Modeling Frequency of Terrorist Attacks

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From the

$(p,d,q) \times (P,D,Q)_s$	AIC	AICc	BIC	MSE
$(0,1,1)$	5.248	5.252	4.265	14907
$(0,1,1) \times (1,0,1)_4$	5.237	5.241	4.270	14578.57
$(0,1,1) \times (1,1,1)_4$	5.249	5.254	4.274	14183.01
$(0,1,1) \times (1,1,2)_4$	5.242	5.246	4.275	14934.03
$(1,1,2)$	5.256	5.260	4.288	15044.47
$(1,1,2) \times (1,0,1)_4$	5.243	5.247	4.292	15130.19
$(1,1,2) \times (1,1,1)_4$	5.252	5.257	4.294	15197.85
$(1,1,2) \times (1,1,2)_4$	5.250	5.254	4.299	15074.55

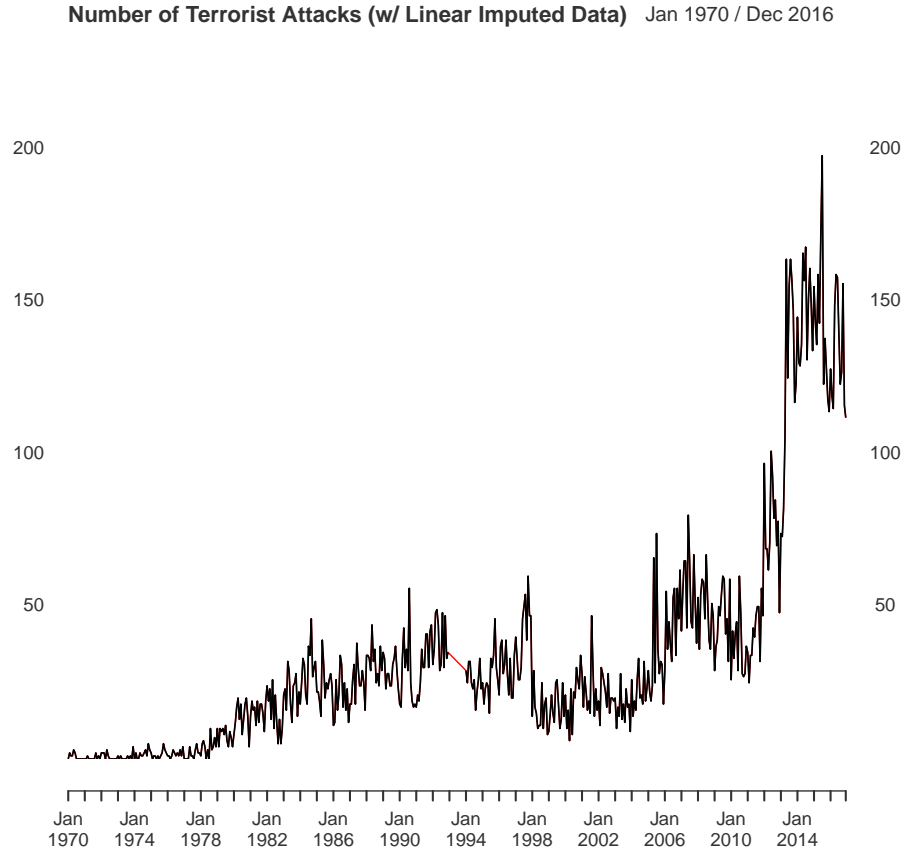Tab. 1: The metrics associated with different SARIMA models denoted by the left hand column.

Number of Terrorist Attacks (w/ Linear Imputed Data)   Jan 1970 / Dec 2016

Fig. 1: The original time series with a linear imputation (in red) for the missing data in 1993.

AR/MA	0	1	2	3	4	5	6	7	AR/MA	0	1	2	3	4	5	6	7
0	x	o	x	x	o	o	o	o	0	x	x	x	x	o	o	o	o
1	x	x	o	x	o	o	o	o	1	x	x	x	x	o	o	o	o
2	x	x	x	x	o	o	o	o	2	x	x	x	x	o	o	o	o
3	x	x	x	x	o	o	o	o	3	x	o	o	o	o	o	o	o
4	x	o	o	o	o	o	o	o	4	x	x	o	o	o	o	o	o
5	x	x	o	o	o	o	o	o	5	x	x	o	o	o	o	x	o
6	x	x	o	o	o	o	o	o	6	x	x	x	o	o	o	o	o
7	x	x	o	o	o	o	o	o	7	x	x	o	o	o	o	o	o

Tab. 2: The EACF table for once diffed (left) and twice diffed data (right).

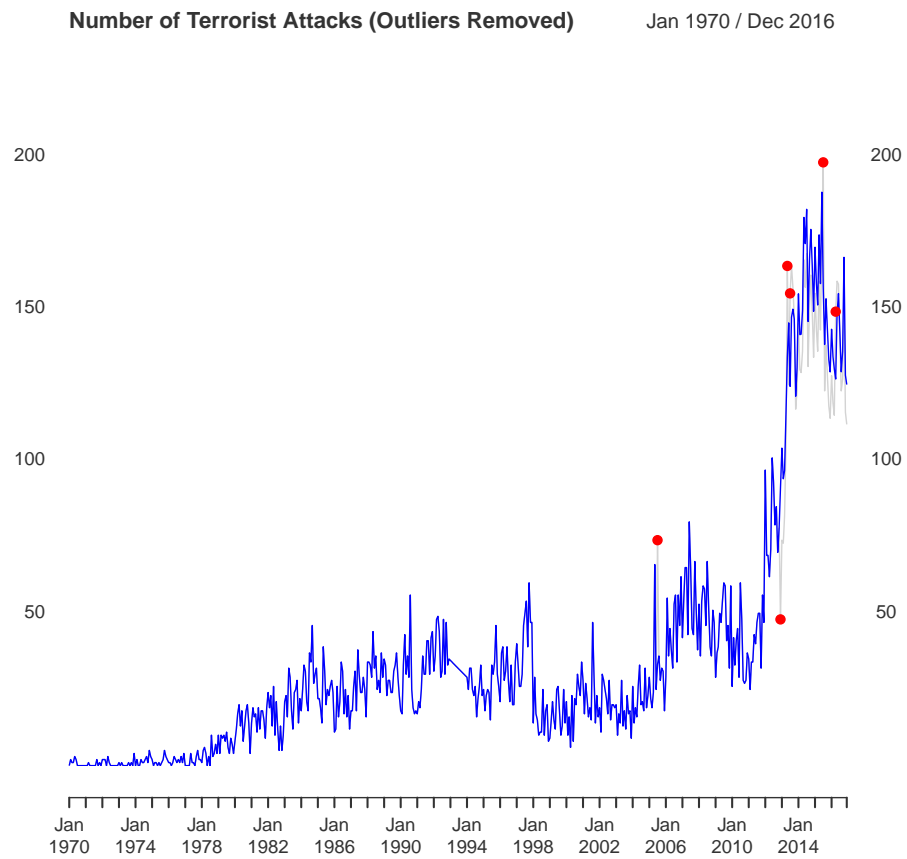**Number of Terrorist Attacks (Outliers Removed)**   Jan 1970 / Dec 2016

Fig. 2: The imputed time series (in blue) with outliers removed. The original time series shown in gray. The 6 outliers are shown in red.

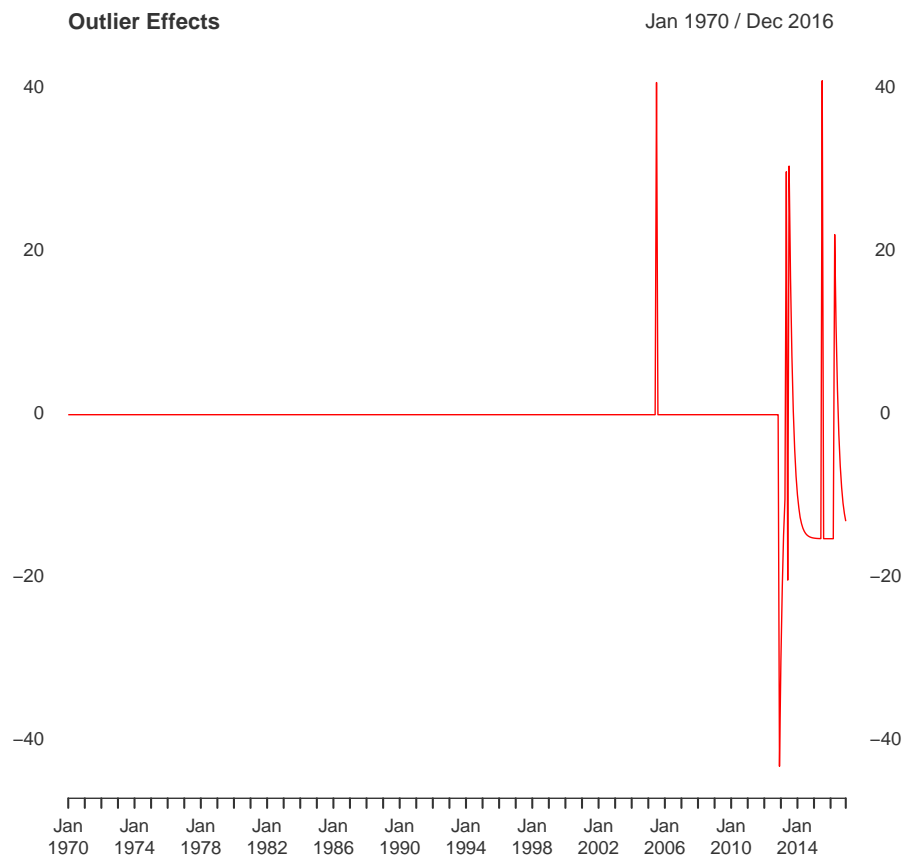**Outlier Effects**   Jan 1970 / Dec 2016
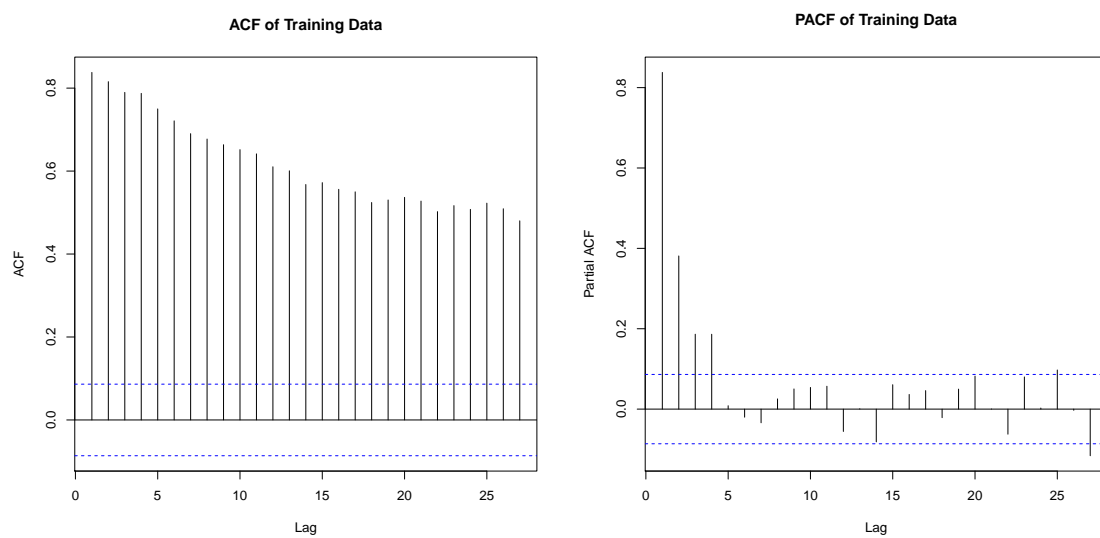
Fig. 3: The outlier effects of the identitifed outliers are displayed here.

Fig. 4: The ACF and PACF of the time series

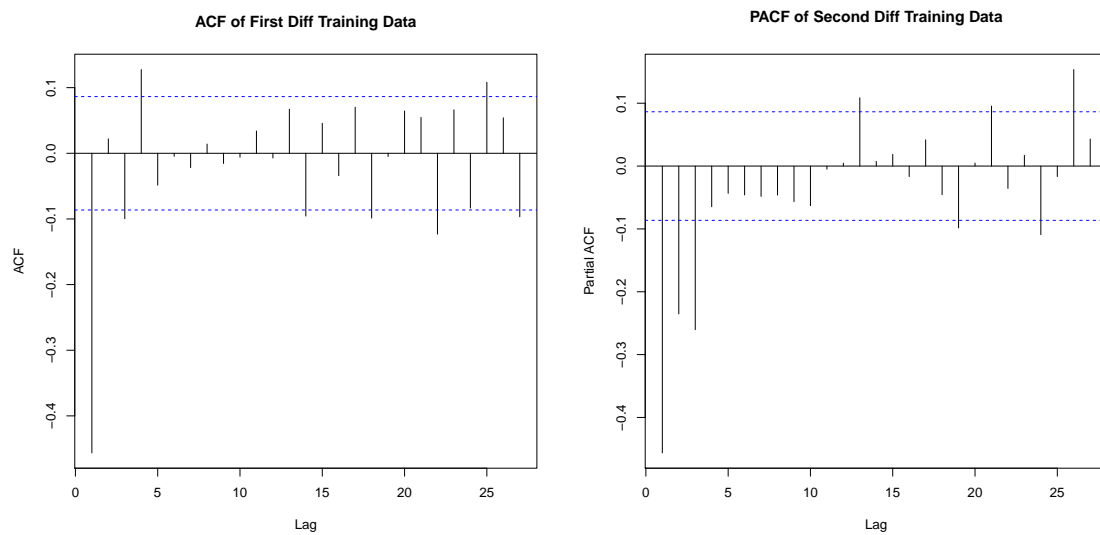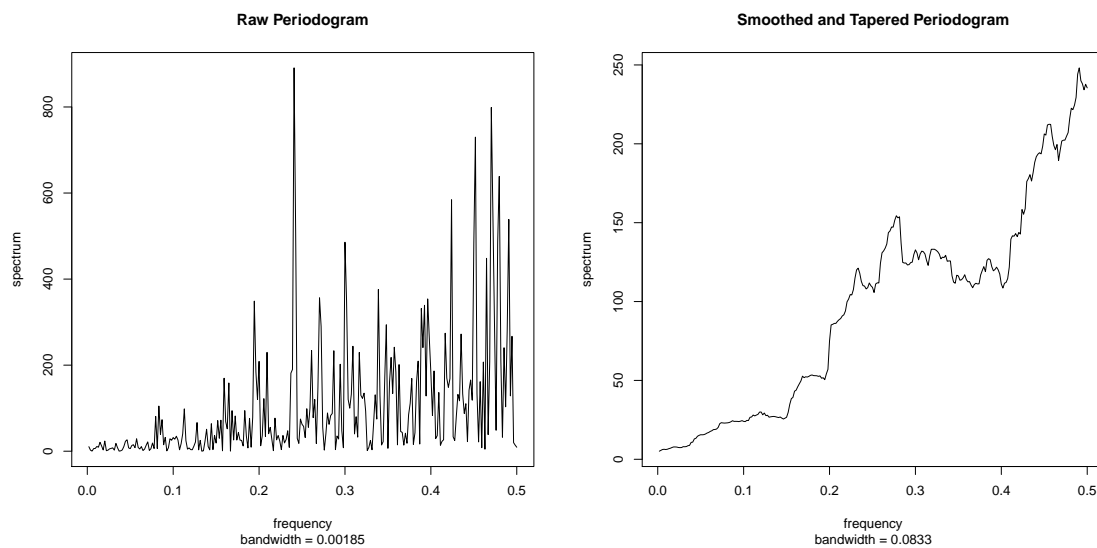Fig. 5: The ACF and PACF of the first diff time series

Fig. 6: The Periodogram (left) and a Smoothed and Tapered Periodogram (right). Smoothed with a Daniell Kerenel with window??TODO?? size $m = \sqrt{n} \approx 22$ and tapered with ??cosine bell taper with? ?val? 0.1
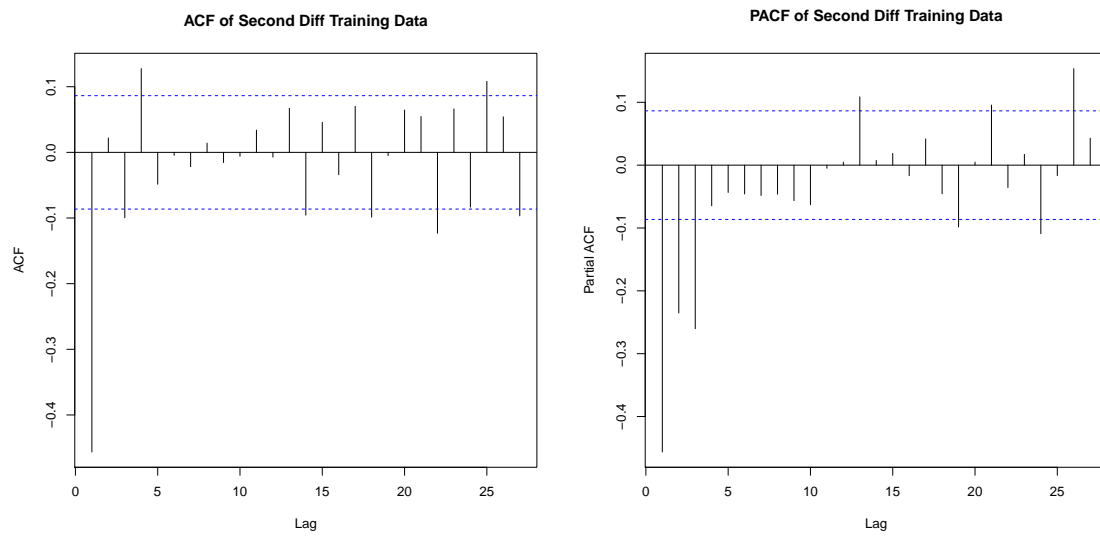
ACF of Second Diff Training Data   **PACF of Second Diff Training Data**

Fig. 7: The ACF and PACF of the second diff time series

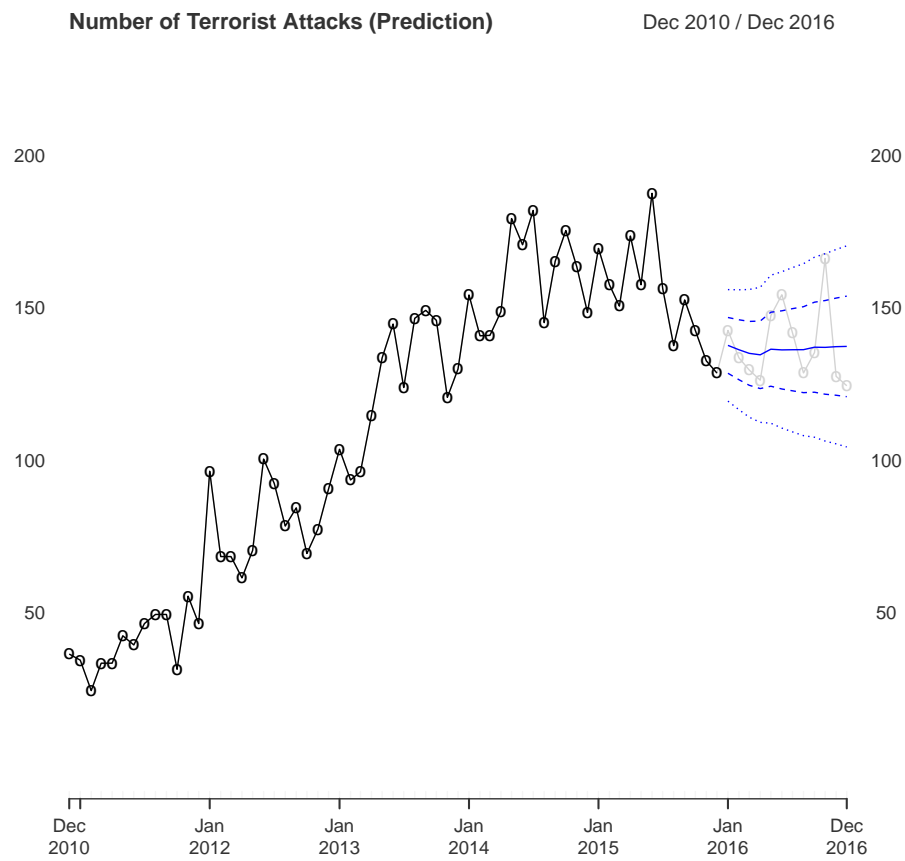**Number of Terrorist Attacks (Prediction)**   Dec 2010 / Dec 2016

Fig. 8: We use the model ————- to generate a 12 month prediction denoted by the blue line. 1 sd and 2 sd error bars are the dotted lines. What actually occured is shown by the light gray.
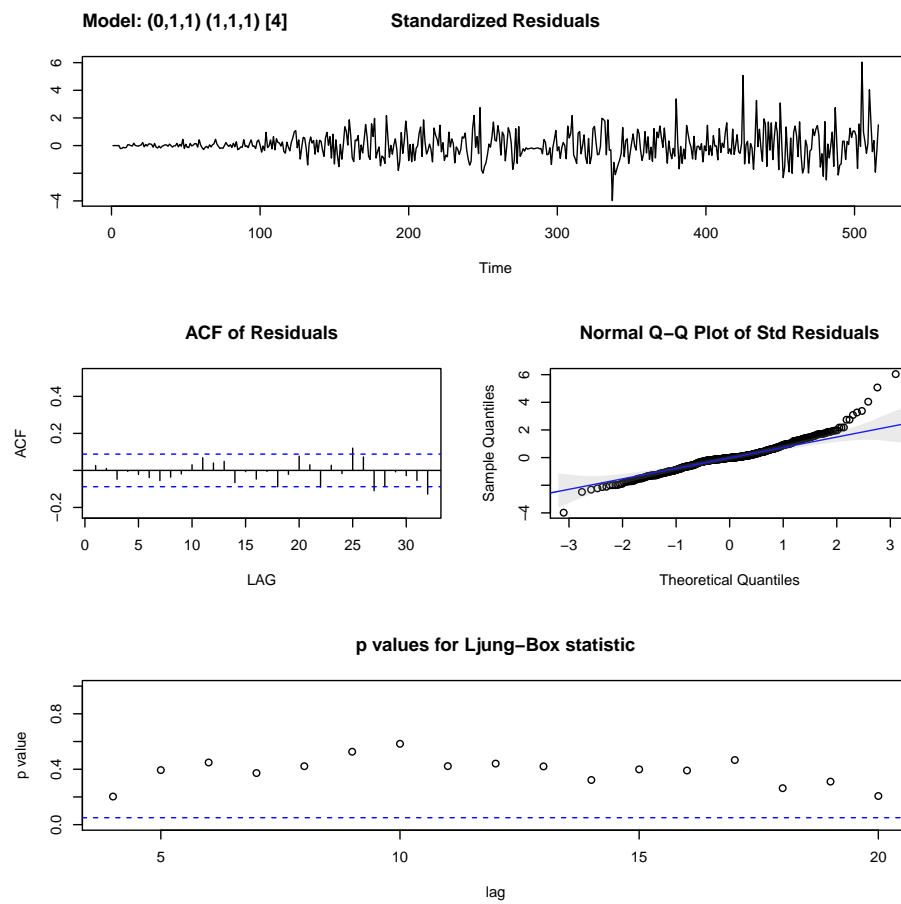
Fig. 9: This is the information from our best model.