MTO Fatal, DRCOND

The time series comprises all fatal accidents. The data were aggregated to monthly time series from January 1992 to December 1998. So there are $n = 84$ observations. May 1996 corresponds to observation #53 in this series. There are 16 time series corresponding to the variables for hour window (11PM, 12AM, 1AM, 2AM), weekgroup (SunWed, ThuSat) and driver condition (sober, drunk). The codes used and their defintions are given in the table below.

#	Code	Definition
1	PM11SS	11PM SunWed Sober
2	AM12SS	12AM SunWed Sober
3	AM1SS	1AM SunWed Sober
4	AM2SS	2AM SunWed Sober
5	PM11TS	11PM ThuSat Sober
6	AM12TS	12AM ThuSat Sober
7	AM1TS	1AM ThuSat Sober
8	AM2TS	2AM ThuSat Sober
9	PM11SD	11PM SunWed Drunk
10	AM12SD	12AM SunWed Drunk
11	AM1SD	1AM SunWed Drunk
12	AM2SD	2AM SunWed Drunk
13	PM11TD	11PM ThuSat Drunk
14	AM12TD	12AM ThuSat Drunk
15	AM1TD	1AM ThuSat Drunk
16	AM2TD	2AM ThuSat Drunk

The time series are comprised of very small counts mostly 0's and some 1's, 2's and 3's. Such time series are better modelled using a Poisson distribution or negative binomial but as we say previously in the TIRF late-night time series analysis, the sensitivity was only slightly improved. As a first step we will use usual intervention analysis method.

May 1996 corresponds to observation #53 in this series. A step intervention model defined by,

$$z_t = \mu + \delta_1 \xi_t + N_t \tag{1}$$

where N_t is the error term. Based on the pre-intervention data we assume initially that N_t is normal and independent, so ordinary multiple linear regression can be used. The intervention series are defined by,

$$\xi_t = \begin{cases} 0 & t < 53 \\ 1 & t \geq 53 \end{cases}$$

The pre-intervention series is fairly short so the following two-step approach to the ARIMA identification of the error term N_t will be used. In the first stage the model in eqn. (1) is fit using standard regression. Then the residuals, the estimated values, $\hat{N}_t$, are obtained and the residual autocorrelation of these residuals is examined. This approach should be expected to work well and is indeed theoretically superior to the alternative approach of basing the model identification on the pre-intervention residuals. The reason for this is that in the estimates of the autocorrelations of $\hat{N}_t$ are first-order efficient as are the estimates in the pre-intervention approach. However since the sample size is larger, this approach provides better estimates.

Regression Results

There was no detectable autocorrelation.

		Estimate	SE	TStat	PValue
PM11SS	1	0.538462	0.101349	5.31295	9.07993×10^{-7}
	ξ	−0.225962	0.164204	−1.3761	0.172536

		Estimate	SE	TStat	PValue
AM12SS	1	0.615385	0.110758	5.55613	3.33407×10^{-7}
	ξ	−0.115385	0.179448	−0.642997	0.52202

		Estimate	SE	TStat	PValue
AM1SS	1	0.480769	0.0921389	5.21788	1.33641×10^{-6}
	ξ	−0.137019	0.149282	−0.917855	0.361387

		Estimate	SE	TStat	PValue
AM2SS	1	0.538462	0.0928975	5.7963	1.21829×10^{-7}
	ξ	−0.100962	0.150511	−0.670791	0.504239

		Estimate	SE	TStat	PValue
PM11TS	1	0.692308	0.115189	6.01019	4.90556×10^{-8}
	ξ	**-0.317308**	**0.186628**	**-1.70022**	**0.0928799**

		Estimate	SE	TStat	PValue
AM12TS	1	1.03846	0.138186	7.51494	6.33127×10^{-11}
	ξ	**-0.413462**	**0.223887**	**-1.84674**	**0.0683925**

		Estimate	SE	TStat	PValue
AM1TS	1	0.461538	0.0930551	4.95984	3.75512×10^{-6}
	ξ	−0.211538	0.150767	−1.40309	0.164366

		Estimate	SE	TStat	PValue
AM2TS	1	0.942308	0.131471	7.1674	3.03204×10^{-10}
	ξ	−0.129808	0.213008	−0.609404	0.543942

		Estimate	SE	TStat	PValue
PM11SD	1	0.538462	0.101349	5.31295	9.07993×10^{-7}
	ξ	−0.225962	0.164204	−1.3761	0.172536

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AM12SD	1	0.615385	0.110758	5.55613	3.33407×10^{-7}
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AM2SD	1	0.538462	0.0928975	5.7963	1.21829×10^{-7}
	ξ	−0.100962	0.150511	−0.670791	0.504239

		Estimate	SE	TStat	PValue
PM11TD	1	0.692308	0.115189	6.01019	4.90556×10^{-8}
	ξ	**-0.317308**	**0.186628**	**-1.70022**	**0.0928799**

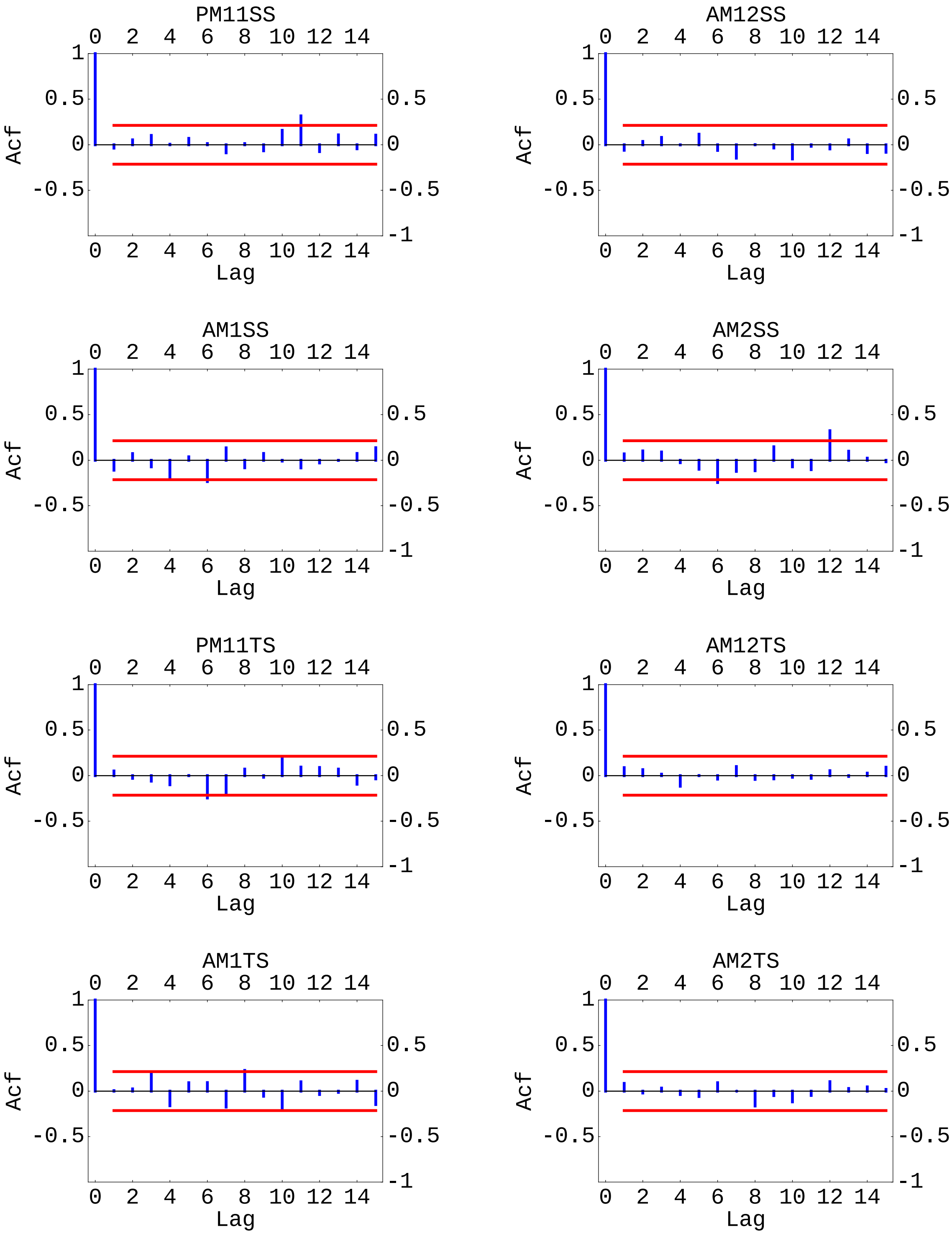
		Estimate	SE	TStat	PValue
AM12TD	1	1.03846	0.138186	7.51494	6.33127×10^{-11}
	ξ	**-0.413462**	**0.223887**	**-1.84674**	**0.0683925**

		Estimate	SE	TStat	PValue
AM1TD	1	0.461538	0.0930551	4.95984	3.75512×10^{-6}
	ξ	−0.211538	0.150767	−1.40309	0.164366

		Estimate	SE	TStat	PValue
AM2TD	1	0.942308	0.131471	7.1674	3.03204×10^{-10}
	ξ	−0.129808	0.213008	−0.609404	0.543942

Residual Autocorrelation Analysis

The residual autocorrelation from the regression model are examined and used to select tentative ARIMA models.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AM12SS
AM1SS
AM2SS
PM11TS
AM12TS
AM1TS
AM2TS
Acf
Lag
0 2 4 6 8 10 12 14
1
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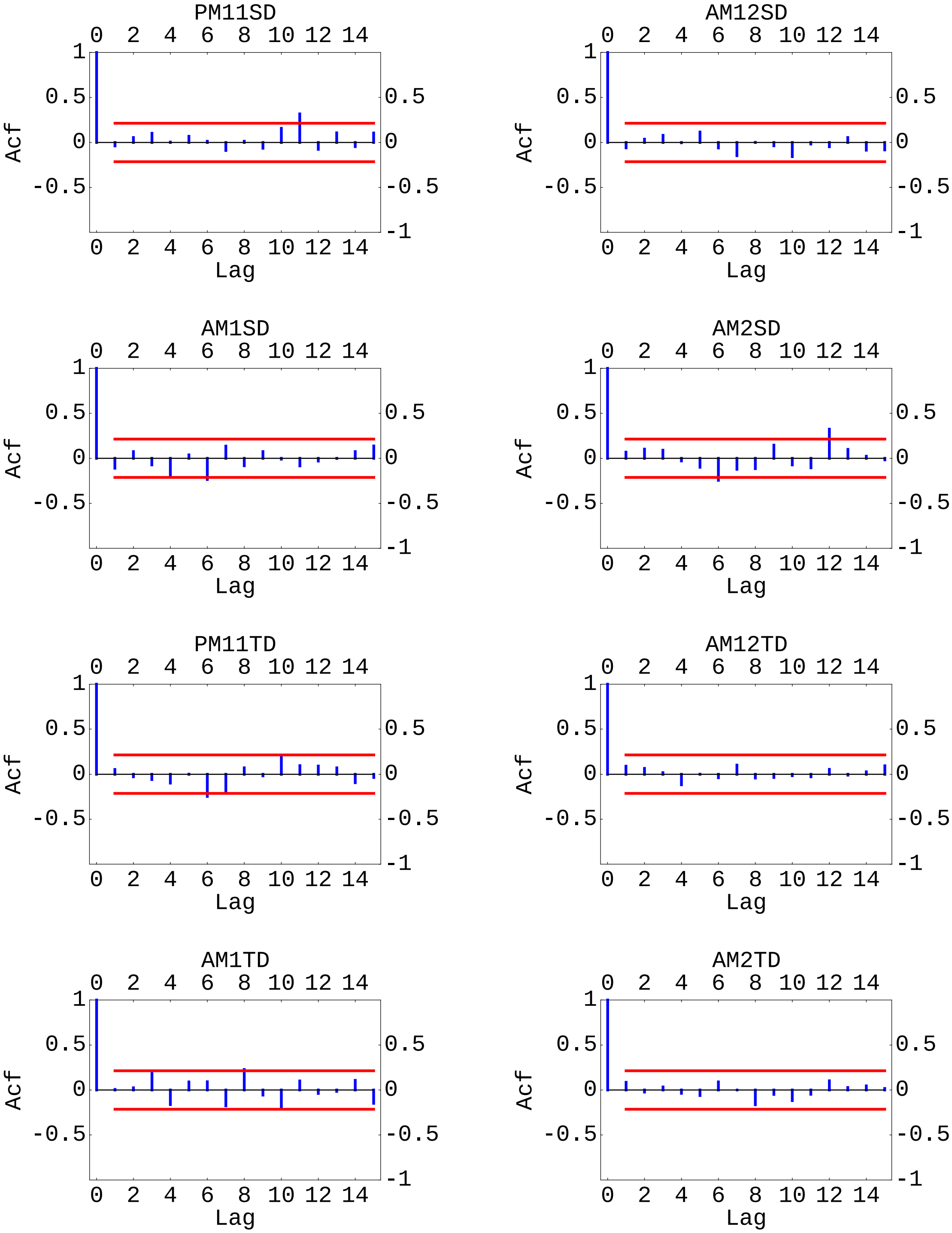
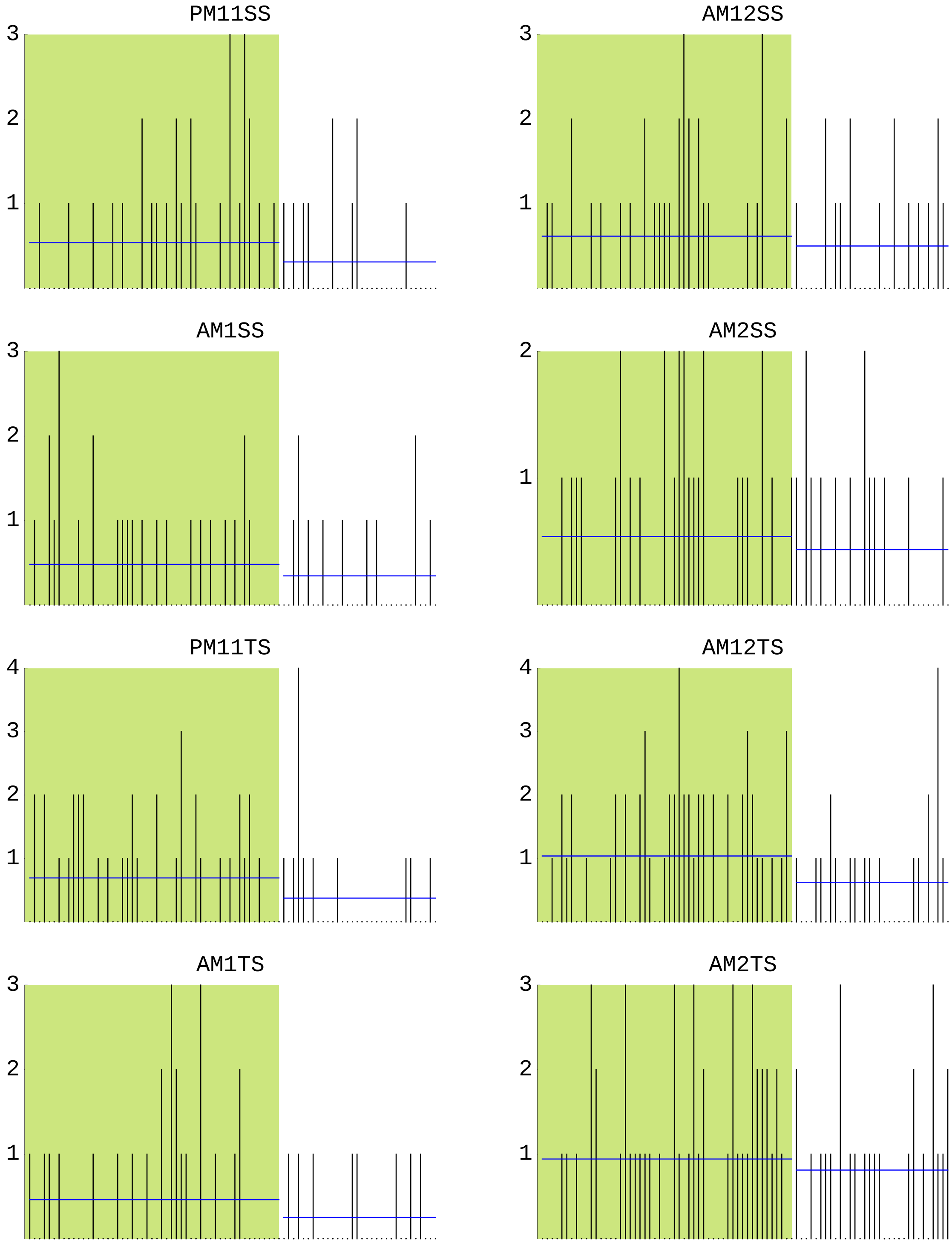
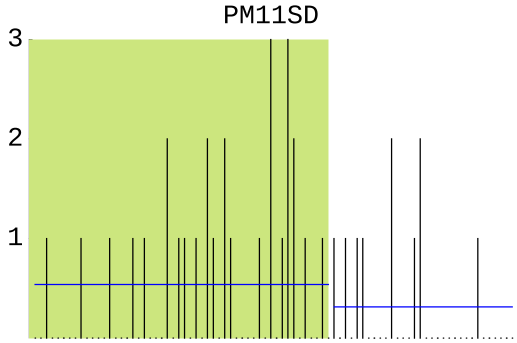
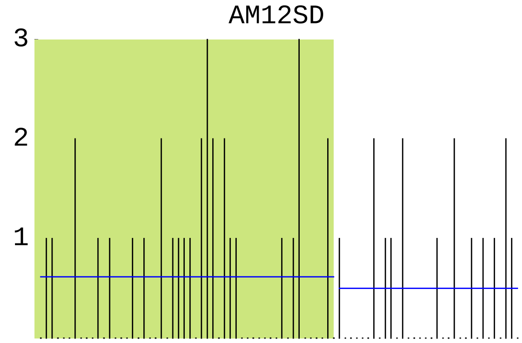
0
-0.5
-1

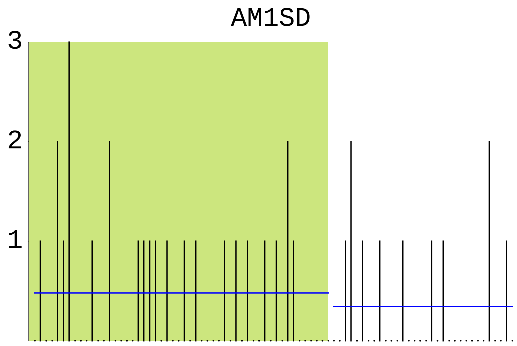

PM11SD
AM12SD
AM1SD
AM2SD
PM11TD
AM12TD
AM1TD
AM2TD
Acf
Lag
0 2 4 6 8 10 12 14
1
0.5
0
-0.5
-1

Intervention Visualization




PM11SD
3
2
1


AM12SD
3
2
1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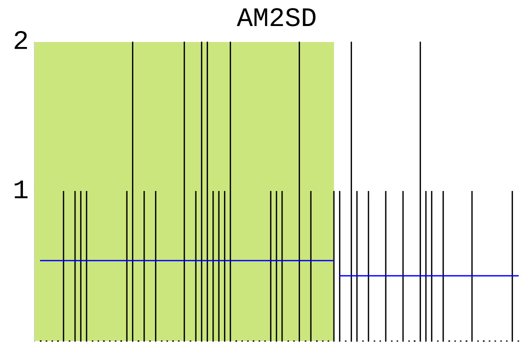
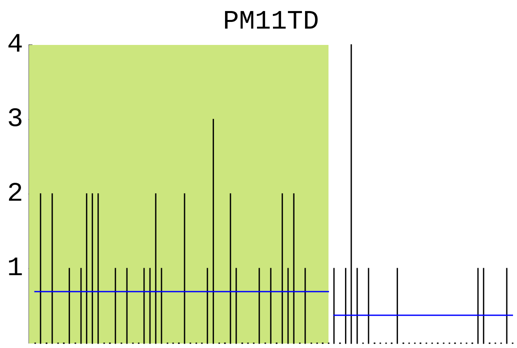
3
2
1


AM2SD
2
1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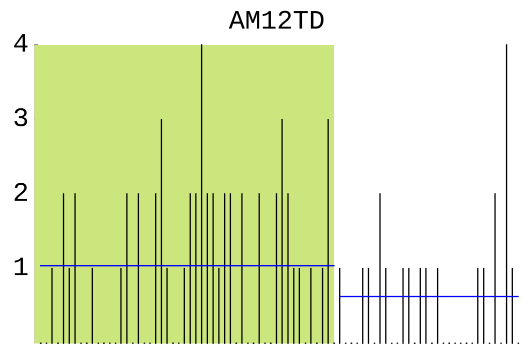
4
3
2
1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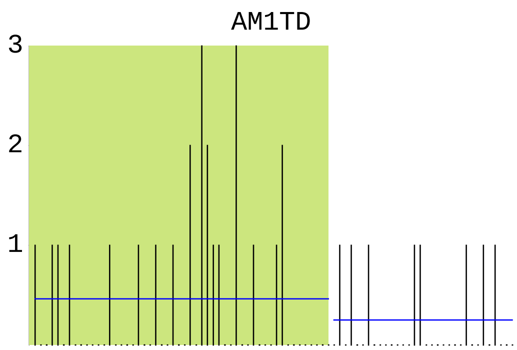
4
3
2
1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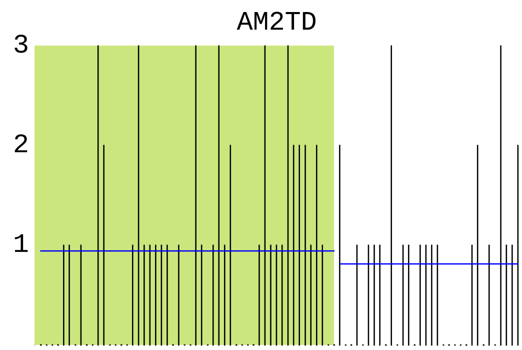
3
2
1


AM2TD
3
2
1