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The New South Wales Criminal Justice System Simulation Model: Further Developments

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In 2001 the Bureau of Crime Statistics and Research developed a stock and flow model to simulate the adult criminal justice system in New South Wales. The purpose of the model is to simulate the effects of policy changes and thereby provide a decision-support tool for policy makers. This bulletin documents improvements made to the model since its initial development. The process of re-estimating parameters for the model utilising improved data sources is described, as are new methods for setting the number of finalisations in each court stock and for determining initial court stock values. Other changes include transferring the model into a new software package and the simulation of seasonality in projected input for the model. A comparison with the original version of the model demonstrates a significant increase in predictive accuracy.

INTRODUCTION

A simulation model of the NSW Criminal Justice System has been developed by the NSW Bureau of Crime Statistics and Research to provide a means of assessing the impact of legislative, policy or resource changes on the criminal justice system. The model was the subject of a 2001 report *Simulating the New South Wales Criminal Justice System: A Stock and Flow Approach* (Lind, Chilvers & Weatherburn). Readers are referred to the 2001 report for a detailed description of the model's structure. In brief, the model consists of five stocks – four court stocks and one prison stock. Persons awaiting determination of court cases are considered to be in one of the four court stocks. When their case is finalised they may move to the prison stock or exit the system. As monthly blocks of persons move through the model, entering via police process at the Local Court level, they are diverted to another stock or out of the system in proportions determined by parameter values calculated from previous years' data. A diagram, from the 2001 report, representing the stock and flow model and a definition of each parameter, is included in Appendix A. Note that, within the model, the court stocks are characterised as 'custody' or 'bail'. For many people, bail may be dismissed or not considered; for convenience these people are regarded as being on bail for the purpose of the model.

The purpose of this report is to document progress in addressing some of the deficiencies which were identified in the concluding discussion of the 2001 report. These deficiencies included the following:

- some of the data necessary for parameter estimation was not available, in particular data relating to case registration in the courts;
- the ability of the model to simulate a court's response to a backlog of cases was not satisfactory, and this was related to the difficulty of estimating finalisations;
- the predictive accuracy of the model was not good for some measures.

The present report begins with a section describing changes in parameter estimates resulting from the availability of more recent data and of new data sources, in particular data relating to case registration in the District Court. There follows a section on other improvements to the model, including the method for setting bounds on court finalisations, and determination of initial stock values. The combined effect of these improvements is demonstrated in the following section, which compares the predictive performance of the new version of the model with that of the original model.

There are two further sections of the report. The first discusses some additional developments, namely the introduction of seasonality into input where the model is used to predict future population levels, and the migration from spreadsheet to modelling software. The second discusses planned future developments.

Throughout this report graphs are used to illustrate the effect of changes made to the model. The graphs show prison populations (remand and sentenced prisoner) each represented by three

Figure 1a: Sentenced population, Jan 2000 to Dec 2001
Simulated using original and recalculated values for *c* and *d*

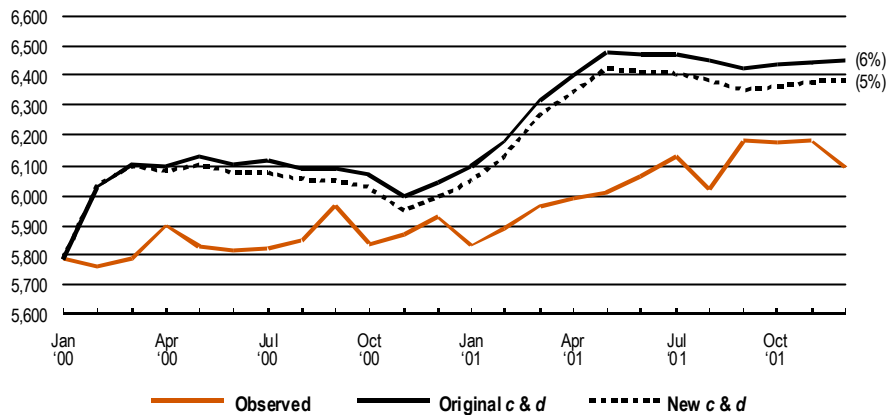
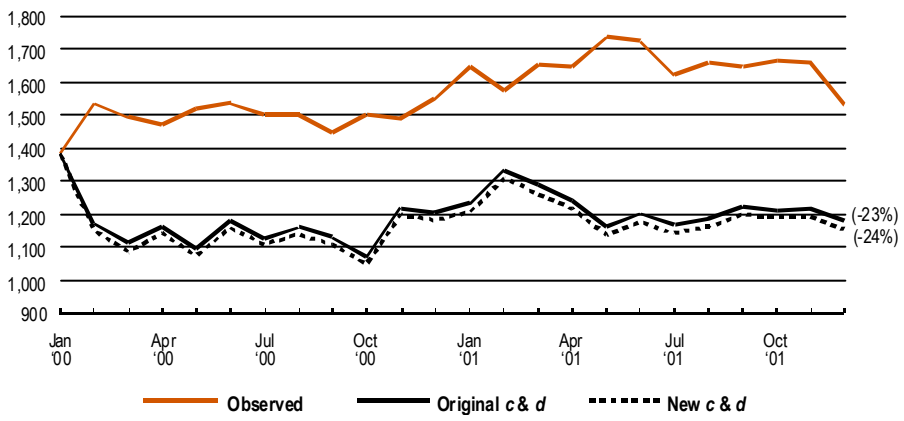


Figure 1b: Remand population, Jan 2000 to Dec 2001
Simulated using original and recalculated values for *c* and *d*



lines. One line shows the predicted population from a simulation with no change made to the model. A second line shows the predicted population from a simulation with the change in question made to the model. A third line shows the observed population. For each graph the time period is the 24 months from January 2000 to December 2001. A number appears in brackets next to each of the simulated lines indicating the percentage deviation from the observed population at the end of the simulation period. It is important to note that the scale, or vertical axis range, may change between graphs, since different simulations produce different ranges in the simulated population. Therefore, the magnitude of a numerically identical percentage difference will appear differently on different graphs.

Unless otherwise noted, simulations use actual police input, in terms of persons formally charged per month, and summonses and court attendance notices issued. Only the parameter being referred to is altered, with all other factors remaining constant.

PARAMETER ESTIMATION

There are three areas where data issues have affected parameter estimates over the past twelve months. They are (1) the availability of data on custody status at registration in the District Court, (2) re-estimation of parameters utilising more recent data, as part of the planned, routine maintenance of the model, and (3) use of a different source for police process input data. The effect on parameter estimates of each of these data issues is discussed in this section.

DISTRICT COURT REGISTRATION DATA

Previously, case registration data available in aggregate form from the District Court was not disaggregated by custody status. For the purpose of determining bail status at registration it was assumed that bail status at finalisation reflected bail status at registration. In reality, we know that in some cases bail status changes during the hearing of the case, typically from custody to bail. Therefore, for any cohort of persons moving through the District Court, the number in custody at case finalisation will be lower than the number in custody at case registration. In other words, by assuming these proportions were equal we have been underestimating the number remanded in custody in the District Court at case registration. The District Court is now able to provide numbers of new cases registered by custody status on a weekly basis. Weekly data is necessary to ensure that custody status reflects the status at registration since the custody status field in the database is updated whenever the status changes. With the new data we can now accurately determine the number of persons in custody at case registration.

There are two parameters affected by the availability of this District Court registration data. They are parameters *c* (proportion of persons formally charged who are placed in custody and who are committed to the District Court) and *d* (proportion of persons charged who are placed on bail and who are committed to the District Court). Parameter *c* is estimated by dividing the number of persons in custody at registration in the District Court by the number of persons formally charged two months earlier. The two-month lag reflects the fact that the median time from arrest to committal in custody cases is two months.[1] With the new data we would therefore expect parameter *c* to increase. We found that parameter *c* went from a previous value of 0.024 to a new value of 0.031.

Parameter *d* is estimated by dividing the number of persons on bail at registration in the District Court by the number of persons formally charged three months earlier. The three-month lag reflects the fact that the median time from arrest to committal in bail cases is three months.[1] With the new data we would therefore expect parameter *d* to decrease. We found that parameter *d* went from a previous value of 0.052 to a new value of 0.041.

Figures 1a and 1b show model simulations for the sentenced and remand prisoner populations, respectively, using the old and new values of parameters *c* and *d*. All other parameters are set at their old values (that is, as estimated in 1998). Observed values for the prisoner populations are also shown for comparison.

The increase in parameter *c* has the effect of increasing the number of persons moving from the Local Court custody stock (L1) to the District Court custody stock (D1). Since the proportion of cases finalised in D1 that result in imprisonment is higher than in L1, upwards pressure is exerted on the sentenced prisoner population. The decrease in parameter *d* has the effect of decreasing the number of persons moving from the Local Court bail stock (L2) to the District Court bail stock (D2). Since the proportion of cases finalised in L2 that result in imprisonment is lower than in D2, downwards pressure is exerted on the sentenced prisoner population.

Figure 2a: Sentenced population, Jan 2000 to Dec 2001
Simulated using 1998 and 2001 parameters

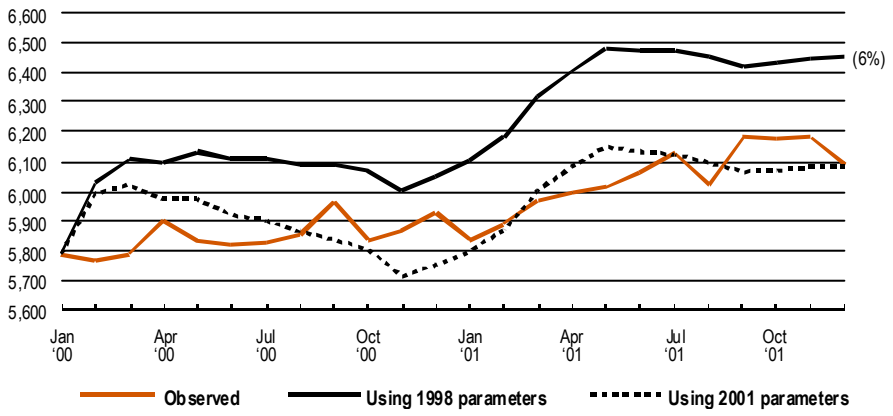
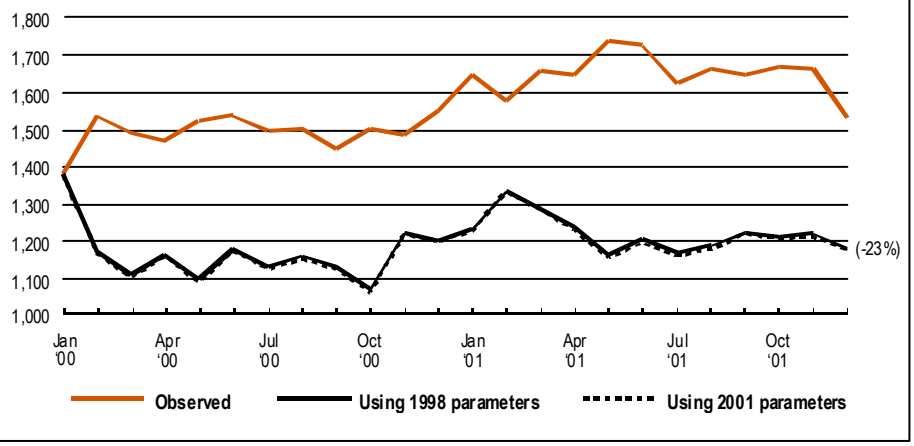


Figure 2b: Remand population, Jan 2000 to Dec 2001
Simulated using 1998 and 2001 parameters



Figures 1a and 1b show that the net effect of these two changes is a reduction in the sentenced prisoner population. The remand population remains relatively unaffected.

PARAMETER RE-ESTIMATION

Parameters were re-estimated with updated data as part of the general maintenance of the model, and this is intended to take place annually. The details of the calculations remain unchanged and are discussed in the previous report.[2]

i) Annual criteria

The original parameter values were calculated with five years' data to the end of the 1997-1998 financial year. The new parameter values calculated are the two-year means for the 2000 and 2001 calendar years.

ii) Re-estimated parameter values

Table 1 shows the original 1998 parameter values and the updated values.

Table 1: 1998 and 2001 parameter values

	1998 value	*2001 value*
a	0.201	0.207
b	0.538	0.514
c	0.024	0.031*
d	0.052	0.041*
e	0.026	0.022
f	0.812	0.825
g	0.262	0.285
h	0.033	0.033
j	0.891	0.940
p	0.103	0.110

* District Court registration data used to calculate parameters *c* and *d* available from 2001 only.

Figures 2a and 2b show simulations of the sentenced and remand prisoner populations using the original 1998 parameters and updated 2001 parameters, as compared to observed values.

Whilst the predicted remand population remains unchanged, there is a significant reduction in the predicted sentenced prisoner population, bringing it more into line with observed values.

POLICE PROCESS

Police process refers to the total number of persons formally charged, or issued a summons or Court Attendance Notice (CAN).[3] These persons constitute the input to the model. The model parameters *a* (proportion of persons formally charged who are placed in custody), *c*, *d*, and *h* (proportion of persons formally charged who are moved from Local Court custody to Local Court bail) are estimated using this input data. In the past twelve months of model development, two changes have been made to the input data. First, the actual numbers of persons in each sub-category of police process are used instead of a fixed proportion of the total and, second, the source of the data is now the Police Enterprise Data Warehouse (EDW), rather than the Computerised Operational Policing System (COPS).

i) Using actual police process figures

The number of persons formally charged per month was previously assumed to be 40 per cent of total police process, the remaining 60 per cent consisting of the issuing of a CAN or summons. This assumption was made because the actual proportion of persons formally charged had fluctuated significantly in the years preceding 1998. As noted in the previous report we would utilise actual figures when this proportion became stable. The proportion formally charged has since settled at around 40 per cent, and so the actual figure for persons charged and persons issued a CAN or summons has been used in re-estimating parameter values.

The number of persons formally charged per month is used to calculate parameters *a*, *c*, *d*, and *h*.

Figures 3a and 3b show a comparison of simulations of the sentenced and remand prisoner populations using parameters calculated assuming persons charged equal 40 per cent of total police process versus parameters calculated using actual police process figures. The parameters unrelated to police process retain their estimated 2001 values for these simulations.

Figure 3a: Sentenced population, Jan 2000 to Dec 2001
Simulated using the percentage and actual police process figures to estimate parameters

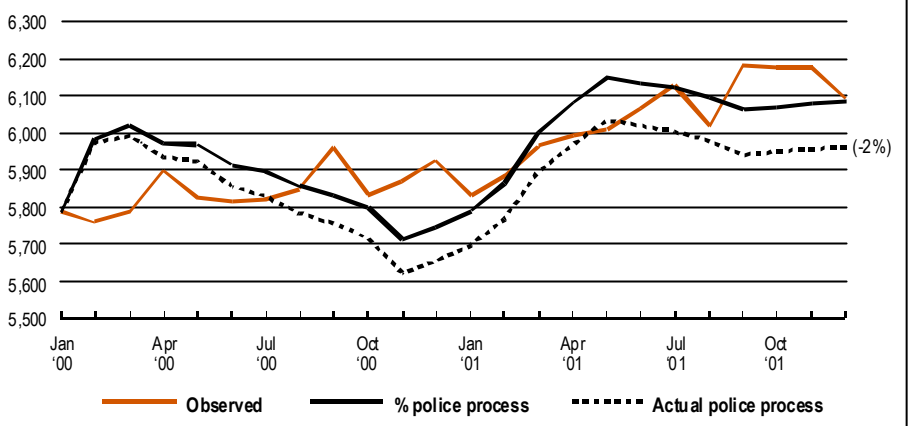
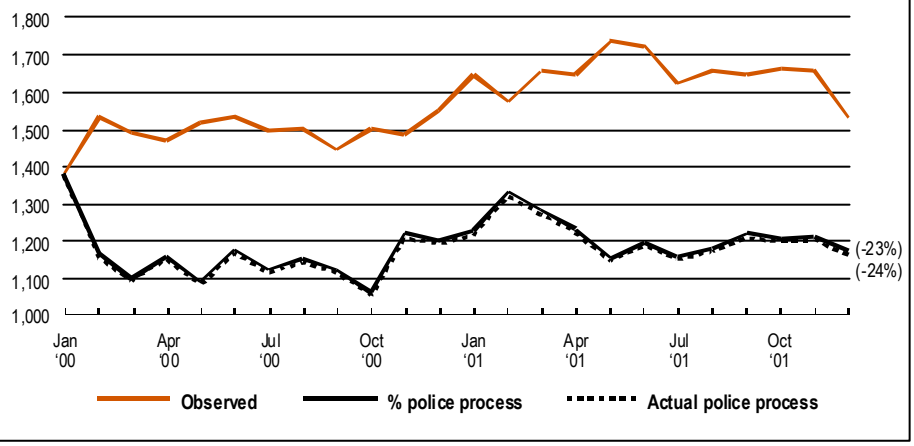


Figure 3b: Remand population, Jan 2000 to Dec 2001
Simulated using the percentage and actual police process figures to estimate parameters



The figures show a relatively small effect on simulated populations arising from the switch from using proportions of police process to actual police process.

ii) Using police Enterprise Data Warehouse data

Data relating to police process is now available from the EDW system. This is preferred over the COPS extract used previously because it sorts records according the date of the arrest, summons or CAN rather than the date of the incident. Over an extended period the numbers do not change significantly; however the change in monthly figures does affect parameter values.

Table 2 shows the new parameter values as calculated using actual EDW police process figures with the affected parameters highlighted.

Figures 4a and 4b show a comparison of simulations of the sentenced and remand prisoner populations using parameters calculated with COPS extract data versus EDW data.[4] The input data for the simulations is from EDW.

Not surprisingly the EDW parameters produce more accurate predictions because they are 'synchronised'[5] with the input. However, the simulated remand population is substantially different from the actual (observed) population.

Table 2: 2001 parameters using COPS and EDW data

	2001 value (COPS)	*2001 value (EDW)*
a	**0.207**	**0.243**
b	0.514	0.514
c	**0.031***	**0.035***
d	**0.041***	**0.046***
e	0.022	0.022
f	0.825	0.825
g	0.285	0.285
h	**0.033**	**0.033**
j	0.940	0.940
p	0.110	0.110

* District Court registration data used to calculate parameters *c* and *d* available from 2001 only.

OTHER IMPROVEMENTS

This section describes the setting of maximum Q values (finalisations per month in each of the court stocks), and the process of re-estimating initial stock values based on recent samples of cases pending in the District Court, disaggregated into custody and non-custody cases.

SETTING MAXIMUM FINALISATIONS EACH MONTH

The number of cases finalised per month from each stock is represented in the model as a 'Q value'. Each court, Local and District, is represented by two stocks. The Local Court stocks are Local Court custody (L1) and Local Court bail (L2); the District Court stocks are District Court custody (D1) and District Court bail (D2). The model uses a decision rule to decide the actual number of cases finalised in each stock for each month of a simulation. The rule assumes that the number of finalisations is equal to the input from the previous month, or the stock level – whichever is the less – within bounds. These bounds are the maximum and minimum Q values and represent the maximum and minimum number of cases that can be finalised in a month, irrespective of input to the stock.

The original model required the user to set maximum and minimum Q values for each of the four stocks. This could be based, for example, on recently observed maximum and minimum numbers of finalisations in the courts. These upper and lower bounds then remained constant for the course of the simulation. The weakness with this strategy was that there were maximum bounds set separately for the custody and non-custody stocks. In reality, courts can change the relative numbers of custody and non-custody matters that they finalise even if they do not finalise more cases in total. So the strategy of fixed maximum finalisations for the custody and non-custody stocks resulted in build-up of one of these stocks whenever the scenario being simulated involved a change in the relative numbers of custody and non-custody matters coming into the system.

To address this problem, the model was changed to require the user only to set the maximum number of total finalisations for the court (Local or District), rather than for each court's two constituent stocks. The actual maximum Q value in each of the two constituent stocks then fluctuates on a monthly basis *according to the input to that stock*. That is, the model sets a maximum number of custody finalisations by taking a proportion of the user-defined maximum *total* finalisations, and this proportion is determined by the proportion of custody matters in the input. The assumption is that magistrates and judges attend to custody and non-custody matters

Figure 4a: Sentenced population, Jan 2000 to Dec 2001
Simulated using COPS and EDW parameters

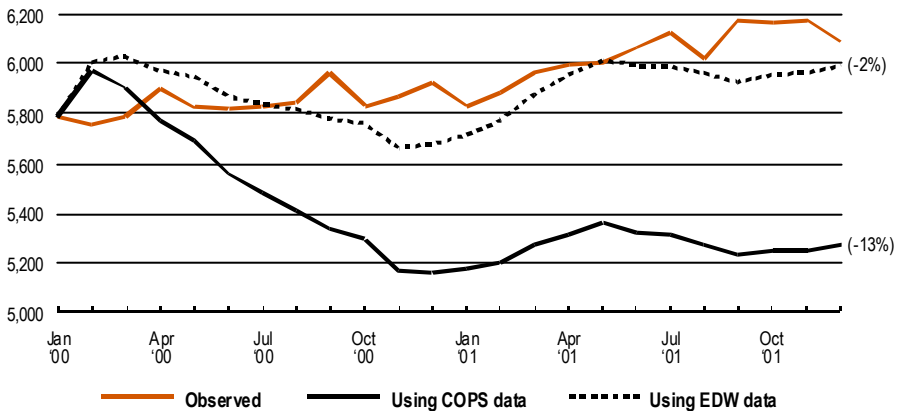


Figure 4b: Remand population, Jan 2000 to Dec 2001
Simulated using COPS and EDW parameters

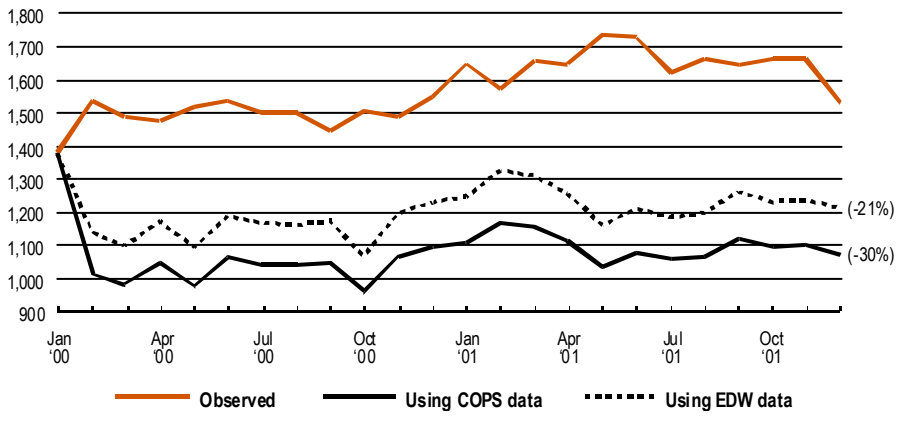


Figure 5a: Sentenced population, Jan 2000 to Dec 2001
Simulated using original Q method and new Q method with 50% increase in parameter a

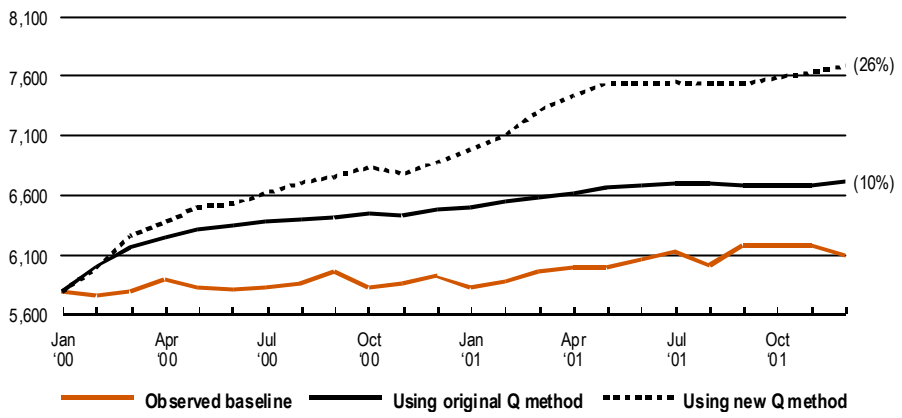
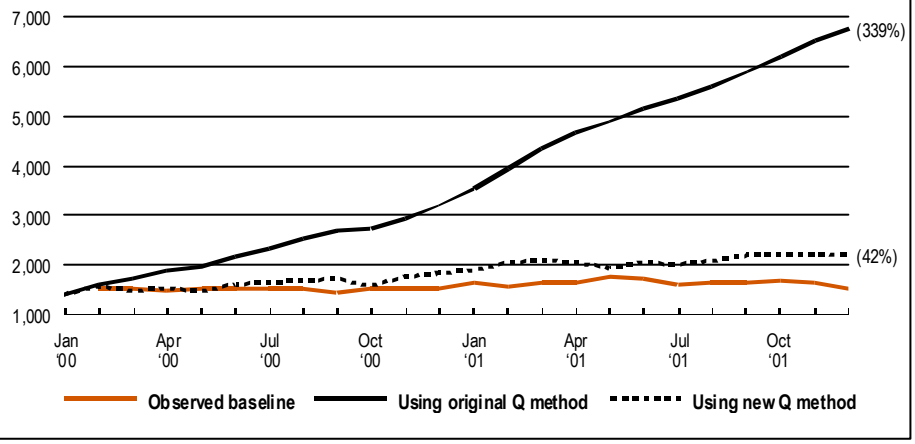


Figure 5b: Remand population, Jan 2000 to Dec 2001
Simulated using original Q method and new Q method with 50% increase in parameter a



according to the relative proportions in their caseload. That is, if there is a build-up of custody cases pending, we assume that the magistrate will attend to these cases at the expense of non-custody cases, to reduce the backlog. In practice the maximum number of total finalisations for a court can be set according to the observed maximum value in the 12 months prior to the simulation period.

In regard to the Local Court, for example, the maximum number of finalisations is divided between the two Local Court stocks in the same proportion as the non-committal input to each stock in the previous month. Therefore if L1 receives 30 per cent of the combined input to L1 and L2 in month (*t*-1), then the maximum number of finalisations for L1 for month (*t*) will be equal to 30 per cent of the total number of finalisations set for L1 and L2. For each month, the maximum number of finalisations in L2 is simply equal to the total minus the maximum number of finalisations in L1. The same logic is used to set the maximum number of finalisations in the two District Court stocks.

In practice, the input to each stock generally lies between the upper and lower bounds, and so the decision rule if the input is greater than or less than these bounds is rarely invoked. However, when a simulation requires a manipulation of input, the upper bound, in particular, becomes very important.

Figures 5a and 5b show simulations of the sentenced and remand prisoner populations, comparing the original strategy for setting the maximum number of finalisations in each stock with the new strategy, for a simulation in which the scenario requires a 50 per cent increase in parameter *a* (proportion of persons formally charged who are placed in custody). The observed values of the actual populations are included as a baseline comparison but are not directly comparable with the predicted values in this case because the scenario is hypothetical.

It is clear that the new strategy results in a greater increase in the sentenced prisoner population. This is because the increase in parameter *a* (proportion of persons formally charged who are placed in custody) leads directly to an increase in the input to the Local Court custody stock (L1), and a corresponding decrease in the input to the Local Court bail stock (L2). The new strategy results in the model allocating more finalisations to L1 at the expense of L2. Since a higher proportion of L1 finalisations result in imprisonment, as compared to L2 finalisations, the sentenced prisoner population increases.[6]

The deficiency of the old strategy is most clearly seen in the simulated remand population. The old strategy did not increase finalisations commensurate with input, resulting in an unrealistic backlog in the Local Court custody stock, thereby over-inflating the remand population. As noted above, the new strategy more realistically models the actual processes of the courts in which a dramatic increase in the remand population would be likely to prompt a re-allocation of court resources.

RE-ESTIMATING INITIAL STOCK VALUES

Initial values for each of the five stocks are necessary to run a simulation. In the original model knowledge of actual stock values was incomplete and stock values were derived. From the Department of Corrective Services we know the monthly sentenced population and also the monthly remand population

(Local Court custody (L1) + District Court custody (D1)). From the District Court we know the number of cases pending each month (District Court custody (D1) + District Court bail (D2)). This District Court data is not disaggregated by bail status. It was previously estimated that the proportion of persons on remand awaiting hearing in the Local Court was 60 per cent. Therefore D1 and D2 could be derived.

However, the estimate of 60 per cent was a rough one, based on a very small sample of cases. To improve the estimation of initial court stocks a survey of District Court cases pending was conducted for two separate months (November 2001 and April 2002). The District Court was able to supply a list of the cases pending in each of these months with the person's name and file number. The file number was then individually matched to the case record in the Case Tracking System which records bail status. The results of this survey showed that 35 per cent of these cases pending before the District Court were for persons in custody, and 65 per cent for persons on bail.

Therefore, from the total number of cases pending before the District Court (D1 + D2) we can now more accurately estimate the two constituent stocks, D1 and D2. We can further derive L1 since the remand population (L1 + D1) is known. This method indicates that the proportion of the remand population awaiting hearings in the Local Court is approximately 68 per cent - higher than the estimate of 60 per cent used in the original model.

Figures 6a and 6b show a comparison between simulations of the sentenced and remand prisoner populations using initial stock values derived by the original method and the new method. The parameter values for these simulations are the updated 2001 values and the input is from the EDW source. The new method for setting maximum bounds for finalisations is also incorporated into these simulations.

The most significant improvement is in prediction of the remand population, which has been markedly inaccurate thus far.

COMPARING THE ORIGINAL AND NEW VERSIONS OF THE MODEL

In summary the changes made to the model are as follows:

- parameter estimates have been revised using new data providing more reliable information on custody status at registration for District Court matters;
- parameter estimates have also been updated using the most recent data, as part of the regular maintenance of the model;
- parameter estimates have been further revised using data from the Police EDW as input for all categories of input;
- the method for determining the maximum number of cases the courts can finalise in a month has been changed to reflect the courts' ability to change the relative mix of custody and non-custody matters they deal with; and
- the initial stock estimates have been improved by obtaining a more accurate estimate of the proportion of persons awaiting a District Court hearing who are in custody.

The combined effect of these changes to the model is illustrated in Figures 7a, 7b and 7c. The figures show the predicted sentenced prisoner, remand prisoner and total prison population respectively. Predictions using the old model are compared with those using the new model and with the actual observed populations in each case.

Figure 6a: Sentenced population, Jan 2000 to Dec 2001
Simulated using original and new stock estimates

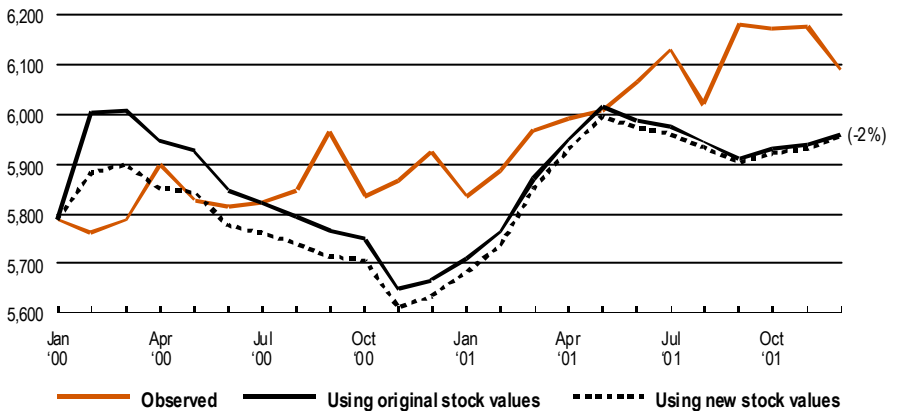


Figure 6b: Remand population, Jan 2000 to Dec 2001
Simulated using original and new stock estimates

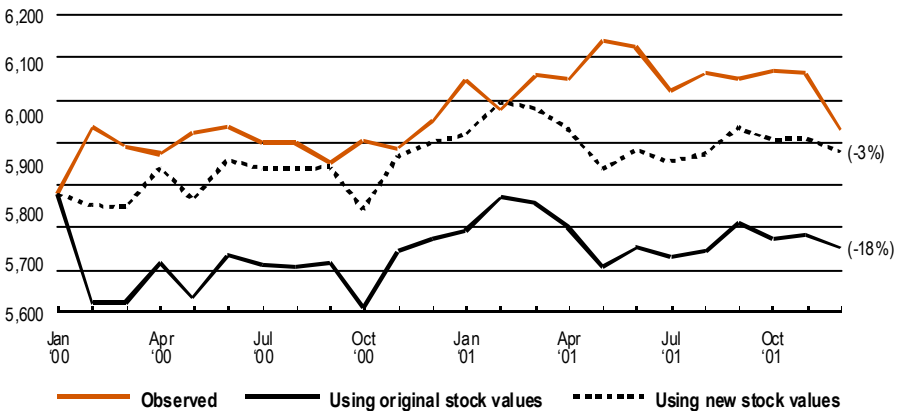


Figure 7a: Sentenced population, Jan 2000 to Dec 2001
Simulated using original and new model

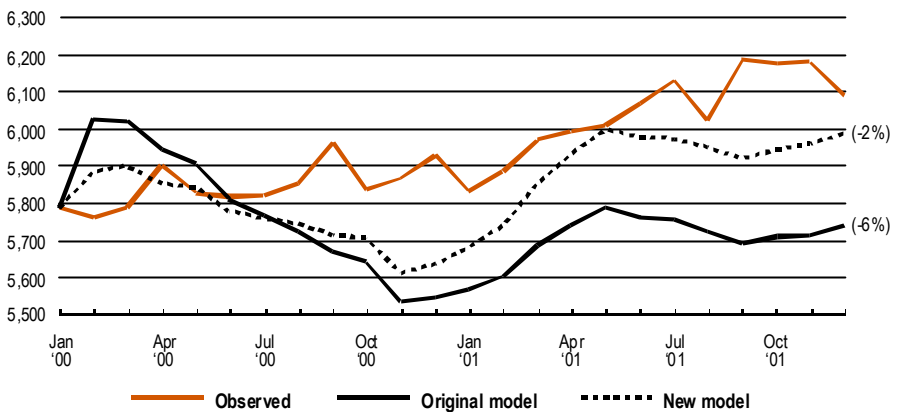


Figure 7b: Remand population, Jan 2000 to Dec 2001
Simulated using original and new model

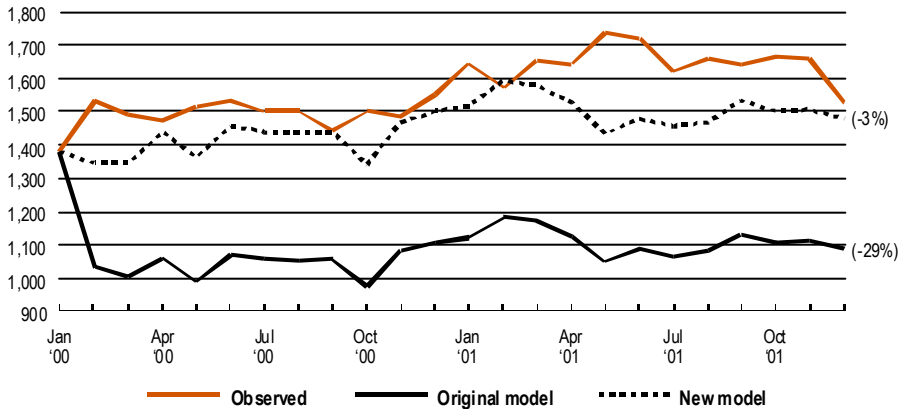
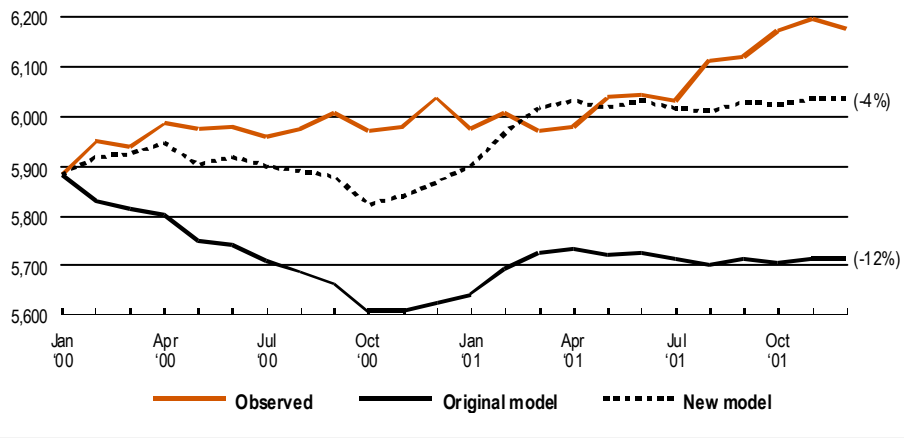


Figure 7c: Total prison population, Jan 2000 to Dec 2001
Simulated using original and new model



For the simulation using the old model, the parameters are as estimated in 1998, the method for setting maximum and minimum bounds for finalisations is unchanged and the determination of initial stock estimates is unchanged. For the simulation using the new model all the changes are incoporated. The input data is from EDW for both simulations.

It can be seen that the developments in the model have improved its predictive performance, most noticeably in regard to the remand population. It should, however, be noted that the comparison is not really a fair one, primarily because the old model's parameters are estimated from older data and from a different set of input data. Hence the old model's predictive performance is poorer than reported in the 2001 report (Lind, Chilvers & Weatherburn). Nevertheless in that report, a similar exercise found that the predicted remand population was 24 per cent less than the observed value, and the predicted sentenced prisoner population was 5 per cent greater than the observed value, at the end of the 24-month simulation period. By comparison the new model under-estimates the sentenced prisoner population by 2 per cent and under-estimates the remand population by 3 per cent at the end of the 24-month simulation period.

The results of the recent simulations are shown in Table 3.

ADDITIONAL DEVELOPMENTS

SEASONALITY AND ANNUAL VARIATION IN INPUTS

Input to the model is via police process, which is broken down into persons formally charged, and persons issued a CAN or summons. A significant difference between the original version and the current model is that the former used actual monthly police process for input to produce simulations that could be checked against observed values. For the current model to predict future stock levels, the monthly input, that is, police process, must itself be simulated.

Table 3: Predictive performance of old model and new model

	Sentenced		Remand		Total	
	Raw	%*	Raw	%*	Raw	%*
Observed	6,092	-	1,352	-	7,750	-
Old model	5,738	-6	1,086	-29	6,824	-12
New model	5,987	-2	1,479	-3	7,466	-4

* Percentage deviation from observed population at conclusion of simulation period.

Initially, this was accomplished by setting the monthly input at the mean level observed over the 12 months prior to the simulation period. This input could be manipulated during a simulation only by setting an annual percentage increase or decrease. In reality we know that police process figures fluctuate monthly and show seasonal variation, thus producing similar patterns in stock values.

Therefore, to approximate these seasonal fluctuations the following strategy has been employed. Using police process data from the EDW system for 1999, 2000 and 2001, each month's figure was expressed as a proportion of the monthly average for that year. An average was then taken of each month's index over the three-year period. This average index is multiplied by the monthly average for the 12 months prior to the simulation period to generate seasonal variation in the input. For example, the average index for January was 1.093, and the monthly average for the previous 12 months was 3349. Thus, the simulated input to the model for each January in the simulation period is 1.093 x 3349 = 3660. The annual percentage increase/ decrease can be utilised in addition to seasonality.

Figures 8a and 8b show the simulated number of persons formally charged and issued a summons or CAN per month generated with seasonality and without,[7] compared to observed numbers from January 1999 to December 2001.

Figures 9a and 9b compare simulations of the sentenced and remand prisoner populations with and without seasonal variation in input.[8]

From these figures it can be seen that input with seasonality shows greater potential for simulating the fluctuations we observe in actual stock levels.

'ITHINK' SOFTWARE

The original version of the model was created in the spreadsheet program Excel. The current version has been transferred into modelling software called **ithink** (see Appendix B for software details). Output is identical with both versions of the model. However, **ithink** is intended specifically for stock and flow models and allows finer manipulation of variables within the model. It also allows for a more user-friendly and intuitive interface. In addition, new models and variations of the current model can be created in less time, making it more feasible to trial alternative model structures.

FUTURE DEVELOPMENTS

INPUT

A comparison of observed finalisations in the Local Court and our input to the Local Court taken from police process

Figure 8a: Persons charged per month, Jan 1999 to Dec 2001

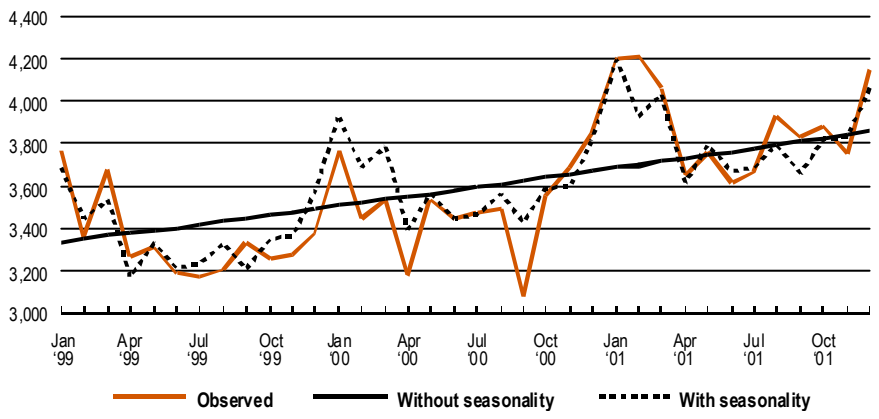


Figure 8b: Persons issued summons/CAN per month, Jan 1999 to Dec 2001

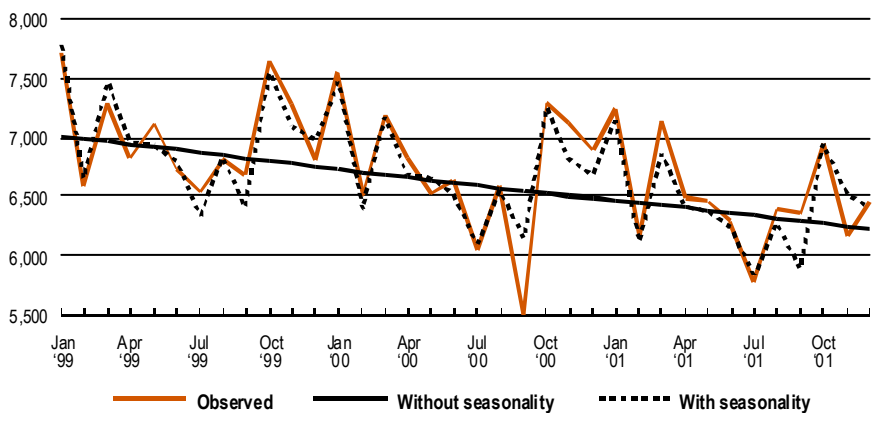


Figure 9a: Sentenced population, Jan 2000 to Dec 2001
Simulated using input with and without seasonality

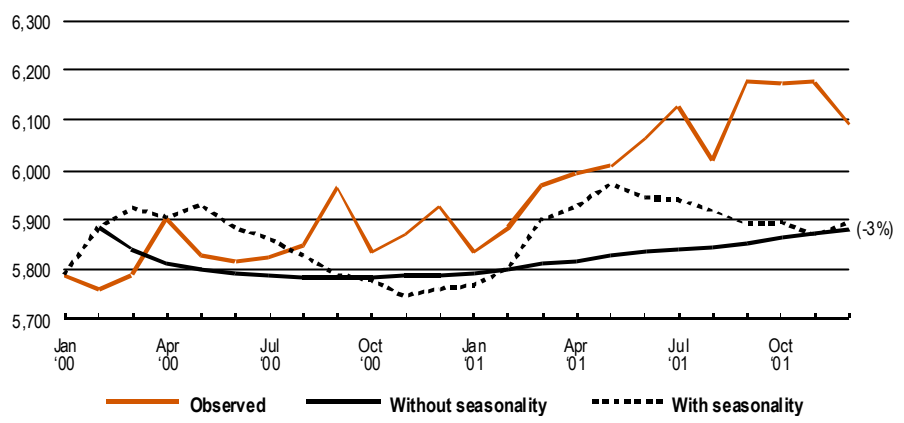
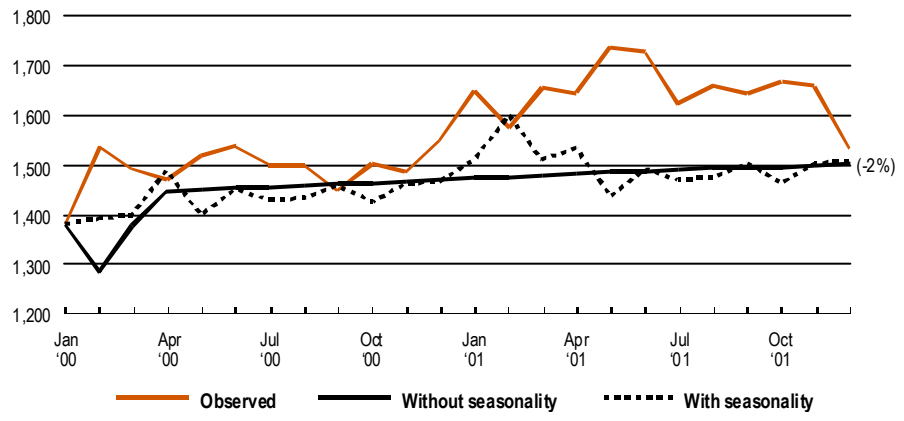


Figure 9b: Remand population, Jan 2000 to Dec 2001
Simulated using input with and without seasonality



indicates that the former is greater than the latter. Since, in reality, these stock levels do not tend towards zero, and since, in addition, we can be confident in the observed number of finalisations, this points to inaccuracy in the input. Considering the two constituent stocks of the Local Court, Local Court custody and Local Court bail, the specific indication is that there are more people entering the Local Court bail stock than we are aware of.

We know that only the police can formally charge someone, but that bodies other than the police can issue a summons or CAN. The Australian Taxation Office, for example, can issue a summons or a CAN under various Acts. Persons summonsed by the Australian Taxation Office were included in input used in this report. There are many other bodies, however, that may be issuing summonses and CANs. One focus on future work on the model, therefore, will be to account for all persons entering the court system, in particular those who enter other than by police process.

REMAND POPULATION

The model assumes that a person refused bail on case registration in the Local Court enters the remand population. In reality we know that some persons are remanded for very short periods (perhaps only a few hours) before their case is finalised or they are granted bail. These people do not actually enter the remand prison system. This issue bears directly on the simulated remand population and also on parameter *h* (proportion of persons formally charged who move from Local Court custody to Local Court bail). Currently the number of persons in this category is unknown but could possibly be derived from a combination of data from the courts and the Department of Corrective Services.

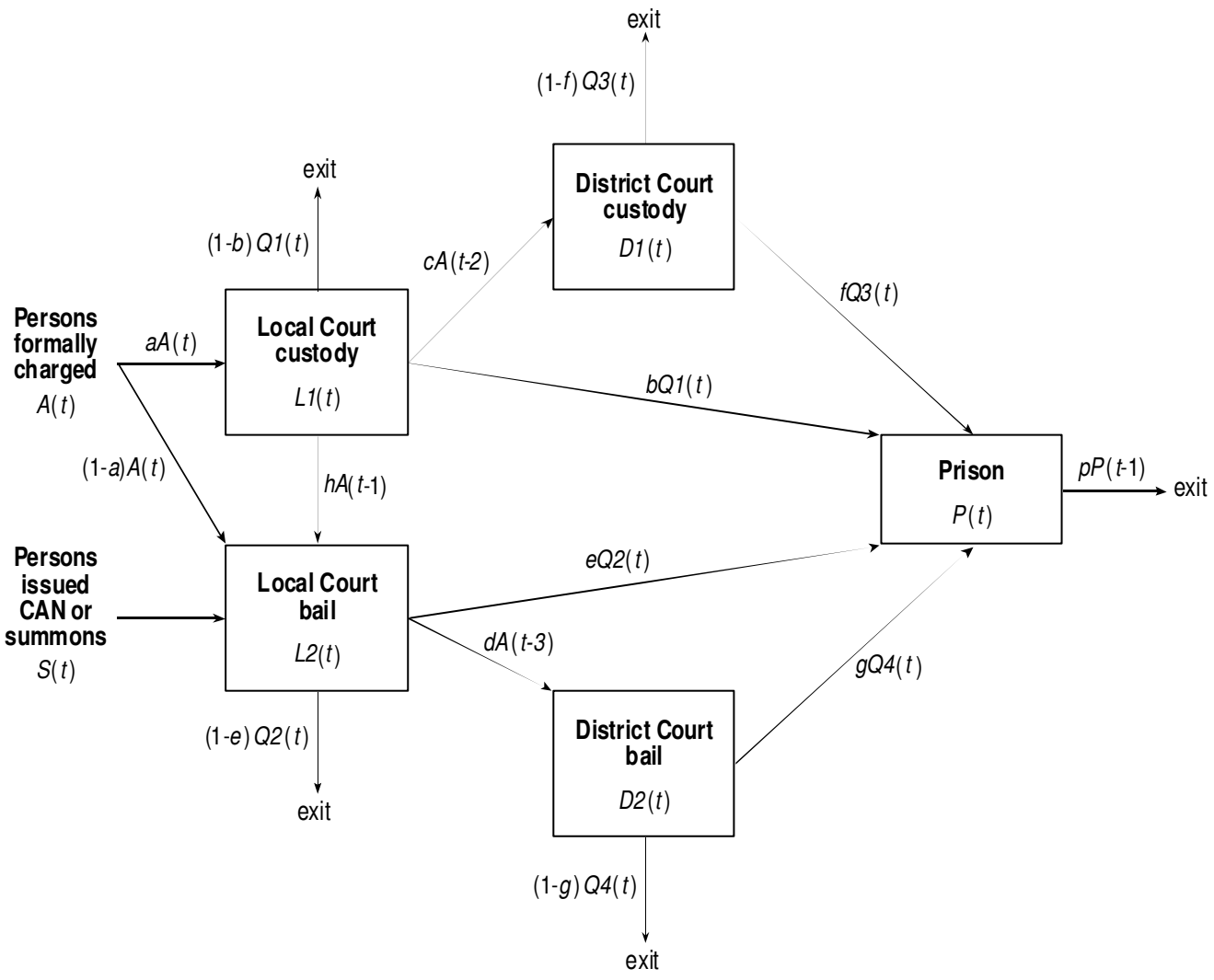
JUVENILE JUSTICE MODEL

Work has begun on the development of model for the Juvenile Justice system. This model will have a stock and flow structure similar to the Criminal Justice System model, and the two models can potentially be linked.

APPENDIX A:

DIAGRAM OF CRIMINAL JUSTICE SYSTEM MODEL

Figure A1: Stock and flow model of the NSW criminal justice system



APPENDIX A CONTINUED:

DEFINITIONS OF VARIABLES USED IN THE MODEL

$A(t)$ = number of persons formally charged in month t

$S(t)$ = number of persons issued a Court Attendance Notice or summons in month t

$L1(t)$ = number of persons in *Local Court custody* in month t

$L2(t)$ = number of persons in *Local Court bail* in month t

$D1(t)$ = number of persons in *District Court custody* in month t

$D2(t)$ = number of persons in *District Court bail* in month t

$P(t)$ = number of sentenced prisoners in prison in month t

$Q1(t)$ = number of persons in *Local Court custody* whose cases are finalised in month t

$Q2(t)$ = number of persons in *Local Court bail* whose cases are finalised in month t

$Q3(t)$ = number of persons in *District Court custody* whose cases are finalised in month t

$Q4(t)$ = number of persons in *District Court bail* whose cases are finalised in month t

a = proportion of persons formally charged who are placed in custody

b = proportion of persons in custody given a prison sentence by the Local Court

c = proportion of persons formally charged who are placed in custody and who are committed to the District Court

d = proportion of persons formally charged who are placed on bail and who are committed to the District Court

e = proportion of persons on bail given a prison sentence by the Local Court

f = proportion of persons in custody given a prison sentence by the District Court

g = proportion of persons on bail given a prison sentence by the District Court

h = proportion of persons formally charged who move from *Local Court custody* to *Local Court bail*

j = adjustment factor applied to the numbers of persons sentenced to prison to determine the number of new entrants to the sentenced prisoner population

p = proportion of the sentenced prisoner population who are discharged from prison each month.

APPENDIX B:

ITHINK SOFTWARE DETAILS

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NOTES

1 Data from BOCSAR database of finalised criminal matters.

2 Lind, B., Chilvers, M. & Weatherburn, D. 2001, *Simulating the New South Wales Criminal Justice System: A Stock and Flow Approach*, NSW Bureau of Crime Statistics and Research, Sydney.

3 The term CAN also includes Field Court Attendance Notices.

4 The actual input used for these simulations and those that follow is taken from the EDW system. Previously the data was taken from the COPS extract.

5 'Synchronised' in the sense that the EDW parameters were estimated based on the EDW input being used for both simulations.

6 It should be noted that, in practice, to simulate a scenario where remand practices changed but sentencing practices did not, it would be necessary to adjust the parameters which affect sentencing to prison from each of the court stocks as well as the remand parameter. However, for demonstration purposes, no changes were made to the sentencing parameters for the simulation reported here.

7 The annual percentage change in persons charged, and persons issued a summons or CAN was set to 7% and –1% respectively. This was based on an observed trend over the previous three years.

8 Note that the input for these simulations, unlike previous simulations, is generated, not actual, since it is the nature of the generated input that is being compared.

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