <- data.frame(Station = Flow$Station, AIC = Flow$AIC,
                     Qtrend = Flow$Value, Qpvalue = Flow$p.value,
                     Q_percent = ifelse(Flow$p.value < 0.1,
                                        (exp(Flow$Value)-1),NA))
# now save the table as a csv file
write.csv(Table5, "../projectdata/Table5.csv", row.names=F)
# show table
pander(Table5, caption = "This is Table 5 in the manuscript")
```

Table 2: This is Table 5 in the manuscript

Station	AIC	Qtrend	Qpvalue	Q_percent
COTT	1347	-0.0002306	0.0313	-0.0002305
RUTH	1957	-0.0005375	5.441e-12	-0.0005373
CORA	3801	-0.0001632	0.002504	-0.0001632
ELIZ	2737	-3.02e-05	0.8857	NA
COCH	2157	-1.3e-06	0.989	NA
COEN	2791	-1.277e-05	0.9453	NA
SCOT	1561	-6.444e-05	0.4501	NA
HELL	2902	-0.0001372	0.1585	NA
NIVE	3395	-6.139e-05	0.6897	NA
MURR	774.9	-0.0002025	3.964e-05	-0.0002025
SOUT	2240	-0.0001143	0.01588	-0.0001143
YARR	-512.9	-0.0001101	0.01643	-0.0001101
DOMB	2128	-0.0001137	0.5228	NA

Table 6

This table combines the results of model 4 and 5, which is the GAMM analysis for flow (Q) taking into account the effect of precipitation (P) and actual ET via s(P,maxT). The AIC values are given to allow comparison with Table 5 in the manuscript.

```
# read in the results of model 4 (a data frame called Store_FwGRE)
load("../projectdata/StoreFwGRE_TrendAnalysis.RData")

Flow_m4 <- do.call(rbind, lapply(1:length(Store_FwGRE),
                          function(i) rbind(Store_FwGRE[[i]][[2]])))

# read in the results of model 5 (a data frame called Store_FwGRE2)
load("../projectdata/StoreFwGRE2_TrendAnalysis.RData")

Flow_m5 <- do.call(rbind, lapply(1:length(Store_FwGRE2),
                          function(i) rbind(Store_FwGRE2[[i]][[2]])))
# load "real_df" with results Mann-Kendall for Model 5
load("../projectdata/GrMKResidGAM_MDPaper.Rdata")



# create a data frame that combines the relevant columns
```

```r
# if p.value < 0.1 do not calculate the annual trend
Table6 <- data.frame(Station = Flow_m4$Station, AIC = Flow_m4$AIC,
                     Qtrend = Flow_m4$Value,
                     Qpvalue = Flow_m4$p.value,
                     Q_percent = ifelse(Flow_m4$p.value < 0.1,
                                 (exp(Flow_m4$Value)-1),NA),
                     AIC_5 = Flow_m5$AIC,
                     `tau MK` = weeklyTable_Mod5_grid$tau_MK,
                     `p-value MK` = weeklyTable_Mod5_grid$p.value.MK,
                     `Hurst coefficient` = weeklyTable_Mod5_grid$Hurst.value,
                     `Hurst p-value` = weeklyTable_Mod5_grid$Hurst.p.value,
                     `p-value LTP MK` = weeklyTable_Mod5_grid$MK.LTP.p.value)

# now save the table as a csv file
write.csv(Table6, "../projectdata/Table6.csv", row.names=F)
# show table
pander(Table6, caption = "This is Table 6 in the manuscript")
```

Table 3: This is Table 6 in the manuscript (continued below)

Station	AIC	Qtrend	Qpvalue	Q_percent	AIC_5	tau.MK
COTT	997.8	-0.0002363	0.0591	-0.0002363	1008	-0.03058
RUTH	1746	-0.0005485	6.455e-10	-0.0005484	1777	-0.1149
CORA	3804	-0.0001627	0.002392	-0.0001626	3812	-0.04533
ELIZ	2676	-3.019e-05	0.8896	NA	2675	-0.002354
COCH	1693	-8.489e-06	0.9418	NA	1695	0.01135
COEN	2781	-1.569e-05	0.9327	NA	2781	0.01319
SCOT	1556	-6.624e-05	0.4324	NA	1555	-0.01539
HELL	2815	-0.0001438	0.1991	NA	2824	-0.01886
NIVE	3291	-6.999e-05	0.6893	NA	3297	-0.009483
MURR	-404.6	-0.000202	0.003849	-0.000202	-391.7	-0.05238
SOUT	1460	-0.0001251	0.03497	-0.0001251	1468	-0.02881
YARR	-514.3	-0.0001098	0.01567	-0.0001098	-511.7	-0.01317
DOMB	2131	-0.0001138	0.521	NA	2130	-0.002892

p.value.MK	Hurst.coefficient	Hurst.p.value	p.value.LTP.MK
0.03265	0.4698	0.00869	0.01465
9.926e-16	0.455	5.389e-05	1.241e-23
0.001545	0.4939	0.7481	0.001752
0.8694	0.5154	0.08395	0.8865
0.428	0.4397	3.596e-08	0.2784
0.3568	0.4685	0.005884	0.2884
0.2824	0.4039	4.325e-19	0.07028
0.1878	0.4405	5.535e-08	0.07301
0.5077	0.557	1.128e-08	0.6553
0.0002532	0.4194	9.954e-14	1.772e-08
0.04419	0.4481	2.581e-06	0.008855
0.3578	0.4028	1.711e-19	0.1192
0.8399	0.452	1.505e-05	0.7974