MISTPOL

Michigan State Police data on car accidents for three border counties. The time series used start in May 1992 and run through to April 1999. There are 84 observations in all and the extended bar hours intervention starts May 1996 corresponding to the 49th observation in the series. The specific time series selected for intervention analysis is the number of fatalities per month in which alcohol was involved. This is compared also with the corresponding time series of monthly fatalities not involving drinking.

Intervention Analysis

May 1996 corresponds to observation #49 in this series. A step intervention model defined by,

$$z_t = \mu + \delta\ \xi_t + N_t \qquad (1)$$

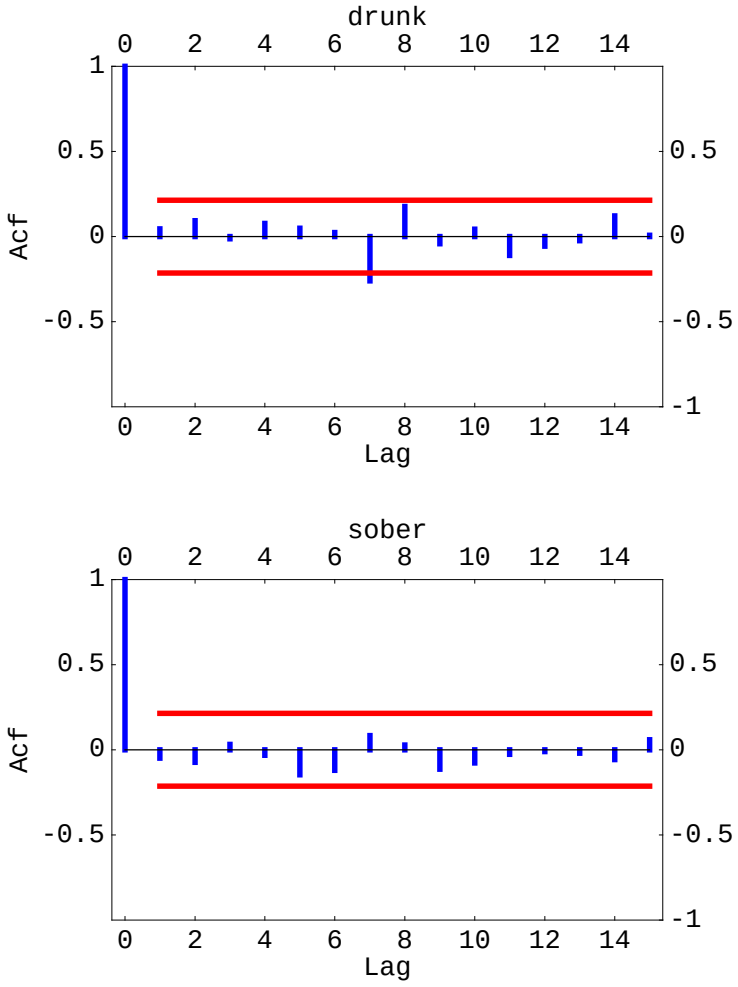
where N_t is the error term. Based on the pre-intervention data we assume initially that N_t is normal and independent, so ordinary multiple linear regression can be used. The intervention series are defined by,

$$\xi_t = \begin{cases} 0 & t < 49 \\ 1 & t \geq 49 \end{cases}$$

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.

Residual Autocorrelation of Fitted Regression

Since there are no large autocorrelations evident at lags one and tweleve, the initial model $N_t \sim$ ARIMA(0, 0, 0) is accepted.



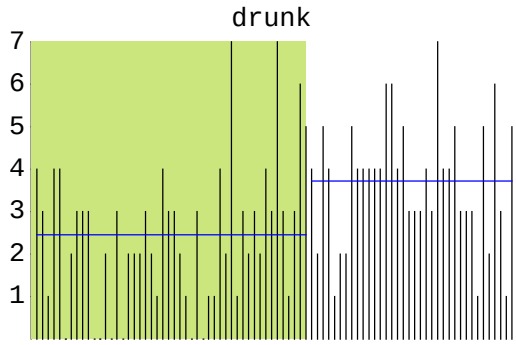
■ Regression Coefficients

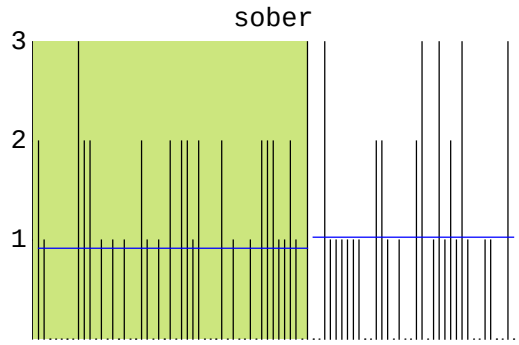
		Estimate	SE	TStat	PValue
drunk	1	2.45833	0.232704	10.5642	0.
	ξ	**1.26389**	**0.355461**	**3.55563**	**0.000629329**

		Estimate	SE	TStat	PValue
sober	1	0.916667	0.141348	6.48515	6.26466×10^{-9}
	ξ	0.111111	0.215913	0.51461	0.60821

■ Visualization

There has clearly been an increase in deaths involving drinking since May 1996 and there is no corresponding change in the death rate for sober drivers.


drunk
7
6
5
4
3
2
1


sober
3
2
1