Accident Risks - Solution

Task 1: The number 4 of the sixth month is replaced by 3 and the analysis repeated

Month	1	2	3	4	5	6
#Accidents	2	0	1	3	2	3
Average till now	2/1=2	2/2=1	3/3=1	6/4=1.5	8/5=1.6	11/6
Expected ahead	5·2=10.0	4·1=4.0	3·1=3.0	2·1.5=3.0	1·1.6=1.6	-
Observed ahead	9	9	8	5	3	-
Probability (tail)	0.6672	0.0214	0.0119	0.0847	0.2164	-

We see that alarm is still given at the sixth month, since the calculated probabilities observed of at least as many accidents ahead as observed from month 3 and 4 onwards are small, and thus indicates a rising trend. However, if the zero of the second month had been a one, we obtain the following, where the evidence for a trend is not sufficient using a 5% probability limit.

Month	1	2	3	4	5	6
#Accidents	2	1	1	3	2	3
Average till now	2	3/2	4/3	7/4	9/5	12/6
Expected ahead	10.0	6.0	4.0	3.5	1.8	-
Observed ahead	10	9	8	5	3	-
Probability (tail)	0.5421	0.1528	0.0511	0.2745	0.2694	-

Task 2: The analysis performed after just five months

Month	1	2	3	4	5
#Accidents	2	0	1	3	2
Average till now	2.0	1.0	1.0	1.5	1.6
Expected ahead	8.0	3.0	2.0	1.5.	-
Observed ahead	6	6	5	2	-
Probability (tail)	0.8288	0.0839	0.0527	0.4422	-

Taking 5% as probability limit there is no support for claiming increased accident rates after just 5 months, as we would do after observing the sixth month (original data and Task 1).

Task 3: Use the described method to analyse the second example

Year	2000	2001	2002	2003	2004	2005	2006
#Assaults	959	989	1052	1001	1120	1087	1105
Average till now	959	974	1000	1000	1024	1035	1045
Expected ahead	5754	4870	4000	3000	2048	1035	-
Observed ahead	6354	5365	4313	3312	2192	1105	-
Probability (tail)	$1.3 \cdot 10^{-15}$	$6.9 \cdot 10^{-13}$	$4.2 \cdot 10^{-7}$	$6.5 \cdot 10^{-7}$	0.00076	0.0537	-

We see (as expected) that the trend comes out very clearly.