Crime and Justice Statistics

NSW Bureau of Crime Statistics and Research

Bureau Brief

Issue paper no.122
April 2017

Forecasting trial delay in the NSW District Criminal Court: An update

Wai-Yin Wan and Don Weatherburn

Aim: *To develop a statistical model which enables court administrators to determine the future impact on trial court delay of changes in the backlog of pending trials.*

Method*: Data on the size of the pending caseload between January 2011 and June 2016 were drawn from records held by the NSW District Criminal Court Registry. Data on mean and median delay between committal for trial and trial finalisation over the same time period were drawn from records held by the NSW Bureau of Crime Statistics and Research. Changes in the mean and median time between committal for trial and case finalisation were linked to changes in the size of the pending trial caseload using polynomial distributed lags modelling (a special form of distributed lags model).*

Results: *The long run effect of a 10 per cent increase (decrease) in the size of the pending trial caseload is a 5.73 per cent increase (decrease) in the mean time between committal for trial and trial finalisation and a 6.08 per cent increase (decrease) in the median time between committal for trial and trial finalisation.*

Conclusion: *Changes in the number of pending trial cases can be used to forecast changes in the time taken to finalise criminal cases in the NSW District Criminal Court.*

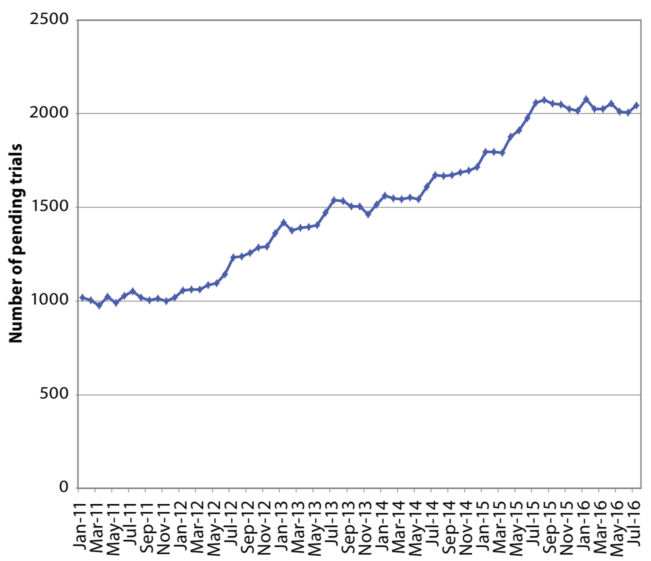
Introduction

Between January 2011 and July 2015, the number of trial cases[1] pending in the NSW District Criminal Court (DCC) more than doubled (see Figure 1). Over the same period, the average and median time between committal for trial and case finalisation more than doubled[2] (see Figure 2).

A comprehensive strategy has been put in place to address the growing backlog of trial cases but at present, there is no easy means of determining the precise effect a fall in the backlog will have on the time required to dispose of criminal trial cases.

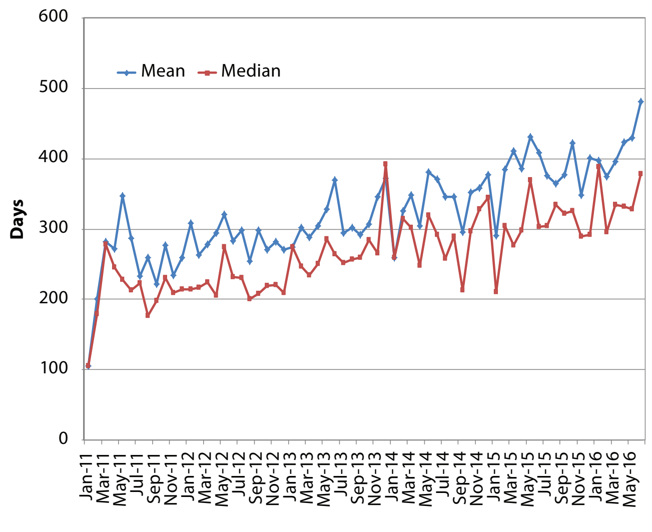
Past research has shown a strong relationship between the time taken to finalise trial cases in the DCC and the size of its pending caseload. Chilvers (2001) found that each 10 per cent increase in the size of the DCC pending trial caseload leads one year later to a 6.2 per cent increase in the median time between committal for trial and case finalisation. That research, however, is now more than 15 years old and may not accurately reflect

Figure 1. Number of pending trials: NSW District Criminal Court (Jan 2011 to Jun 2016)



Suggested citation: Weatherburn, D. & Wan, Wai-Yin (2017). *Forecasting trial delay in the NSW District Criminal Court: An update* (Bureau Brief No. 122). Sydney: NSW Bureau of Crime Statistics and Research.

Figure 2. Mean and median days between committal for trial and case finalisation: NSW District Criminal Court (Jan 2011 to Jun 2016)



the current relationship between the size of the pending trial caseload and the length of time taken to finalise trial cases.

The purpose of the analysis presented here is to update Chilvers (2001) study by examining the relationship between the size of the pending trial caseload and the time taken to finalise trial cases using more recent data on the pending trial caseload and delays. We do this separately for NSW as a whole and for the Sydney District Court. The case numbers were too small in other District Court venues to perform the same analysis. In the next section of the report we provide more details on the methods used in the analysis. The section that follows presents our findings. The final section discusses those findings.

Method

Data

In this analysis, the dependent variable is court delay, defined as the mean or median monthly number of days from trial committal to finalisation of the case. The independent variable is the monthly number of pending trial caseload. All the series contain 66 observations which start from January 2011 and ends in June 2016. As already noted, separate analyses are conducted for NSW as a whole and for the Sydney District Criminal Court.

Statistical analysis

Polynomial distributed lag (PDL) model is used to examine the relationship between pending caseload and court delay over time. When an independent variable (e.g. the pending caseload) is highly auto-correlated, the PDL model (a type of finite distributed lag model where the lag coefficients are restricted) is preferred over the infinite distributed lag model in which no restriction is made on the lag coefficients. A high level of autocorrelation in the independent variable may lead to unstable and unreliable coefficients with larger standard errors.

The PDL model, proposed by Almon (1965), imposes a shape on the lag distribution of the independent variable to reduce the effect of collinearity. The PDL model is specified as:

$$Y_t = a + \Sigma_{i=0}^{q} b_i X_{t-i} + \Sigma_{k=2}^{12} c_k m_k + e_t$$

where

$$b_i = s_0 + s_1 i + s_2 i^2 + \ldots + s_p i^p,\ i = 0, 1, \ldots, q; \qquad (1)$$

Y_t is the log of the dependent variable; X_{t-i} is the log of the independent variable at lag i; m_k is the monthly dummy variable (e.g. m_2=1 for February and m_2=0 otherwise); and e_t is the residual error which is assumed to be identically and independently distributed (white noise). Ordinary least square (OLS) method is used to estimate the coefficients including the intercept a, the coefficients for the monthly dummy variables (c_k's) and the parameters in the polynomial function (s_j's) which describes the lag weights. The lag weights (b_i's) are then computed based on equation (1).

Model fitting

The procedures to select the best model with optimal lag length q and polynomial degree p involve three steps. Firstly the lag length q is selected based on the Akaike information criterion (AIC) and Schwarz criterion (SBC) using an unrestricted distributed lag model. The lag length with the smallest AIC and SBC provides the best fit to the data and is chosen as the optimal lag length q. Based on the optimal lag length q, the second step is to choose the optimal polynomial degree p that fits the shape of the lag distribution.

A preliminary analysis using the cross-correlation between the court delay and the pending caseload shows that the cross-correlation decreases linearly with increasing lag order. This suggests that the polynomial degree p will not exceed two. Two PDL models with polynomial degrees (p=1 and p=2) and the chosen lag length q in the first step are then fitted. The optimal degree p is determined based on the significance of the polynomial term and the AIC/SBC. The chosen model should have a significant polynomial term and have the smaller AIC/SBC.

The last step of the model fitting is to test if the "zero tail" end point restrictions should be applied on the polynomial function to restrict the lag distribution to a linear function with negative slope. This restriction assumes that the relationship between court delay and pending caseload is decreasing linearly with increasing lag order. The zero tail end point restriction is tested using an F-test and the restriction is rejected if the p-value is smaller than 0.05.

Interpretation

The dependent and independent variables are specified in log form so that the lag weights can be interpreted as the short-run elasticities. The short-run elasticity is defined as the immediate percentage change in the court delay in the current and future months when there is a one per cent temporary shock to the pending caseload in the current month. A significantly positive coefficient b_i indicates that the court delay at the current month (i=0) or i months later increases by b_i per cent for a one per cent increase in the pending caseload at the current month. Summing the three short-run elasticities (b_0+b_1+b_2) gives the long-run elasticity which represents the percentage change in the court delay for a one per cent permanent increase in the pending caseload.

Results

Table 1 shows the results of the modelling. The independent variables are listed in the far left hand column. The entries in the second column show the effect of each variable on the (log) mean time between committal and case finalisation in the NSW District Court. The entries in the second column show the same effects for median delay. The following three columns provide the same information but for the Sydney District Criminal Court.

The first row shows the contemporaneous effect of a change in the pending trial caseload. The second and third rows show the lagged effects of a change in the caseload. The remaining variables control for seasonal variation in the backlog and delay. Significant effects have been highlighted with an asterisk.

Inspection of the first row shows the size of the pending trial caseload has a significant positive contemporaneous effect on trial court delay. The elasticity of trial court delay with respect to the size of the pending trial caseload in NSW is 0.286. Put simply, this means a 10 per cent increase (decrease) in the size of the pending trial caseload in NSW will produce an immediate increase (decrease) of 2.86 per cent in the average (mean) time and a 2.43 per cent increase in the median time it takes to finalise trial cases in the NSW District Criminal Court.

A similar pattern can be observed for trial cases dealt with in the Sydney District Criminal Court. Here a 10 per cent increase (decrease) in the Sydney trial case backlog results in an immediate 2.38 per cent increase (decrease) in the average time taken to finalize criminal trials in the Sydney District Criminal Court. The effect on the median time to finalise trial cases in the Sydney District Court (1.77%) is quite a bit smaller.

There are two other points worthy of note in Table 1. The first is that there are strong seasonal effects, with markedly higher levels of trial court delay in May and June (for example) than in other months. The second (note the significant effects on Lag 1 and Lag 2) is that the effects of an increase in the size of the pending trial caseload are felt not only in the same month but for two months after the increase in the pending trial caseload occurs.

Table 2 summarizes the contemporaneous, lagged and long-run findings. The essential point to note (see bottom row) is that a 10 per cent increase (decrease) in the pending trial caseload in NSW, over the long run produces a 5.73 per cent increase (decrease) in the average time to finalise trial cases and a 6.08 per cent increase (decrease) in the median time to finalise trial cases. The corresponding effects for the Sydney District Court are 4.76 per cent and 3.53 per cent, respectively.

Table 1. Parameter estimates of polynomial distributed lags models

All NSW District Courts			**Sydney District Court**		
Independent Variables	**Log of mean delay**	**Log of median delay**	**Independent Variables**	**Log of mean delay**	**Log of median delay**
Log of pending trial caseload in all NSW courts (X)	0.286*	0.243*	Log of pending trial caseload in Sydney courts (X)	0.238*	0.177*
Lag 1 of X	0.191*	0.182*	Lag 1 of X	0.159*	0.118*
Lag 2 of X	0.095*	0.122*	Lag 2 of X	0.079*	0.059*
Lag 3 of X		0.061*	Lag 3 of X		
February	0.072	0.033	February	0.009	-0.058
March	0.120*	0.023	March	0.019	-0.064
April	0.106*	0.020	April	0.090	-0.052
May	0.229*	0.150*	May	0.214*	0.147
June	0.191*	0.064	June	0.221*	0.042
July	0.042	-0.005	July	0.008	-0.096
August	0.020	-0.045	August	-0.060	-0.188*
September	-0.014	-0.088	September	-0.067	-0.060
October	0.078	0.038	October	0.017	-0.062
November	0.045	0.003	November	0.038	-0.033
December	0.103	0.082	December	0.036	-0.044
Constant	1.521*	1.123*	Constant	2.750*	3.352*

* denotes that the coefficient is statistically different from zero at a 5% significance level.

Table 2. Short-run and long-run elasticity of the pending trial caseload on mean and median court delay

All NSW District Courts			Sydney District Court		
10% growth in State-wide pending trial caseload	**Resulting growth in mean delay**	**Resulting growth in median delay**	**10% growth in State-wide pending trial caseload**	**Resulting growth in mean delay**	**Resulting growth in median delay**
In the same month	+2.86%	+2.43%	In the same month	+2.38%	+1.77%
One month later	+1.91%	+1.82%	One month later	+1.59%	+1.18%
Two months later	+0.95%	+1.22%	Two months later	+0.79%	+0.59%
Three months later		+0.61%			
In long run	+5.73%	+6.08%	In long run	+4.76%	+3.53%

Discussion

Chilvers (2001) found that a 10 per cent change in the size of the pending trial caseload led to a six per cent change in the median time taken to finalize trial cases in the NSW District Criminal Court. We find that a 10 per cent change in the size of the pending trial caseload leads to a 6.08 per cent change in the median time taken to finalise trial cases in the NSW District Criminal Court. It is interesting and reassuring to note that, 15 years later, a separate analysis using quite different methods has obtained an almost identical result.

The implication for delay reduction strategies is concerning. At present it takes around 260 days to finalise 50 per cent of trial cases in the NSW District Criminal Court. To halve the median time taken to finalise trial cases (that is, to reduce the median time to finalise trial cases from 260 days to 130 days), the backlog of pending trial cases would have to be reduced by about 80 per cent. It is important to note, moreover, that the full effects on trial court delay of an initiative that cuts the backlog will take more than three months to become apparent.

Notes

1. In what follows the term 'trial case' refers to cases involving a person committed for trial, regardless of whether that case is finalised by a trial, a plea or some other means (e.g. a 'no-bill').
2. The unusually low value for average delay in January 2011 occurs because only one case was finalised in that month (due to the court vacation and the time required to dispose of that case was unusually short).

References

Almon, S. (1965). The distributed lag between capital appropriations and expenditures. *Econometrica*, 33, 178-196.

Chilvers, M. (2001). *Forecasting trial delay in the NSW District Criminal Court* (Bureau Brief No. 16). Retrieved 16 November 2016 from NSW Bureau of Crime Statistics and Research's website: http://www.bocsar.nsw.gov.au/Documents/BB/bb16.pdf

NSW Bureau of Crime Statistics and Research - Level 1, Henry Deane Building, 20 Lee Street, Sydney 2000
bcsr@justice.nsw.gov.au • www.bocsar.nsw.gov.au • Ph: (02) 8346 1100 • Fax: (02) 8346 1298 • ISBN 978-1-925343-41-0