

**Table 10: Summary of fitted model for monthly number of new problem gambling counselling clients taking into account autocorrelations.**

```
Call:
arima(x = log(ds1), order = c(1, 0, 0), seasonal = list(order = c(1, 0, 0),
  frequency = 12), xreg = cbind(trend, stepch, chtrend))

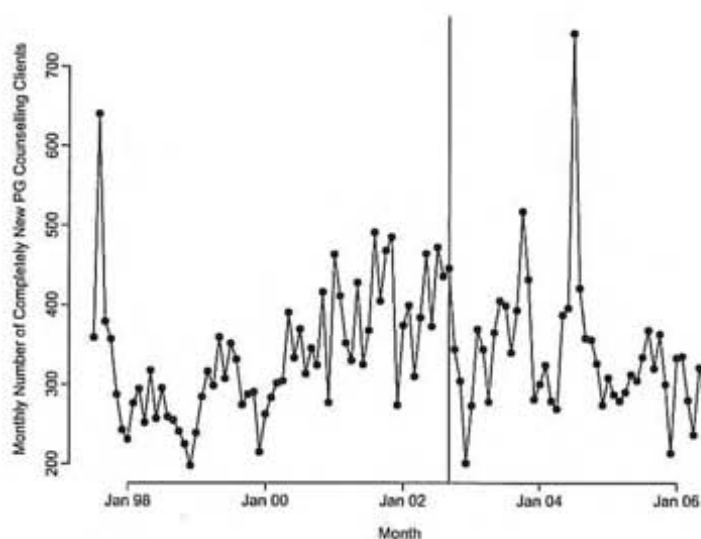
Coefficients:
      ar1      sar1  intercept    trend   stepch   chtrend
 0.4499  0.3837    5.6490  0.0070 -0.1258 -0.0111
s.e.  0.0886  0.0956    0.0991  0.0026  0.1119  0.0049

sigma^2 estimated as 0.03026:  log likelihood = 34.58,  aic = -55.16
```

#### 4.4 Completely New Problem Gambling Clients

A plot of the number of completely new problem gambling clients is given in Figure 5 while a table of the number is given in Table 11.

Figure 5: Time series plots for completely new problem gambling counselling clients.



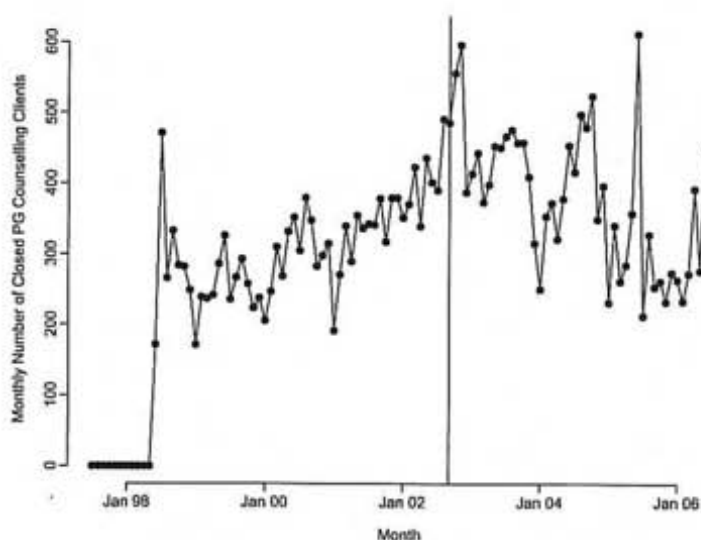
#### 4.5 Closed Problem Gambling Clients

A plot of the number of new problem gambling clients is given in Figure 6 while a table of the data is given in Table 12.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1997							359	640	379	357	287	243
1998	231	276	294	252	317	257	295	259	255	241	225	198
1999	239	284	316	298	359	307	351	331	274	287	290	215
2000	262	283	301	304	390	333	369	313	345	324	416	277
2001	463	411	352	330	428	325	368	491	405	468	485	274
2002	374	399	310	384	464	373	472	436	446	344	304	201
2003	273	369	344	278	365	405	399	340	393	517	432	281
2004	300	324	279	269	387	396	741	421	358	356	326	274
2005	308	287	279	290	312	305	334	368	320	363	300	214
2006	333	335	280	237	321	300						

Table 11: Monthly completely new problem gambling counselling clients.

Figure 6: Time series plots for closed problem gambling counselling clients.



## 5 Problem Gambling Financial Counseling

Data on clients receiving Problem gambling financial counselling is also kept in the IRIS database. From the database the number of monthly clients, the number of current clients, the number of new clients, the number of former clients were calculated, with the same definitions as for problem gambling counselling.

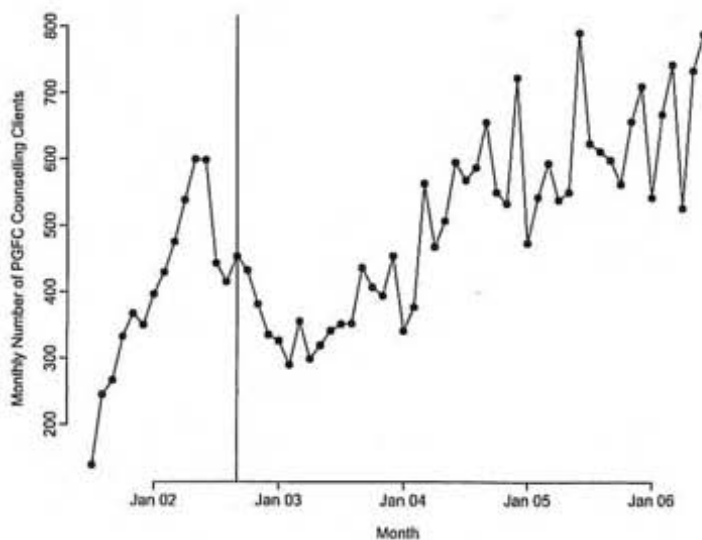
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1997							0	0	0	0	0	0
1998	0	0	0	0	0	172	471	266	333	284	282	249
1999	172	239	237	242	286	326	236	267	293	258	224	238
2000	206	247	310	269	332	352	305	380	348	283	298	315
2001	192	271	340	290	355	337	343	342	379	318	380	380
2002	352	371	423	340	436	402	391	491	486	556	596	388
2003	414	443	374	399	453	451	467	476	458	458	410	316
2004	251	354	373	322	379	454	417	498	480	524	350	397
2005	232	341	262	285	358	612	213	328	254	262	233	274
2006	264	234	273	393	277	450						

Table 12: Monthly closed problem gambling counselling clients.

### 5.1 Monthly Problem Gambling Financial Counselling Clients

A Graph of the data is given in Figures 7, while Table 13 gives the data. Similar to the problem gambling clients, although there appears to be a reduction in the monthly number of problem gambling financial counselling clients, this might also be due to a trend that appears to have began a few months earlier.

Figure 7: Time series plots for monthly problem gambling financial counselling clients.



Similar to the analysis of gambling expenditure and problem gambling counselling, the first analysis conducted for the number of monthly problem gambling financial counselling clients

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2001							139	245	267	332	367	350
2002	396	429	475	538	599	598	443	415	453	432	381	335
2003	326	290	355	299	319	341	351	352	436	407	394	454
2004	341	377	563	468	507	595	568	587	655	550	533	722
2005	473	542	593	538	550	790	623	611	598	562	656	709
2006	542	667	742	526	733	788						

Table 13: Monthly problem gambling financial counselling clients.

was to fit a linear model to the log of the number of monthly clients with a linear trend, a step change for the impact of the smoking bans, a change in slope term, and dummy variables for the months. The results are given in Table 14.

The interpretation of the results in Table 14 is as follows:

- the intercept term corresponds to the log of the number of clients at the beginning of the data period.
- the trend term shows there is an increase of approximately 8.3% per month prior to the smoking bans, corresponding to an annual increase of 159%.
- the  $-0.68$  coefficient means there was an approximate 68% decrease in expenditure corresponding to the smoking ban. A better approximation to the reduction is

$$100 \times (1 - \exp(-0.68)) = 49.3\%,$$

with a 95% confidence interval ranging from 38% to 59%.

- Corresponding to the smoking bans there was also a decrease in the trend of about 5.9% per month. The estimated annual trend after the smoking bans is 24%.
- There is a seasonal pattern in the number of clients, with the highest values in March, June, and September.

All the terms in the model are statistically significant. However, there is also some autocorrelation in the residuals, which means that the standard errors may be underestimated. Therefore a time series regression model was fitted, allowing for the autocorrelation between successive observations, and also including an autoregressive seasonal pattern rather than using dummy variables for the months. The results are given in Table 15. This model gives similar results for

Table 14: Summary of fitted model for monthly number of problem gambling financial counselling clients.

```

Call:
lm(formula = log(ds1) ~ trend + stepch + chtrend + DumFeb + DumMar +
    DumApr + DumMay + DumJun + DumJul + DumAug + DumSep + DumOct +
    DumNov + DumDec)

Residuals:
    Min       1Q   Median       3Q      Max
-0.35226 -0.10086 -0.01463  0.10045  0.29487

Coefficients:
              Estimate Std. Error t value Pr(>|t|)
(Intercept)  5.30747    0.11036  48.093 < 2e-16 ***
trend         0.07919    0.01127   7.025 9.34e-09 ***
stepch       -0.68064    0.10074  -6.757 2.34e-08 ***
chtrend      -0.06129    0.01133  -5.411 2.32e-06 ***
DumFeb        0.05126    0.10335   0.496  0.6223
DumMar        0.20143    0.10347   1.947  0.0578 .
DumApr        0.03660    0.10365   0.353  0.7256
DumMay        0.12767    0.10391   1.229  0.2256 .
DumJun        0.22942    0.10423   2.201  0.0329 *
DumJul       -0.02074    0.10382  -0.200  0.8426
DumAug        0.04041    0.10388   0.389  0.6991
DumSep        0.24152    0.10391   2.324  0.0247 *
DumOct        0.18432    0.10365   1.778  0.0821 .
DumNov        0.16724    0.10347   1.616  0.1130
DumDec        0.20645    0.10335   1.998  0.0518 .
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.1634 on 45 degrees of freedom
Multiple R-Squared:  0.8117, Adjusted R-squared:  0.7531
F-statistic: 13.85 on 14 and 45 DF, p-value: 6.233e-12

```

the trend and change in trend, but the standard errors are more realistic, and in all cases larger. The annual trend prior to the smoking bans is estimated to be 142%, while after the smoking bans it is estimated to be 25.9%.

Importantly the estimate of the stepchange has decreased to be 43.0% with a 95% confidence interval ranging from 18.5% to 60.2%. However, given the trend which began before the smoking bans and the small amount of data it is especially difficult to be definitive on the effect of the