
A COMPUTER SIMULATION MODEL OF THE DISTRICT CRIMINAL COURT OF NEW SOUTH WALES

**Ian Crettenden
Jeanette Packer
Susan Macalpine**

**Produced with the assistance of the
Law Foundation of New South Wales**

New South Wales Bureau of Crime Statistics and Research

1993

Published by the NSW Bureau of Crime Statistics and Research
Attorney General's Department
Level 5
20 Bridge Street
Sydney

ISBN 0 7310 0225 3

PREFACE

Court systems are inherently complex and difficult to manage. Cases do not simply arrive in a single uninterrupted stream and consume a fixed and predictable amount of court time on their way through to disposal. At every point in the process variability intrudes. Cases arrive at variable rates, change their status in variable ways and consume highly variable amounts of court time. For various reasons they cannot always proceed on the date on which they are listed and they cannot always be listed in the order in which they arrive for disposal.

This variability greatly complicates the process of making decisions about how much time to allocate to deal with a group of cases and how best to list them for disposal. To make matters worse, in criminal matters the stakes involved in these decisions are high. Inadequate listing and court time allocation decisions can leave individuals waiting a long time, sometimes in custody, to have the charges against them determined. Whether a defendant is guilty or innocent this is unacceptable. 'Justice delayed', as the saying goes, 'is justice denied'.

Court administrators can seek to improve the efficiency of a court system by experimenting with different listing regimes and different ways of allocating court time or by altering the frequency of events which delay cases, such as requests for adjournments or late changes of plea. Experimentation, however, is a time-consuming and cumbersome way of evaluating the impact of new policies on complex systems. An alternative strategy is to create a computer simulation model of the process in question and explore the effect of policy options through it rather than by experimenting with the process itself.

Despite their potential, there have been few attempts to build simulation models of the court process. In order to explore the utility of such a model, the NSW Bureau of Crime Statistics and Research developed a simulation model of the District Criminal Court of New South Wales. The model allows users to examine the effect of changes to a wide range of court process variables; including the rate at which cases arrive for disposal, the amount of court time they consume and the rate at which they are adjourned. This report describes the model in detail and illustrates its potential applications.

The results should be of considerable interest to court administrators both in Australia and overseas.

Dr Don Weatherburn
Director

March 1993

ACKNOWLEDGEMENTS

The development of the model was greatly assisted by a grant from the Law Foundation of New South Wales. This allowed the appointment of Sue Macalpine to carry out testing and scenario analysis. The Law Foundation has also provided financial assistance in the production of this report.

We are also grateful for valuable advice provided by John Castellan, who was Director of the Criminal Listing Directorate at the time the model was developed and by Bob McClelland, Registrar of the District Criminal Court.

A number of members of the Bureau also deserve our thanks. Elizabeth Matka and Les Kery collected data for the model parameters. Patricia Evans and Theo Groenestein carried out data analysis to produce values for the model parameters.

Don Weatherburn, Bronwyn Lind and Tom Robb provided valuable advice in the development of the model and Don Weatherburn and Bronwyn Lind commented on a number of early drafts of this report.

Finally, Judith Mead and Les Kery were responsible for desktop publishing.

CONTENTS

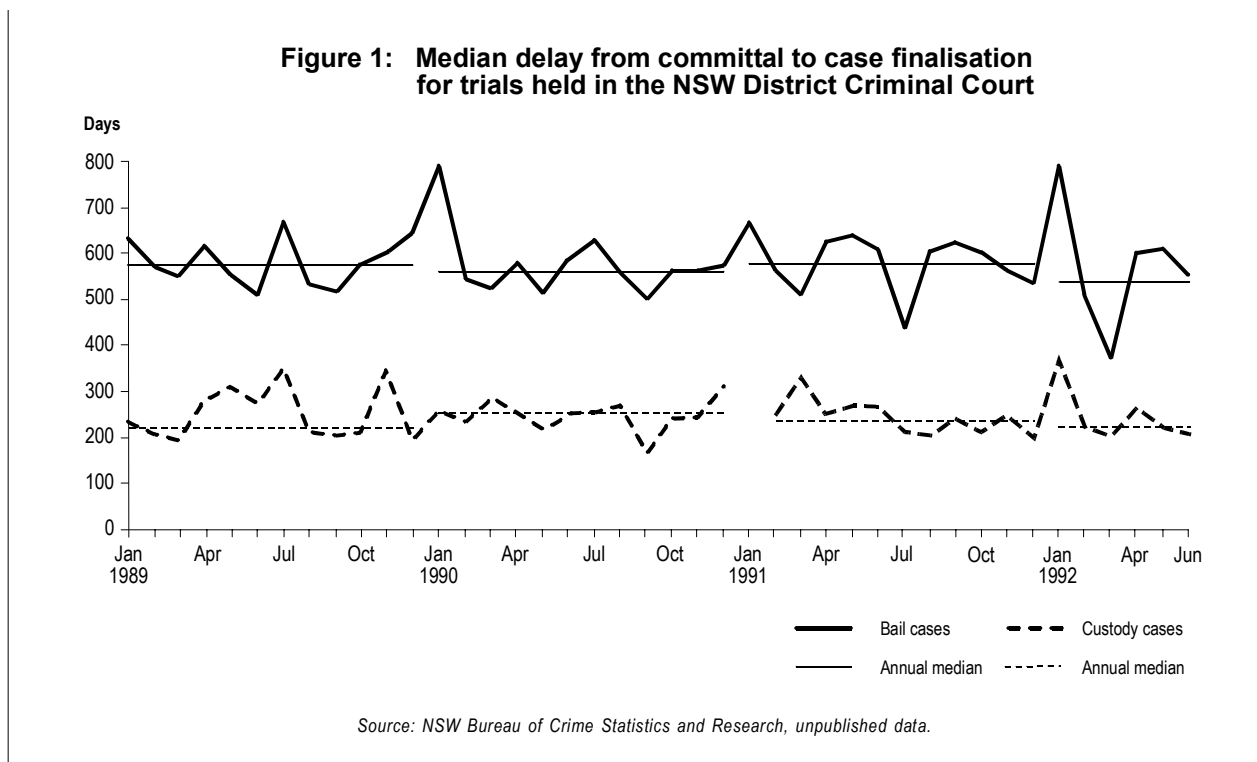
PART 1: BACKGROUND	1
PART 2: STRUCTURE AND OPERATION OF THE DISTRICT CRIMINAL COURT	3
2.1 Organisation of the District Criminal Court	3
2.2 Processing steps in the District Criminal Court	3
2.2.1 Case registration	3
2.2.2 Issue of Notice of Readiness	4
2.2.3 Exits without a hearing	4
2.2.4 Change of plea	4
2.2.5 Case listing and adjournments	5
2.2.6 Hearing allocation	6
2.3 Determinants of demand for court time in the District Criminal Court	6
2.4 Determinants of the amount of court time available	7
2.5 Determinants of delay from registration to finalisation	7
PART 3: STRUCTURE AND OPERATION OF THE DCC MODEL	8
3.1 Description of processing stages in the DCC model	9
3.1.1 Case registration	9
3.1.2 Case backlog	9
3.1.3 Issue of Notice of Readiness	9
3.1.4 Exits without a hearing	9
3.1.5 Change of plea or grounds of appeal	9
3.1.6 Case listing	10
3.1.7 Adjournments	10
3.1.8 Hearing allocation	10
3.2 Parameters available in the DCC model and their uses	11
3.3 Output measures available from the DCC model	13
3.4 Design considerations and assumptions	13
3.4.1 Design considerations	14
3.4.2 Assumptions	14

CONTENTS CONT.

PART 4: MODEL IMPLEMENTATION AND ASSESSMENT	16
4.1 Model implementation	16
4.1.1 The number of cases registered each month	16
4.1.2 The probability of a case being adjourned	16
4.1.3 Available court time	17
4.1.4 The listing quota	17
4.1.5 The probability of a case exiting	17
4.1.6 The distribution of hearing lengths	17
4.1.7 The probability of a case changing plea/grounds	18
4.1.8 The time taken for the issue of a Notice of Readiness	18
4.1.9 The listing priority rules	18
4.1.10 Cases finalised	19
4.1.11 Case backlog	19
4.2 Model assessment	19
4.2.1 Output stability testing	20
4.2.2 Validity testing	22
 PART 5: APPLICATION OF THE MODEL	 33
5.1 Scenarios - the problem of court delay	33
5.1.1 The baseline	33
5.1.2 Increased court capacity	36
 PART 6: CONCLUSION	 43
 NOTES	 44

PART 1: BACKGROUND

Trial court delay is a major problem in the District Criminal Court in NSW. Figure 1 shows the time taken from committal to case finalisation for all trials finalised each month from January 1989 to June 1992. There has been a reduction of only approximately 30 days from 1989 to 1992 for cases where the accused is on bail and virtually no change in delay for those accused remanded in custody.



Up to the present time there has been no facility available to allow the administrator to assess the effectiveness of the large number of possible options for reducing court delay. It is neither efficient nor cost effective to implement each of a range of options in order to determine which is the most effective. One cost effective method of assessing the relative merits of different court delay options, however, is to model their effects on a computer. As long as the court process is accurately modelled the administrator can evaluate the effectiveness of different options without having to introduce them into the court system. This not only saves time and money. It reduces the risk of injustice associated with the introduction of new or untried changes to criminal justice administration.

As part of its efforts to reduce the level of court delay in the District Criminal Court the Attorney General's Department funded the development of a computer simulation model of the District Criminal Court by the NSW Bureau of Crime Statistics and Research. Additional funding was obtained from the Law Foundation of NSW. The model was developed in 1989 and 1990.

The District Criminal Court (DCC) model is a PC-based computer simulation model of the NSW District Criminal Court. The aim of the model is to allow administrators to assess the impact of various options on court delay and case backlogs. Using the model, different options can be compared in terms of their effectiveness in reducing both delay and the backlog of cases, so that the most effective alternatives can be identified and implemented. In addition, the model is designed to allow the user to determine the length of time an initiative may take to have an effect. A policy initiative which can reduce the number of cases in the backlog by half within three years, may be considered to be more desirable than one which can reduce the backlog by a similar amount, but will not have its effects for four years. The DCC model allows an assessment to be made of the time various options would take to have their effects.

In Part 2 of this report the structure and operation of the District Criminal Court of NSW is described. Part 3 describes the structure and operation of the DCC model and indicates how the model mimics the court processes described in Part 2. In Part 4 the implementation and assessment of the DCC model is described. Part 5 outlines an application of the model to the assessment of a possible option for alleviating court delay.

The purpose of the report is to describe a method for analysing management options for the District Criminal Court and to present an illustrative example. The results from the example should not be taken as necessarily indicative of the current state of the NSW District Criminal Court. The assumptions on which the analysis is based were correct in 1989, the year in which testing of the model began. Implementation of the model would require up-to-date information on the state of the District Criminal Court. Some of this information (e.g. the time taken for the issue of a Notice of Readiness and available court time) is not routinely collected at present.

PART 2: STRUCTURE AND OPERATION OF THE DISTRICT CRIMINAL COURT

In this section we will describe the organisation of the District Criminal Court in NSW and the processing steps through which cases pass. In addition, the determinants of demand for court time, the amount of court time available and court delay will be considered.

2.1 ORGANISATION OF THE DISTRICT CRIMINAL COURT

The District Criminal Court of NSW is divided into seven administrative areas. These areas are Sydney, Sydney West, Dubbo, Newcastle, Lismore, Wollongong and Wagga Wagga. Within each of these areas there is a registry, a listing directorate and an allocated group of courts. In general terms, each registry is responsible for the administrative work associated with all cases to be heard in its allocated group of courts, and the listing directorate is responsible for the timetabling of all cases to be heard in that group. The specific number of courts and the method of timetabling may be different within each administrative area. In this section we will describe the operation of the Sydney Registry and the Sydney Listing Directorate. These represent the largest administrative area in NSW which will be referred to as the Sydney Registry area.

2.2 PROCESSING STEPS IN THE DISTRICT CRIMINAL COURT

In order to understand the structure of the DCC model it is necessary firstly to understand the types of cases dealt with in the District Criminal Court and the way in which cases pass through the court.

There are four types of case processed by the District Criminal Court. These are:

- (1) cases committed for trial from a Local Court;
- (2) cases committed for sentence from a Local Court;
- (3) appeals against the severity of sentence handed down in a Local Court; and
- (4) appeals on all grounds (i.e. against both the conviction and the severity of sentence imposed in a Local Court).

Although the various types of case are processed somewhat differently, the basic processing steps are similar for each type of case. The processing stages for cases committed for trial will be described in detail because the stages are most complex for this type of case. Where the processing steps for other types of case differ from those for trials this will be detailed. The processing steps to be described are those which applied in the Sydney Registry area in 1989, when the model was developed.

2.2.1 CASE REGISTRATION

A case which has been committed for trial from a Local Court must first be registered. Registration involves a number of administrative procedures including obtaining transcripts

of the committal hearing, recording details of the parties to the case and registering any case exhibits. Files must be prepared for the judge who will hear the case, for the Director of Public Prosecutions, and for the registry itself. All of this administrative work must be completed before the case can proceed to a hearing.

2.2.2 ISSUE OF NOTICE OF READINESS

Following registration, the Director of Public Prosecutions (DPP) must issue a Notice of Readiness to the listing directorate indicating that the prosecution case is prepared. There are statutory limitations on the maximum amount of time allowed to issue the Notice of Readiness. In 1989 the time limit for cases involving juveniles was 2 months, for cases where the defendant was in custody it was 3 months and for all other cases it was 9 months from the date of registration. If the time limit is exceeded for any case, the Listing Director schedules a hearing for the case so that a judge can determine the cause of the delay. This has the effect of forcing a case before the court when the time limits have been exceeded. Once a Notice of Readiness has been received at the listing directorate the initial administrative work is complete and the case can be scheduled for a hearing.

A Notice of Readiness is not required for sentence committals or for appeals from the Local Courts. These case types can be timetabled for a hearing as soon as the registration process is complete.

2.2.3 EXITS WITHOUT A HEARING

There are a number of processing steps which may intervene between the filing of a Notice of Readiness and a trial hearing. Some of these steps result in the trial committal exiting from the court system without receiving a trial hearing. This will happen when the defendant absconds or dies or when all charges against the defendant are withdrawn by the DPP. The withdrawal of charges by the DPP is called a No Bill.

In practice some of these events are more likely to occur the closer the case is to being heard. As the hearing day approaches, the likelihood increases that the defendant will abscond. It is also more likely that the DPP will have examined the evidence against the defendant and have decided that the charges are to be withdrawn.

Note that in the case of appeals from Local Courts, the DPP does not withdraw charges. The appellant may, however, withdraw the appeal. This has a similar effect in that the appeal will exit from the court system without receiving a hearing.

2.2.4 CHANGE OF PLEA

Another processing step which may intervene between the filing of a Notice of Readiness and a trial hearing is a change of plea from not guilty to guilty. When a case changes plea from not guilty to guilty it also changes case type from a trial to a sentence matter. As a result the subsequent processing stages of the case will be changed to match those followed by sentence matters.

Similarly, the defendant in a case committed for sentence may change plea from guilty to not guilty. This will result in the case being processed as a trial. An appellant can also change the grounds of appeal from an appeal against all grounds to an appeal against

severity or vice versa with the leave of the court. This will alter the way in which the case is subsequently processed.

2.2.5 CASE LISTING AND ADJOURNMENTS

If the defendant does not die or abscond and the DPP does not withdraw all charges and no change of plea occurs, the case proceeds to be listed for a hearing as a trial. The process of listing involves timetabling cases so that they can be heard and finalised by the court. The number of trials listed to be heard in any particular period is determined by a quota which is set for that period. The quota is governed by the amount of court time available in the period. The quota for different periods will vary due to judicial vacations and public holidays. In 1989, cases were listed and the case quota set on a weekly basis.

Since there is insufficient court time available within a single time period to hear all the trials which are ready for hearing, priority rules must be applied when deciding which cases are to be listed first. The Listing Director, in consultation with the Chief Judge of the District Court, sets the priority rules to be applied. In general, those cases which have been waiting the longest time for a hearing will receive the highest priority. There are, however, a number of exceptions. Cases in which the defendant is being held in custody awaiting a hearing will receive a higher priority than cases which have been waiting a similar amount of time, but in which the defendant is on bail. Some classes of case, such as child sexual assault cases and cases where there was a death involved or which involved interstate or overseas witnesses may also receive a high priority. At the discretion of the Listing Director and the Chief Judge, other 'important' cases may also receive a high priority.

The major objective in listing is to maximise the utilisation of court time whilst at the same time minimising the possibility that a trial will be listed for hearing but will be unable to be heard due to insufficient court time being available. On the surface, the listing of trials to fill available court time appears relatively simple. Problems arise, however, when trials drop out of the list at the last minute through factors such as plea changes or No Bills. If there is no case ready to replace a case which has been dropped from the list, then the court time assigned to the dropped case will not be utilised. This problem is exacerbated by the fact that cases are also often adjourned. A case which has been adjourned leaves the list prior to a hearing and must subsequently be re-listed. A case may be adjourned and re-listed several times before being heard.

In NSW and many other court jurisdictions the risk of unutilised court time has usually been countered by employing an overlisting strategy. An overlisting strategy is one in which more cases are listed for hearing than can possibly be heard in the available court time if all were to go to a hearing. In other words the listing quota is higher than would be expected on the basis of the available court time in the period. Under this strategy, if a case changes plea or exits without requiring a hearing there will usually be a back-up case which can take its place. This reduces the risk of wasted court time. It is important to note, however, that overlisting by too great an extent will result in large numbers of cases on the list not being heard because there is insufficient court time available. These cases are classified as not reached. In listing, therefore, the risks of unutilised court time and of having cases not reached compete with each other.

In case listing, 'long matters' (trials that are of two weeks or longer duration) are treated differently from short trials (less than two weeks), sentence matters and appeals which are dealt with together as 'short matters'. The court time which is available in any period is

divided into 'long matter time' dedicated to hearing long trials, and 'short matter time' dedicated to hearing short trials, sentence cases and appeals. There are separate listing quotas for long and short matters for the same time period.

2.2.6 HEARING ALLOCATION

In any given week, cases which have been listed for a hearing in that week must be allocated a portion of available court time. The amount of court time which is allocated to a case is based on an estimate of the hearing duration provided by the defence and the prosecution. The hearing time required by individual cases is quite variable. A trial may take less than a day or in excess of 12 months to be heard. In general, sentence matters and appeals require much less hearing time than do trials.

Long trials are allocated to long matter court time according to their estimated duration and their order of priority. If there is any remaining long matter court time within a period then this extra time is used to hear short matters.

Short matters are allocated to short matter time in a manner which is analogous to that for long trials. If any short matter time in a given period is not required for the allocated short matters, however, it is not used to hear long trials. This residual time will either be used for civil cases or will not be used at all.

2.3 DETERMINANTS OF DEMAND FOR COURT TIME IN THE DISTRICT CRIMINAL COURT

The speed with which cases progress through the court system depends on the balance between demand for court time and court capacity.

Demand for court time in the District Criminal Court is determined by a number of factors. The critical underlying determinants are the number of cases which require a hearing and their hearing durations. Demand for court time will be high when the number of matters to be heard is small but their hearing durations are long or when their hearing durations are short but there are a large number to be heard. Of central importance, then, in determining the demand for court time are factors which affect either the duration of cases or the number of cases which must be heard.

Several factors influence the number of cases which must be heard, including the number of cases of each case type which are registered, the number of cases which change plea and the number which exit without a hearing. Obviously, the more cases that are registered, the greater the number of cases which must be heard. Secondly, if a person changes plea from not guilty to guilty the case type changes from a trial to a sentence matter. Changes in plea produce corresponding changes in the number of trials and sentence matters which must be heard. Thirdly, cases exiting without a hearing reduce the number of cases of that case type which remain to be heard.

The other major determinant of demand for court time is the average hearing duration of cases. In general, trials require more court time than sentence matters or appeals. For example, Weatherburn and Nguyen da Huong¹ have shown that the average duration of District Criminal Court trials is 22.2 hours and the average duration of sentences and appeals is 0.5 hours.

2.4 DETERMINANTS OF THE AMOUNT OF COURT TIME AVAILABLE

The total hearing time made available in a twelve month period in the District Court is divided between the civil and criminal jurisdictions, according to the projected demand for each. In 1989, there was court time available for the District Criminal Court for eleven courts for five hours a day, five days per week. There were two vacation periods during which the courts were not available. These vacations totalled 10 weeks. As described above, court time is also divided between long matter time which is devoted to long trials and short matter time which is devoted to short trials, sentence matters and appeals.

In general, any event which prevents a trial from being heard once it has been listed will have the effect of reducing the amount of court time available unless back-up cases can be inserted. Events which will have this effect include the finding of a No Bill, the absconding or death of the defendant, plea changes and adjournments. If a case exits without a hearing after it has been listed and a back-up case cannot be heard in its place, court time will remain unused. Alternatively, if a trial case changes plea to guilty after it has been listed, the court time which has been set aside for hearing the trial may remain unused unless there is another trial on the list which can take its place. To the extent that it is not possible to insert a back-up trial for cases which drop out, the amount of court time available for hearing trials will be reduced. A plea change prior to listing should not however have this effect, since the case will be listed as a sentence rather than as a trial matter.

Adjournments have an effect which is equivalent to that of a plea change after listing. As with plea changes after listing, when a case is adjourned the court time which has been set aside for hearing the case will be unused unless it can be reassigned to a back-up case. The problem of adjournments will be much greater for long trials than for short matters, since the amount of available court time which has been set aside and which can potentially be lost, is much greater for long trials.

2.5 DETERMINANTS OF DELAY FROM REGISTRATION TO FINALISATION

There are two major components of delay from case registration to finalisation. These are preparatory time and queuing time.

Preparatory delays are those delays which are independent of the backlog of cases which are waiting for a hearing at any point in time. For short matters these delays are inconsequential. For trials, however, there may be substantial delays while the prosecution case is prepared and a Notice of Readiness filed.

Queuing delay is that time added to the processing of a case due to the fact that it must be listed for hearing after cases which were registered earlier or have a higher priority. As described above, cases are generally heard in the order in which they are registered. A new case must therefore wait its turn for hearing in a queue of cases. The time added by queuing delay to a particular case is a direct function of the number of cases awaiting a hearing. The number of cases awaiting a hearing is in turn a direct function of their average hearing duration and the amount of available court time.

PART 3: STRUCTURE AND OPERATION OF THE DCC MODEL

As noted above, the aim of the DCC model is to allow administrators to assess the impact of various options on alleviating court delay and case backlogs. Using the model, different options can be compared in terms of their effectiveness in reducing delay and the backlog of cases, so that the most effective alternatives can be implemented.

In general terms, the District Criminal Court (DCC) model is a PC-based computer simulation model. It is composed of a series of program modules which represent the steps through which criminal cases progress in the District Criminal Court. The model attempts to mirror the operation of the court by creating computer records which represent individual court cases and tracking their progress through the system. The model has a number of processing steps which are analogous to the processing steps in the District Criminal Court. Not all cases pass through every stage. Events such as a change of plea or a change of grounds of appeal will alter the sequence of stages through which cases pass.

In the model, each event which can alter the sequence of stages through which a case can pass is assigned a probability. The relevant probability values are entered as parameters by the user. For example, the user may enter a parameter into the model which assigns a probability of 0.3 that a case will change plea prior to listing. The model will then apply this probability to each incoming case to determine whether or not it will change plea. Each parameter is applied to each case individually.

A cycle of the model represents one month of real time. In the model, in each cycle each of the processing stages is applied in turn. The parameters relevant to each stage are applied to the set of cases which is currently at that stage. For example, in a cycle the plea change parameter will be applied to those cases which were registered in the previous cycle. At the same time, the listing parameters will be applied to those cases for which a Notice of Readiness has been issued. A run of the model occurs when cases are processed through a number of consecutive monthly cycles over a specified period (e.g. 12 months). Because progress through various stages in the model is controlled by probability values, it is possible to obtain somewhat different results with identical parameter values on separate runs of the model over the same period. Separate runs of the model over the same period with the same parameter settings are called iterations. The issue of the stability of the model output over iterations will be considered in a later section.

Following a run of the model, statistics may be obtained on the size of the case backlog and the age of cases which have been finalised as well as the age of the pending caseload, i.e. the age of those cases which have not yet been finalised. It is possible, in addition, to obtain statistics such as the number of trials heard each month, or the number of cases which changed plea.

In the following sections a detailed description of the major processing steps within the DCC model is provided. The parameters which are available for manipulation by the user are also described, as well as the output which can be obtained.

3.1 DESCRIPTION OF PROCESSING STAGES IN THE DCC MODEL

3.1.1 CASE REGISTRATION

The model operates, as already noted, by processing cases in monthly cycles. The user specifies the number of new cases to be registered in each month. On the basis of the specified numbers, the model creates a number of computer records each cycle. These represent newly registered committals or appeals from the Local Court.

3.1.2 CASE BACKLOG

In addition to the new cases created in the model during the course of the year, it is also important to take account of the number of cases which are already waiting for a hearing prior to the start of the year. Cases can be included in the model by 'seeding' it with cases at various stages of processing. These cases represent the backlog of cases waiting to be processed at the beginning of the period to be simulated. This backlog of cases can be added to represent the state of the courts at a particular time. For the purpose of this report, the DCC model was seeded with a backlog of cases which represented the pending caseload at the beginning of 1989.

3.1.3 ISSUE OF NOTICE OF READINESS

As indicated earlier, for trial cases there is a statutory requirement placed on the DPP to prepare the prosecution case and issue a Notice of Readiness within a set time limit. The DCC model takes account of these statutory requirements on the different types of trial case by assigning a certain probability that a trial will be ready in a particular month. The user is able to alter these probability values to take account of any change in the time limits, or in the ability of the DPP to prepare the prosecution case more rapidly. The user can also specify the probability of being ready earlier than the statutory limit. Probabilities of readiness after one, two and three months can be specified.

3.1.4 EXITS WITHOUT A HEARING

In the model, as in the real world, a case can leave the court system without receiving a hearing. This will occur if the defendant dies or absconds, or, in the case of trial and sentence cases, if the DPP withdraws all the charges against the accused. Appeals may also leave the system without a hearing. This will happen if the appellant withdraws the appeal. The likelihood of all of these ways of exiting prior to a hearing is, however, controlled by a single 'exit' parameter. As noted above, the likelihood of these events occurring increases as the case approaches a hearing. This has been dealt with in the model by having two separate values for the parameter, one representing the likelihood of these events occurring before listing and one representing their likelihood after listing. In addition, there are separate values for the exit parameter before and after listing for each case type.

3.1.5 CHANGE OF PLEA OR GROUNDS OF APPEAL

The second major type of event which can occur in the model is a change of plea for trial and sentence cases or a change of grounds of appeal for appeal cases. The importance of these events is that they alter the case type and therefore the subsequent processing

steps for that particular case. For example, by changing plea from not guilty to guilty, a case which has been committed for trial will change to a sentence matter. This will have an effect on the way in which the case is processed by the court. Similarly, if a person changes plea from guilty to not guilty, the case type would be changed from sentence to trial, and the subsequent processing for that case would follow the path for trials rather than sentences. A similar state of affairs exists for appeals. A person can change the grounds of appeal from all grounds to severity or, conversely, from severity to all grounds. Again these events are more likely to occur after a case has been listed for hearing. To account for this in the model separate parameter values are specified representing the likelihood of a change of plea/grounds before and after listing.

3.1.6 CASE LISTING

The next major processing step in the model is the listing of cases. In the model there are two major components to the listing process. These are the listing quota and the priority rules.

In the model the quota is specified on a monthly basis.² The model allows the user to specify a separate listing quota for trials and other matters for each month of the year. This is to account for the variations in the amount of court time available in different months as a result of factors such as judicial vacations and public holidays. Trials are referred to as long matters in the model. All other cases are referred to as short matters.³

The model provides two methods for dealing with the process of assigning priorities to different cases. The model allows the user to specify the relative priorities given to custody cases, non-custody cases and cases that have been not reached. In addition, the user can specify the percentage of available court time to be used for custody cases, non-custody cases and not reached cases. This is to ensure that whilst some case types may receive relative priority, they will not consume all of the available court time in every month. Some proportion of court time can be set aside so that all cases, regardless of their priority value will be heard at some point once they have been waiting for a sufficient period of time. This is referred to as the time percentage system.

3.1.7 ADJOURNMENTS

A case which has been listed for hearing may be adjourned. This typically happens when one or both parties (defence and prosecution) are not ready to proceed to a hearing. If an adjournment is granted a new hearing date must be set by the court. In the DCC model, adjourned cases must be re-listed before they can proceed to a hearing. In principle, cases can be adjourned an indefinite number of times. To simplify the process within the DCC model, cases are allowed a maximum of only three adjournments. In practice, over 80 per cent of cases reach a hearing with fewer than three adjournments.⁴

3.1.8 HEARING ALLOCATION

Each case in the model is assigned a different hearing length from a distribution of possible hearing lengths entered by the user. This is to account for the variability in hearing durations described above. Whilst in the real world, hearing durations vary for different types of offence as described above, in the DCC model there is no categorisation of cases by offence. This has been done to simplify the data collection and analysis required for parameter estimation.

As with listing, allocation of cases to available court time in the model occurs on a monthly basis.⁵ The DCC model assigns a certain amount of the available court time in the current month to each of the cases which have been listed for that month in order of priority. The amount of court time assigned to a case is equivalent to its hearing duration.

Cases are allocated available court time until no further time is available in the month. In a given month, if there is time remaining in the long matter category after all listed long matters have been heard, then this time is available for hearing short matters. If however, there is excess short matter time in a given month it will not be used to hear long matters and will be regarded by the model as unused court time. Any cases remaining to be allocated after all of the available time has been used are categorised as not reached and are returned to be re-listed in a later month.

Some particularly long trials may not be able to be finalised within one month. In order to account for these long cases, the DCC model sets a maximum amount of court time allowed per month for a single case. This maximum is five days per week for four weeks (i.e. a total of 20 days available court time per month). In allocating court time to long cases, therefore, time up to this maximum will be allocated from the current month. Time is then used from subsequent months until the case has been fully heard. For example, a trial with an estimated hearing duration of three months allocated a hearing in January, will be allocated 20 days available court time in January, and 20 days in each of February and March.

3.2 PARAMETERS AVAILABLE IN THE DCC MODEL AND THEIR USES

Table 1 lists all the model parameter types which can be manipulated. Each parameter can be entered or changed separately for different case types (trials, sentence cases, all grounds appeals and severity appeals) and for custody and non-custody cases. As the NSW District Criminal Court is divided administratively into seven different registry areas, the model requires different values for these parameters for each of the registries.

Table 1: User entered parameters

Number of cases registered in each month (January to December)
Probability of exit before listing for hearing
Probability of exit after listing for hearing
Probability of change of plea/grounds before listing for hearing
Probability of change of plea/grounds after listing for hearing
Probability of readiness (trial cases only)
Probability of adjournment
Listing quota per month
Hearing duration
Available long matter court time
Available short matter court time
Priority rules for listing and hearing
Number of cases in the backlog

In general, the parameters take the form of probability values. There are, however, several parameters for which this is not the case. The processing parameters, such as the amount of court time available and the size of the listing quota are not probability values. This reflects the fact that these factors are set by court administrators. The numbers of new cases entering the system each month are also fixed values. The amount of court time which will be required by each case when it is allocated a hearing is not a probability but is entered as a frequency distribution. This feature allows the user to enter a range of possible hearing lengths to take account of both the general variability in hearing durations and the relatively rare cases which consume a disproportionately large amount of court hearing time. Hearing times are assigned to cases according to their relative frequency in the distribution. If 10 per cent of hearing times in the distribution are between 7 and 14 days, on average 10 per cent of cases will be given a hearing time within these limits.

There are several types of policy option which can be modelled using these parameters. For example, changes in the number of cases registered per month could be used to model the effect of a given offence being moved from the jurisdiction of the District Criminal Court to the jurisdiction of the Local Court. Alternatively, a police 'crack-down' on some class of serious offence can be modelled by altering the number of District Criminal Court registrations. The registrations parameter can also be varied to model an administrative change resulting in more cases being disposed of at the committal hearing in the Local Court rather than proceeding to the District Criminal Court for a hearing, or more defendants deciding to plead guilty at committal, resulting in more sentence committal registrations rather than trial committal registrations.

Changes to the probability of exit for the different types of case will alter the number of cases which are removed from the system without requiring a hearing and, therefore, the level of overall demand for court time. User variation in this parameter allows modelling of events such as changes to the number of cases which are No Billed.

The change of plea/grounds parameter allows modelling of initiatives such as plea bargaining which are directed at maximising the proportion of persons who plead guilty. Policy initiatives directed at obtaining earlier pleas of guilty can also be modelled by changing the relative probabilities of plea/grounds change before and after listing.

The probability of readiness parameter influences administrative delay and may be altered to model an administrative change resulting in an increase or decrease in the rate at which cases are prepared for a hearing.

The adjournment parameter can be used to model a change in policy by the judiciary which restricts the number of adjournments allowed per case.

The listing quota and the priority rules for listing and hearing are together used to model the listing strategy. They can be varied to examine the tradeoff between the number of cases which are not reached due to overlisting and the amount of unused court time due to underlisting.

Initiatives directed at altering the average duration of hearings, such as reducing hearing duration by removing summing up by the judge in short trials can be modelled using the hearing duration parameter. Since the model allows the user to enter a distribution of hearing lengths, it is also possible to model the effects of a number of very long trials (in excess of 12 months) on the total demand for hearing time.

The available court time parameters can be used to examine the impact of building new courts;⁶ increases in the total time per day for which the courts sit (e.g. through the introduction of night courts); increases in the number of days per year for which the courts sit by reducing the annual vacation; or an increase in the total time available through apportioning more time to criminal matters at the expense of civil matters.

In addition, the relative amounts of court time devoted to short and long matters can be altered. This allows modelling of administrative changes such as devoting more courts to the hearing of trials rather than sentence matters and appeals.

3.3 OUTPUT MEASURES AVAILABLE FROM THE DCC MODEL

In order to assess the impact of various scenarios such as those outlined above, the model provides a number of output measures. Since the model is directed at examining policy initiatives aimed at alleviating court delay, the two central output measures are the size of the case backlog and the delay from registration to case finalisation. These output measures are available for each case type for each month of the simulation.

Additional output measures include:

- (a) the number of cases still in the court system at the end of the month and the processing stage at which they are being held, e.g. the number of cases waiting to be listed, the number of cases awaiting the issue of a Notice of Readiness;
- (b) the amount of court time used in the month;
- (c) the number of cases finalised in the month; and
- (d) the age of each case which is still in the system at the end of each month.

In addition to the general output measures available from the model, the user can obtain more detailed information relating to specific stages or specific groups of cases. Thus, it is possible to obtain the number of cases which were not reached, the number of cases which were adjourned and the number of cases which exited without receiving a hearing. These output measures are not obtainable directly but are available from a unit record file of all cases which is generated by the model. This file can be analysed using a statistical package in the same way as a data file would be analysed. There is thus considerable flexibility in the range and detail of information which can be obtained from any particular run of the model.

The DCC model stores data from each monthly cycle. By running the model over a number of cycles it is possible to obtain a picture of the court process over a period of 12 months or longer. This allows the user to determine the lag between the introduction of a new initiative and its effects on various aspects of the system. For example, the user may wish to know the length of time from the introduction of a number of new courts until the current backlog of cases has been removed. For this type of analysis, output can be collected over a number of years. The same method allows analysis of seasonal effects or the effect of an influx of a large number of cases in a particular month.

3.4 DESIGN CONSIDERATIONS AND ASSUMPTIONS

In the development of the model it was necessary to make a number of simplifications and assumptions. These were necessary because many aspects of the court process involve

subjective decisions which are inherently difficult to model. There is also a tradeoff between the level of detail included in the model and the speed with which it will operate on a computer. The specific simplifications and assumptions which have been made in the DCC model are described in this section.

3.4.1 DESIGN CONSIDERATIONS

Choice of parameters

The choice of the parameters to include in the model was determined by the aim of the model. In particular it was important that the model included parameters which could be manipulated by the user, to represent every aspect of court processing which might influence court delay. Aspects of court processing such as details of the outcomes of cases, which were not considered to be related to court delay were not included in the model. In addition, those aspects of court processing which are subjective could not be included.

Method of case processing

As the time taken for various processes within the District Criminal Court to occur was an important aspect of the model, decisions regarding the method of case processing which would be adopted in the model were critical. In order to maximise the amount of information available about particular cases and processing stages, individual cases were represented by separate computer records. This allows examination of issues such as which processing stages most contribute to the backlog of cases, or how long the slowest cases take to be finalised.

The choice of cycle length is also relevant to the detail of the estimates of delay which can be obtained. A short cycle length such as a day allows very detailed estimates of the time taken for various events to occur. Such a short cycle length, however, results in the need for a great deal of computer time to process a typical model scenario. On the other hand, a cycle length of one year is much less resource intensive, but provides little detail about the timing of individual events. In the DCC model, a compromise between these two extremes was adopted and cases were processed in cycles of one month's duration. This means that all estimates of delay can be measured in units of a month.

Another aspect of case processing which was considered to be critical to court delay is the uncertainty associated with which processing stages a case will undergo and the order in which these stages will occur. In order to model this uncertainty the majority of the parameters are in the form of probability values. This means that at each processing stage in the model, a probability value is applied to decide what will happen to each case. Thus, on successive runs of the model, different results may be obtained, even with identical parameter settings.

3.4.2 ASSUMPTIONS

A fundamental assumption of the DCC model is that no court time is lost between the end of one case and the commencement of another. It is also assumed that there is no court time lost when a case cannot proceed and a back-up case is substituted. The practical effect of this assumption is that there will be no difference in the total demand for court time between a single case of, say, 20 days hearing duration, and 10 short cases whose total hearing duration is 20 days. Similarly, there is no difference in total demand in a situation

where all cases listed for a period are able to proceed and are heard by the court, and one in which a large number of listed cases are adjourned and are replaced by back-up cases. As this assumption of perfect efficiency is not a reflection of the true situation, the DCC model will tend to underestimate the amount of court time which will be required in most scenarios. In practical applications using the model this assumption is not important because it is possible to adjust the available court time or alternatively to add extra time to each hearing duration to take account of the time lost between one case ending and another starting. Collection of information on this lost time is, however, vital to ensure the accuracy of such adjustments.

Another assumption concerns the priority rules for listing of cases. Factors other than custody and length of time in the queue are not taken into account in the model as they would be in the real world. As noted above, other factors which are used to decide case priority include the type of offence and the 'importance' of the case. It is assumed, however, that such factors will affect only a minority of cases and will not substantially alter the aggregate results obtained from the model.

Although the DCC model allows for the possibility that courts attached to different registries process cases at different rates, it does assume that all of the courts within a single registry area process cases at similar rates. It is possible that some courts take longer to process cases than do other courts attached to the same registry. Given that courts within a particular registry area tend to deal with similar cases, however, the assumption of the model on this issue would not seem unreasonable.

Similarly, it is assumed that the number of cases disposed of in any particular period is independent of the number of cases in the backlog. In other words, in the DCC model the distribution of hearing lengths is unrelated to the number of cases in the backlog. It is possible that courts respond to a large backlog by hearing cases more quickly. This is likely in circumstances where judicial officers have a quota of cases to get through (as occurs, for example, in Local Courts). In the Higher Courts, however, judges are generally not assigned a set of cases to dispose of in a given period. There is, therefore, no reason to expect the hearing duration of cases to depend on the size of the backlog of cases.

One final point deserves mention. No attempt was made to model the crime and law enforcement process which provides the input to the District Criminal Court. These elements were not modelled because too little is currently known about the relationship between crime, law enforcement and demand for court time. It is thus necessary for the user to calculate the likely changes to the number of new cases registered in the District Criminal Court which will result from a particular change to crime rates or law enforcement policy. These calculated values must then be input to the model. Whilst this is a limitation to the DCC model, it avoids possibly unwarranted assumptions regarding the influences on the number of cases in the District Criminal Court of crime rates and policing activity.

PART 4: MODEL IMPLEMENTATION AND ASSESSMENT

4.1 MODEL IMPLEMENTATION

The DCC model is used for policy analysis by manipulating different parameter values to reflect the changes expected within the court system as a result of a specified policy initiative.

To assess the results of a model run it is necessary to compare the predictions with measures which accurately reflect the state of the court system at some point in time. It is necessary therefore to run the model using a set of baseline parameter measures which have been estimated from data for a specified time period and check that the output of the model matches the actual output from the court system over that period. In this section, the data sources used to determine each of the baseline parameters for the model are described. The assumptions and limitations in estimating these values are also discussed.

Data from a number of sources were used for parameter estimation. The majority of the parameter values used in the model were calculated from a data collection covering all cases finalised in the Sydney District Criminal Court Registry area between January and September 1989. The data collection included 231 trials, 58 sentence matters, 257 all grounds appeals and 283 severity appeals. Data collected for these cases included the date of committal, date of issue of Notice of Readiness, the number of adjournments, the date the hearing commenced and ended, the date of a No Bill, the date of plea/grounds change and the number of plea/grounds changes, the date first not reached and the number of times not reached, the date of issue of a bench warrant (indicating that the offender had absconded) and the date of sentence. These data will be called the 1989 data set. To assess the variability of these initial parameter estimates a further data collection was undertaken for all cases finalised in the first six months of each of 1990 and 1991.

4.1.1 THE NUMBER OF CASES REGISTERED EACH MONTH

The NSW Department of Courts Administration provided details of the cases registered at the Sydney District Criminal Court. This information was provided for each case type and for each month between January 1989 and December 1990. It was classified according to the case type and the custody status of the accused. Where there was more than one accused per case, the case was considered to be a custody case if any defendant was in custody.

4.1.2 THE PROBABILITY OF A CASE BEING ADJOURNED

The following values were calculated from the 1989 data set for each of the four case types:

- (i) The probability of cases listed for hearing being adjourned once;
- (ii) The probability of cases which have already been adjourned once, being adjourned a second time;
- (iii) The probability of cases which have already been adjourned twice, being adjourned a third time.

4.1.3 AVAILABLE COURT TIME

The NSW District Court Executive Office provided the dates of the judicial periods in 1989 and 1990. This information also included the vacation sitting dates in January and July. Details of the judicial vacation periods were also supplied. In addition, the District Criminal Court Listing Directorate provided a breakdown of the number of courts being used for trials and for short matters.

Based on the durations of judicial periods and the allocation of courts and judges, the number of court days available per month for hearing trials and short matters was determined. These figures were then converted to hours by assuming that each court day was five hours in duration. These calculations underestimate the time available for short matters. This arises because, if there is excess time available, it is common for a judge to deal with some of his or her own short matters while sitting in a trial court.

4.1.4 THE LISTING QUOTA

Statistical reports prepared by the Criminal Listing Directorate provided the monthly listing quotas. Weekly statistics on the processing of trials have been kept since 1987. Information on short matters, is however, less reliable, in particular for 1989. As this was the only information on short matters which was available, however, it was used for parameter estimation.

4.1.5 THE PROBABILITY OF A CASE EXITING

A trial or sentence case was considered to have exited if all charges against an individual were withdrawn by the prosecution, or if the defendant absconded or died. Similarly, appeals were considered to have exited if the appellant withdrew the appeal, absconded or died.

The 1989 data set was used to determine the probability of exit for each case type. Where a case had changed plea or grounds of appeal, its case type at finalisation was used.

The following probabilities were calculated for each of the case types:

- (i) The probability of a case exiting before it is listed;
- (ii) The probability of a case exiting after it has been listed for hearing.

4.1.6 THE DISTRIBUTION OF HEARING LENGTHS

The approach taken to gather information on hearing lengths differed for long and short matters. The 1989 data set was used to determine the hearing length for trials. For short matters, data from the Recording Branch in the Sydney District Criminal Court provided hearing lengths. Details of the method of computation of these hearing lengths are now provided.

Trials

The 1989 data set included the commencement and completion dates for each of the trials finalised in the first nine months of 1989. The approximate hearing duration of each trial was then estimated as the time between these two dates. For trials which were commenced and completed on the same day, this method would have yielded a hearing length of zero

days. In addition, for trials which spanned more than one day, this method would have meant that no time was consumed on the last day of the hearing. To overcome this problem, half a day was added as a correction factor to all hearing durations.

The hearing length of a case does not account for all the court time a case may consume. Available court time is also occupied with a variety of interlocutory activities. These activities include call-ups, adjournments, pre-trial conferences and mentions. To account for the time consumed by these processes, the product of the average number of mentions per case and the average length of a mention was added to each hearing length.⁷ A frequency distribution of trial hearing lengths was then prepared from these data.

Short matters

Data from sound recordings of short matters maintained by the Recording Branch at the Sydney District Criminal Court were used to determine the length of short matter hearings. In particular, the tape counter values for the start and end of hearings were obtained for a sample of 100 short matters. The start value was then subtracted from the end value and this difference was converted to minutes representing the hearing duration. Frequency distributions of hearing lengths were generated from this sample for each of sentence cases, all grounds appeals and severity appeals.

4.1.7 THE PROBABILITY OF A CASE CHANGING PLEA/GROUNDS

The 1989 data set was used to determine the probability of a change of plea or grounds of appeal. It is possible for a defendant or appellant to change plea a number of times during the course of a case. Where a defendant or an appellant changed plea/grounds an uneven number of times, the case was considered to have changed plea/grounds.

The following probabilities were calculated for each of the case types:

- (i) The probability that a case changed plea/grounds before listing;
- (ii) The probability that a case changed plea/grounds after listing.

4.1.8 THE TIME TAKEN FOR THE ISSUE OF A NOTICE OF READINESS

The 1989 data set was used to determine the time taken for the issue of a Notice of Readiness for each trial. The number of days between committal and the issuing of a Notice of Readiness was calculated for each trial. This time delay in days was converted to months by dividing by 30.4. As the model processes cases on a monthly basis, any delays with fractional parts were rounded up to the next month. By this method, the probability of a case being ready after one, two and three months was calculated.

4.1.9 THE LISTING PRIORITY RULES

The priority given to custody cases and those cases already not reached twice was determined by discussions with the Criminal Listing Directorate. It was necessary to apply a more formalised priority rule than would be used in practice. In particular, it was necessary to decide whether or not custody cases should have priority over the cases which had been in the list for a long time. In practice, the Listing Director would decide this priority on a case by case basis.

On the basis of discussions it was decided to adopt the following priorities:

- (a) custody cases which have been previously not reached on two occasions are given the highest priority;
- (b) all other custody cases are given second priority;
- (c) non-custody cases which have been not reached twice are given third priority; and
- (d) all other non-custody cases are given the lowest priority.

In addition to these priority rules, the time percentage system was used to ensure that no single class of case was accorded an absolute priority in listing. Values for the percentages were set on the basis of discussion with the Listing Directorate.

4.1.10 CASES FINALISED

For the purpose of validity testing, it was necessary to obtain the number of cases finalised in each month of 1989 and 1990, so that model output could be compared with actual case disposal rates. The number of cases finalised in the Sydney Registry area each month in each of these years was determined from the NSW Higher Criminal Courts data collection maintained by the NSW Bureau of Crime Statistics and Research.

4.1.11 CASE BACKLOG

In order to assess the effect of various initiatives on the backlog within the Sydney Registry area, it was necessary to collect data on the composition of the backlog of cases awaiting hearing in the Sydney Registry area at the beginning of 1989. The cases forming this backlog were then entered to the model. Obtaining complete information on these cases proved difficult. The number of cases of each case type was available, but the history of each case, and the amount of court time it was likely to consume were not available. As a consequence, it was difficult to assess the length of time which these cases had been waiting for hearing, and so to determine their relative priorities in the listing process. To overcome this problem, an arbitrary committal date prior to the date of the first model cycle was applied to all cases in the backlog. This had the effect of giving all cases in the backlog a higher priority than the cases generated by the model during its run. The backlog cases were entered directly into the listing process. Thus, it was assumed that for these cases, any pre-listing plea change and exit events had already occurred, and for trials, that a Notice of Readiness had been issued. The cases were randomly assigned a hearing duration from the hearing duration distribution which was applicable to their case type for 1989.

4.2 MODEL ASSESSMENT

There are two major factors to be considered when assessing the utility of the DCC model. First, it is necessary to establish whether or not the model has output stability. In other words, the output from successive simulation runs of the model in which the parameter values are kept the same (i.e. iterations) must be examined to establish the amount of variability between them. Second, validity testing is necessary. This involves establishing that the output of the model matches the actual values of the output variables in the court system. If the match is not achieved, the model must be adjusted and validity re-tested. When the match is established the model is considered to be a valid representation of the court system. The way in which each of these issues was addressed will be examined in this section.

4.2.1 OUTPUT STABILITY TESTING

As discussed in Part 3, the events in the model are controlled by probability values which are applied to individual cases. As a result, it is possible to obtain somewhat different results if the model is run a number of times even though the parameter values are identical. For example, even though the probability of change of plea is kept constant at 0.3 over several runs, the actual number of cases which change plea may vary in these runs. If there is a large amount of variability between iterations it is necessary to run the model over a large number of iterations and average the output to obtain stable results. Testing was carried out to determine how variable the output was from one run to another with the parameter values kept constant.

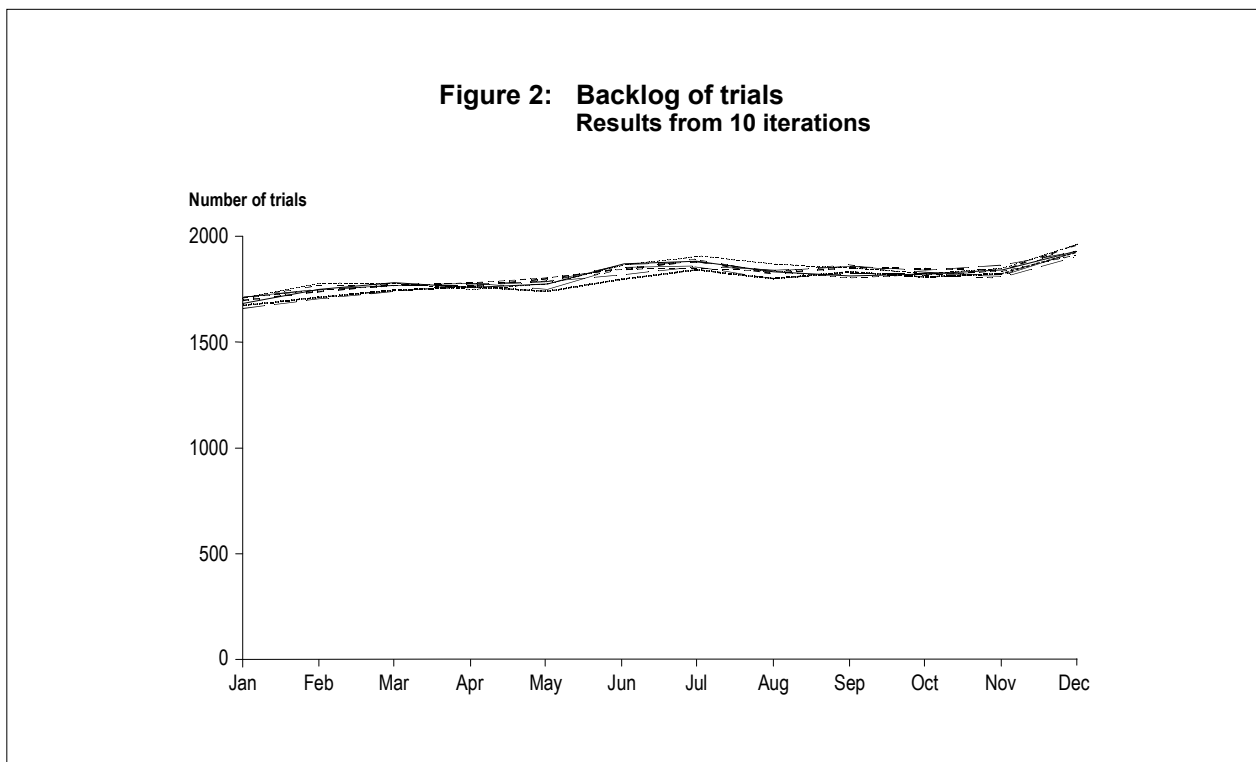


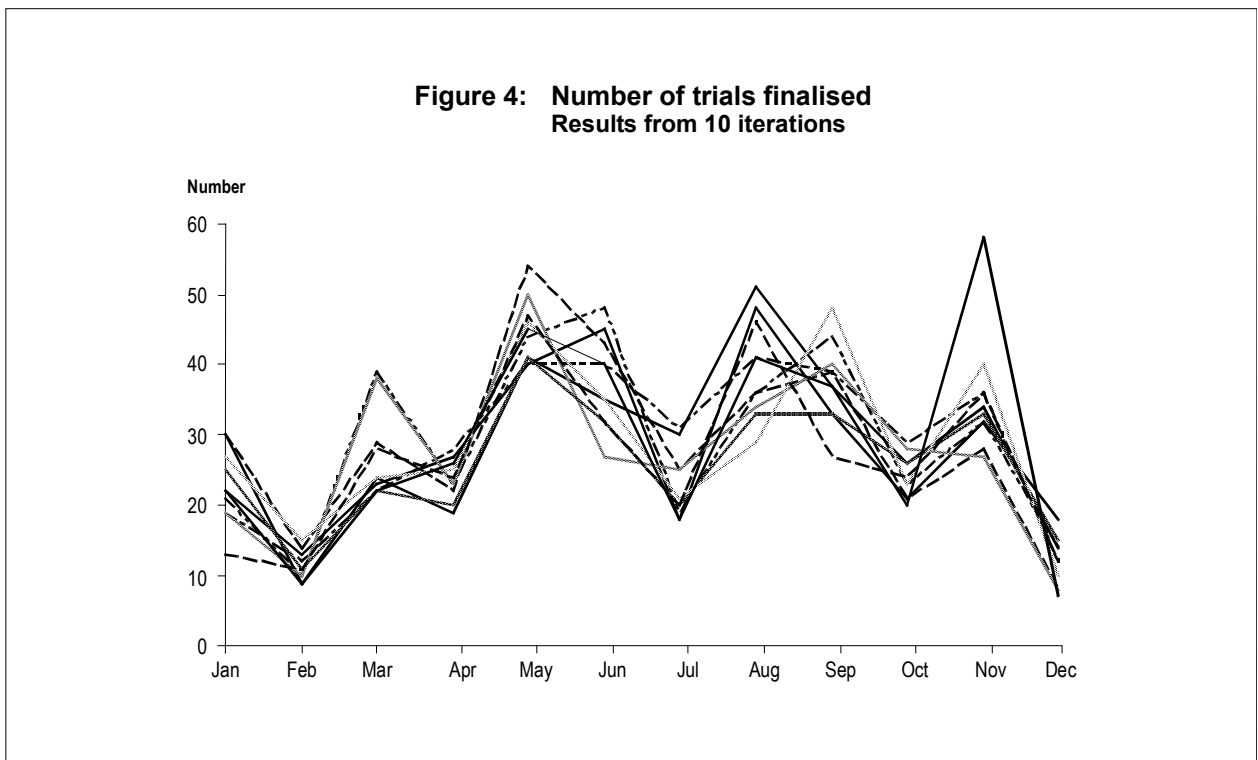
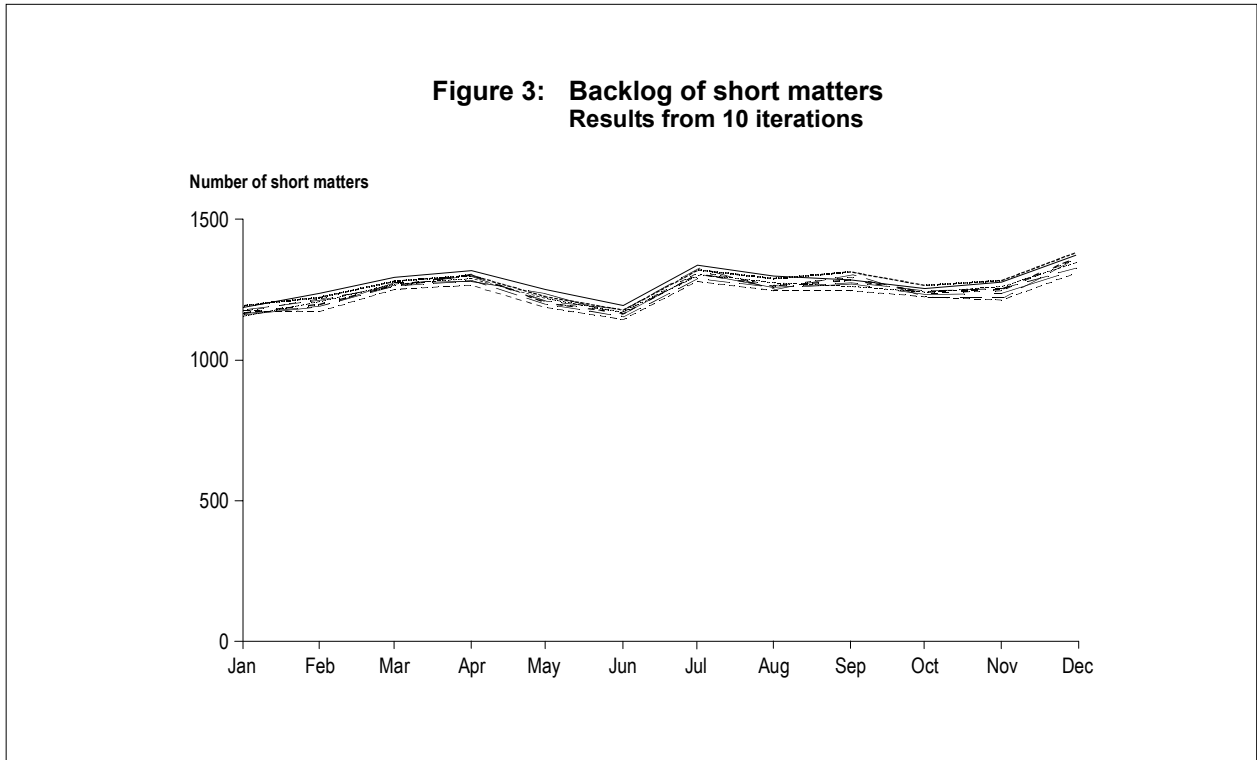
Figure 2 shows the number of trials in the backlog each month for ten 12-month runs of the model with identical parameter settings. As can be seen from the figure there is very little variation between iterations.

Similarly, as shown in Figure 3, the size of the backlog of short matters does not vary between iterations of the model.

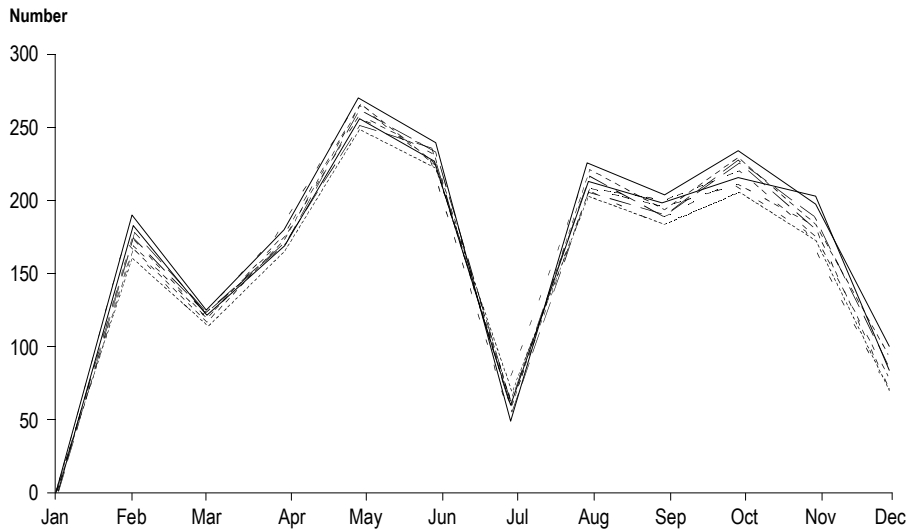
When the number of cases finalised is considered, it can be seen that there is some variability between iterations in the number of trials finalised in each month (see Figure 4) but very little variation between iterations in the number of short matters finalised each month (see Figure 5).

On the basis of these tests, therefore, it was concluded that the model is stable across iterations. In other words, it is not necessary to average the results from a large number of

iterations to determine the way the court processes cases under a specified set of parameter values. The output from a single iteration was therefore used in validity testing and scenario analysis.



**Figure 5: Number of short matters finalised
Results from 10 iterations**



4.2.2 VALIDITY TESTING

As noted above, it is important that the model's baseline run accurately reflects the actual state of the court system. In order to test that the baseline is accurate it is necessary to compare the model's predictions at a given point in time with output measures from the court system at the same point in time.

As mentioned earlier the model makes predictions about the impact of parameter changes on a wide variety of variables. These include: the size of the pending caseload, the average age of cases in the pending caseload, the number of cases finalised within a period, the age of finalised cases, the amount of court time utilised within a period and the number of cases not reached in a particular period.

Each of these outcome measures could potentially be compared with actual values from 1989 and 1990 to validate the model. It was found, however, that actual values for many of these measures were difficult to obtain from the courts for the relevant years, particularly on a monthly basis. As a result, in order to validate the model within a reasonable time period, it was found necessary to limit the outcome variables on which validation would be performed.

There are many ways of assessing the accuracy of the model but most of them give interdependent results. We can compare the predicted backlog of cases with the actual backlog of the courts, or we can compare the number of cases finalised by the model with the number of cases actually finalised. The size of the backlog, however, is dependent, at least in part, on the number of cases finalised. The results of tests on this last measure will, therefore, have implications for any comparisons we make of actual and predicted backlog. Perhaps the best way of making an assessment of model accuracy in these circumstances is to pick the most fundamental measures of court activity as the basis of assessment. One of the most fundamental is clearly the number of cases disposed of. It is sensitive to

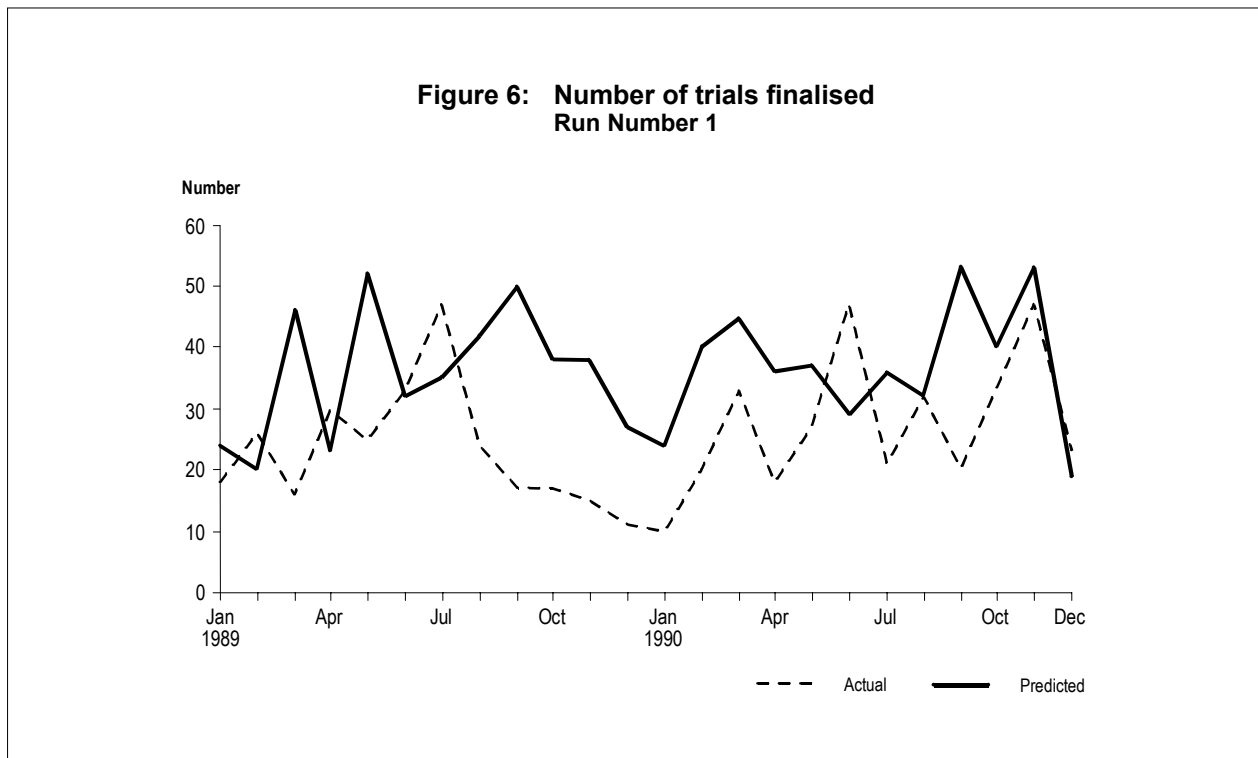
assumptions about parameters including plea rates, rates of exit prior to a hearing, and available court time. For the purpose of initial validation, therefore, the variable which was chosen was the number of long and short matters finalised each month.

To validate the model, runs were carried out for the two year period January 1989 to December 1990 using the parameter values for the Sydney Registry area for 1989. The predicted number of cases finalised per month was compared with the actual values for this period. Where the model was shown to generate incorrect predictions, one or more of the assumptions of the model involved in the prediction was considered to be in error. The major possible sources of error were:

- (i) incorrect parameter values;
- (ii) incorrect assumptions about the operation of particular stages of case processing (e.g. the order in which cases are listed for hearing); or
- (iii) incorrect assumptions about the relationship between various stages of case processing (e.g. that trial duration is not affected by the number of cases registered as trials).

Where the model generated incorrect predictions each of these possible sources of error was explored and the model program adjusted where necessary.

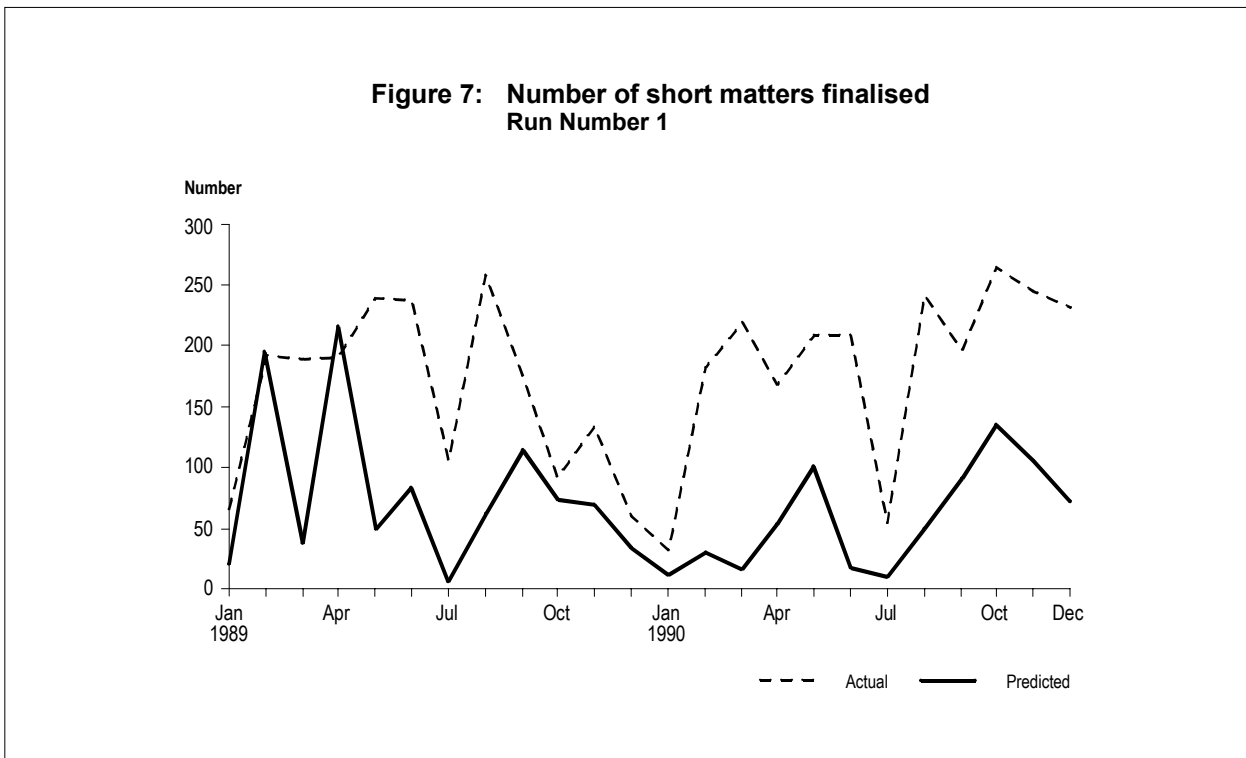
The specific procedure which was followed to test and fine tune the model was as follows. For each run of the model for the two year period January 1989 through to December 1990, the number of cases finalised each month as trials or short matters (sentences, all grounds appeals and severity appeals) was compared with the actual number of cases finalised in the Sydney Registry during the same period. A number of adjustments were necessary to obtain accurate monthly output from the model for each case type. Results will now be presented.



Run Number 1

Initial parameter estimates based on 1989 data were obtained as described above and the model was run for the two year period from January 1989 to December 1990. The model's predictions of the numbers of trials and short matters finalised are compared with the actual numbers of trials and short matters finalised in Figures 6 and 7 respectively.

It is apparent from the graphs that the predicted number of short matters finalised in the model was smaller than the number actually disposed of in 1989. At the same time, the predicted number of trials finalised was greater than the actual number finalised.



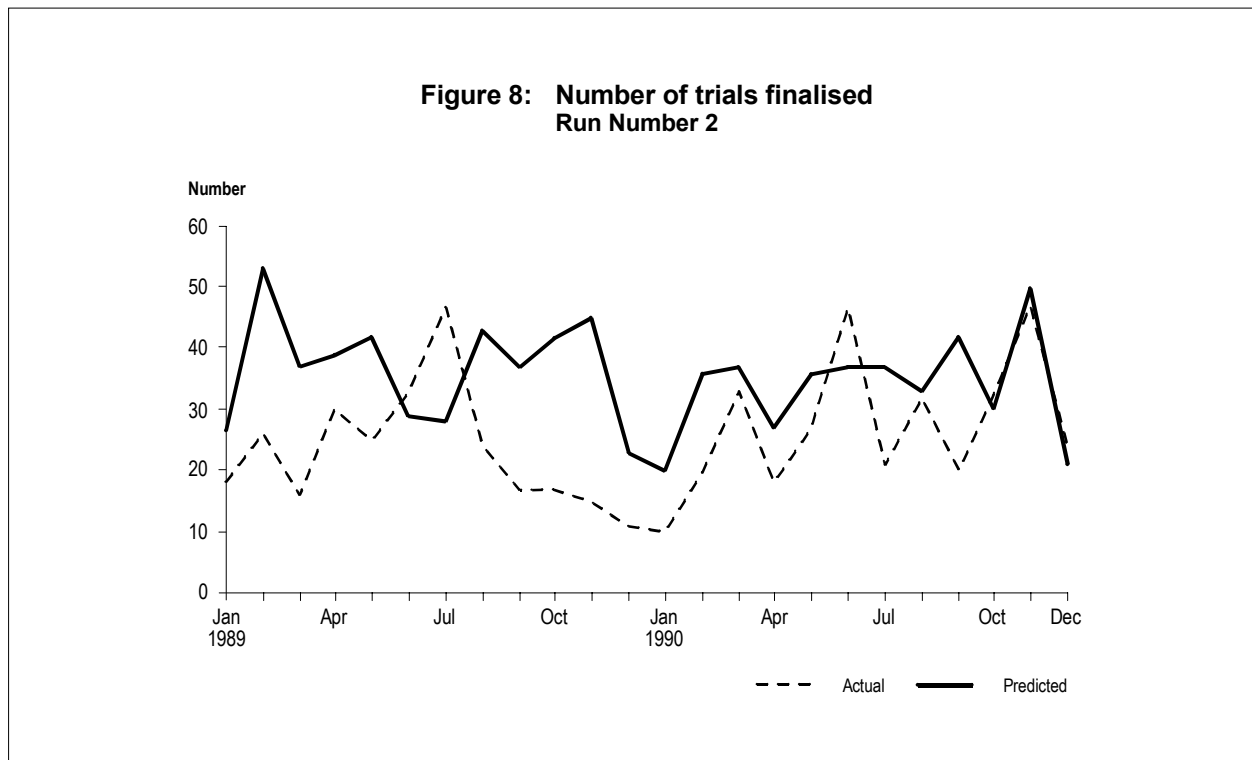
Run Number 2

From the results of the first run, it appeared that the relative proportions of court time assigned to long and short matters was incorrect. During discussions with staff from the Criminal Listing Directorate two possible causes of this discrepancy were suggested. First, it was noted that judges often deal with their own part-heard short matters during breaks in proceedings in trials. In other words, short matters are often heard in what was counted in the model as long matter court time. As a result, the model over-estimated the amount of available long matter time and, therefore, the number of trials finalised was also over-estimated. The extent to which this occurred could not be determined exactly but it was suggested that the hearing of short matters may account for between 10 and 20 per cent of long matter time.

Second, the Criminal Listing Directorate indicated that they separately timetabled cases which were expected to have a hearing length exceeding 25 hours to ensure that these cases were heard and that only one or two of them would be heard at any one time. These long trials were called special fixtures. This meant that, in the court system, it was likely that

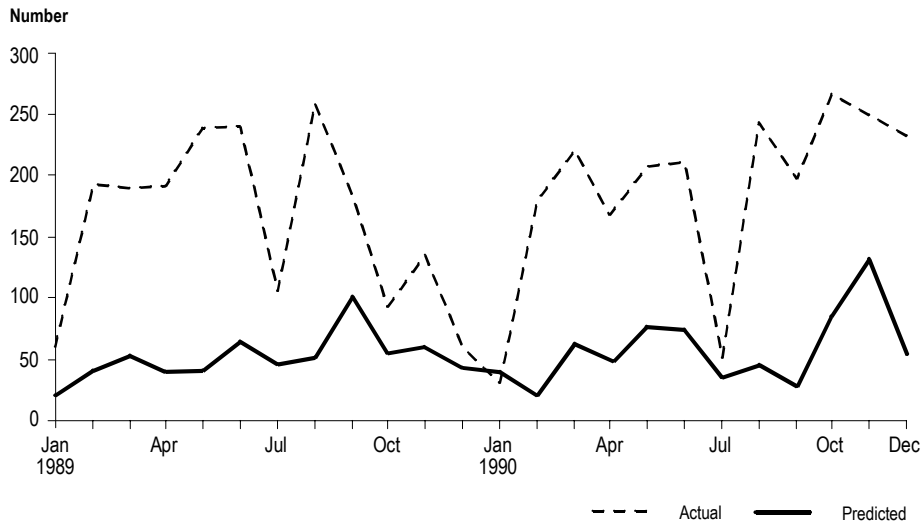
there would always be a number of special fixtures being heard. This did not match the way in which the model treated trials of long duration. In the model, trials of long duration had a very low probability of occurrence. As a result it was possible that, in any one particular run of the model there would be no long trials being heard in a given period even though a number of long trials were actually heard in the District Criminal Court in that period. The time which in the real world was devoted to the hearing of one or two special fixtures, would in the model be used to hear many more shorter trials. In other words, in the model there would be many short trials being finalised at the expense of a few long trials. This would have the effect of the model over-estimating the number of trials finalised.

It was decided to examine the effects of changes to the model parameters to resolve each of these problems in turn. First the over-estimate of available long matter time was examined. In order to increase the accuracy of the model estimate of available long matter time it was decided to adjust the parameter on the basis of the estimates provided by the Criminal Listing Directorate. Accordingly, 10 per cent of the court time which was previously assigned to the hearing of trial matters was reassigned to short matter hearings. This corresponded to the lower estimate provided by the Criminal Listing Directorate. Otherwise all of the other parameters were set as in Run Number 1.

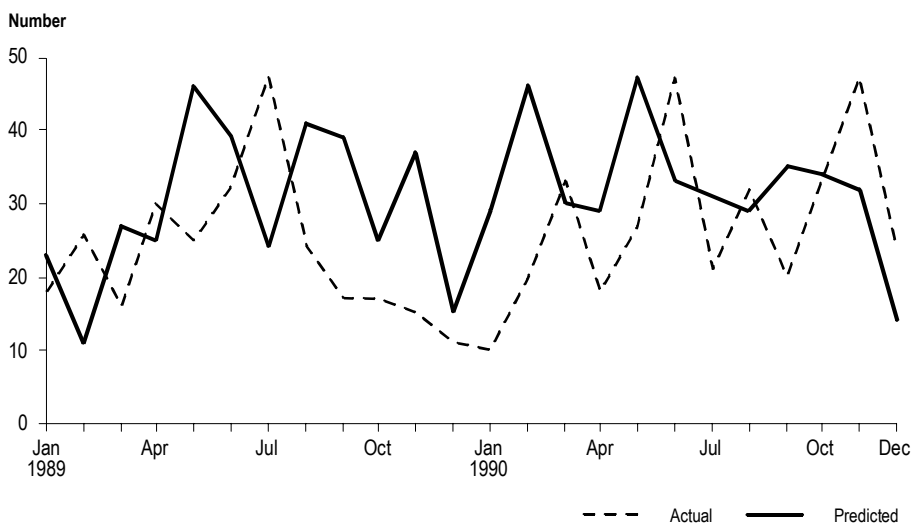


The numbers of trials and short matters finalised when this change was incorporated are shown in Figures 8 and 9 respectively. It is obvious that the number of trials finalised was still excessively high whereas the number of short matters finalised was too low.

**Figure 9: Number of short matters finalised
Run Number 2**

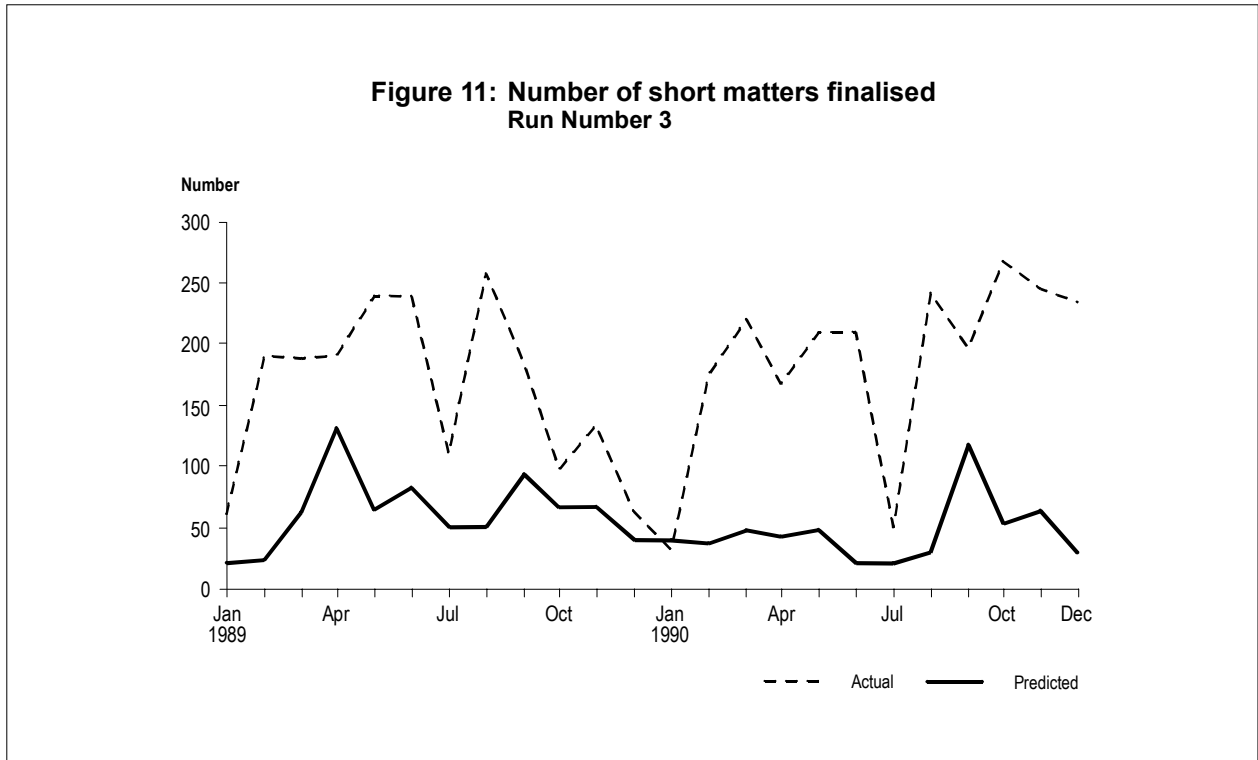


**Figure 10: Number of trials finalised
Run Number 3**



Run Number 3

As the previous run did little to alleviate the mismatch between the predicted and actual numbers of finalised trials and short matters, it was decided to increase further the court time allocated to short matters. In this run, therefore, 20 per cent of the court time which



was previously assigned to trial hearings was reassigned to short matters hearings. This corresponded to the upper estimate provided by the Criminal Listing Directorate. Again, all other parameter values remained unchanged from Run Number 1.

From Figures 10 and 11 it can be seen that, although the predicted numbers of trials and short matters finalised were now closer to the actual numbers finalised, in the model there were still too many trials being finalised and too few short matters finalised.

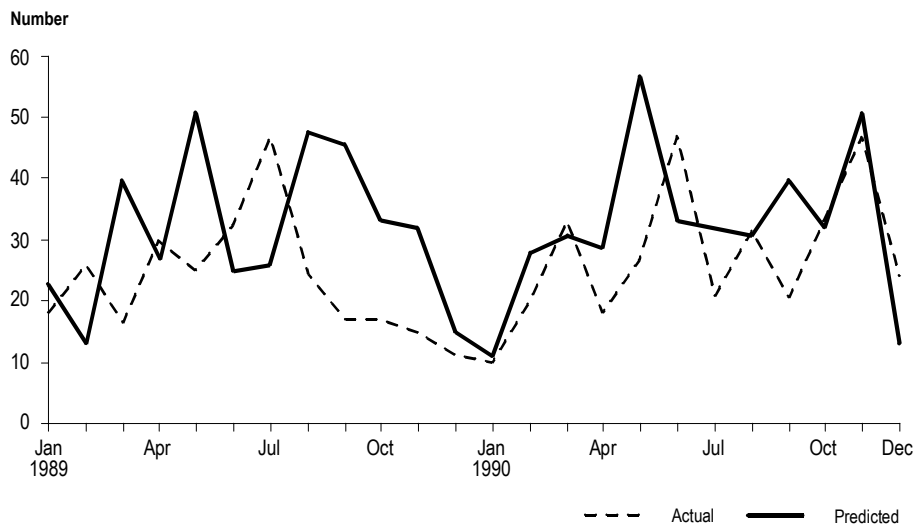
Run Number 4

Increasing the available court time for short matters further was not appropriate on the basis of the estimates provided by the Criminal Listing Directorate. In this run, therefore, we considered the second issue, that of special fixtures.

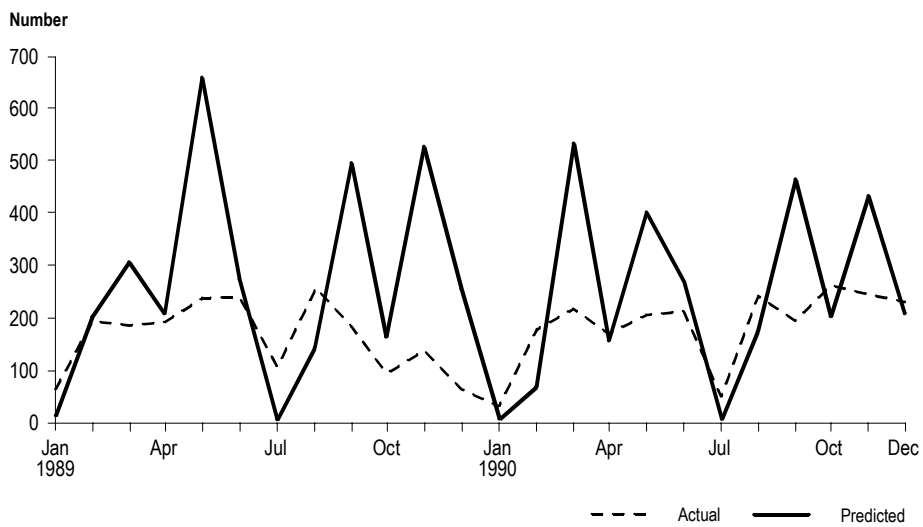
As noted above, the Criminal Listing Directorate dealt with any cases which were expected to have a hearing length exceeding 25 hours (special fixtures) on an individual basis. These cases were allocated court time independent of the listing quota and were certain to be heard on their nominated date. In the model, cases with very long hearing durations were extremely unlikely to be selected from the distribution of hearing durations. As a result, it was possible that a run of the model would not include any such long cases. In this way the number of long trials finalised in the model would not necessarily match the number of long trials actually finalised in 1989. To take account of this in the model we reduced the amount of court time available for hearing trials by the amount of time actually used by special fixtures in 1989 as determined by data supplied by the Criminal Listing Directorate. In addition, hearing durations for trials in excess of 25 hours were removed from the hearing duration distribution. All other parameters were set as in Run Number 3.

The results of this run are shown below. From Figures 12 and 13 it can be seen that this change greatly improved the match between the predicted and actual number of cases finalised. The predicted number of trials finalised approached the actual figures. Now, however, the predicted number of short matters finalised exceeded the actual number of short matters finalised.

**Figure 12: Number of trials finalised
Run Number 4**



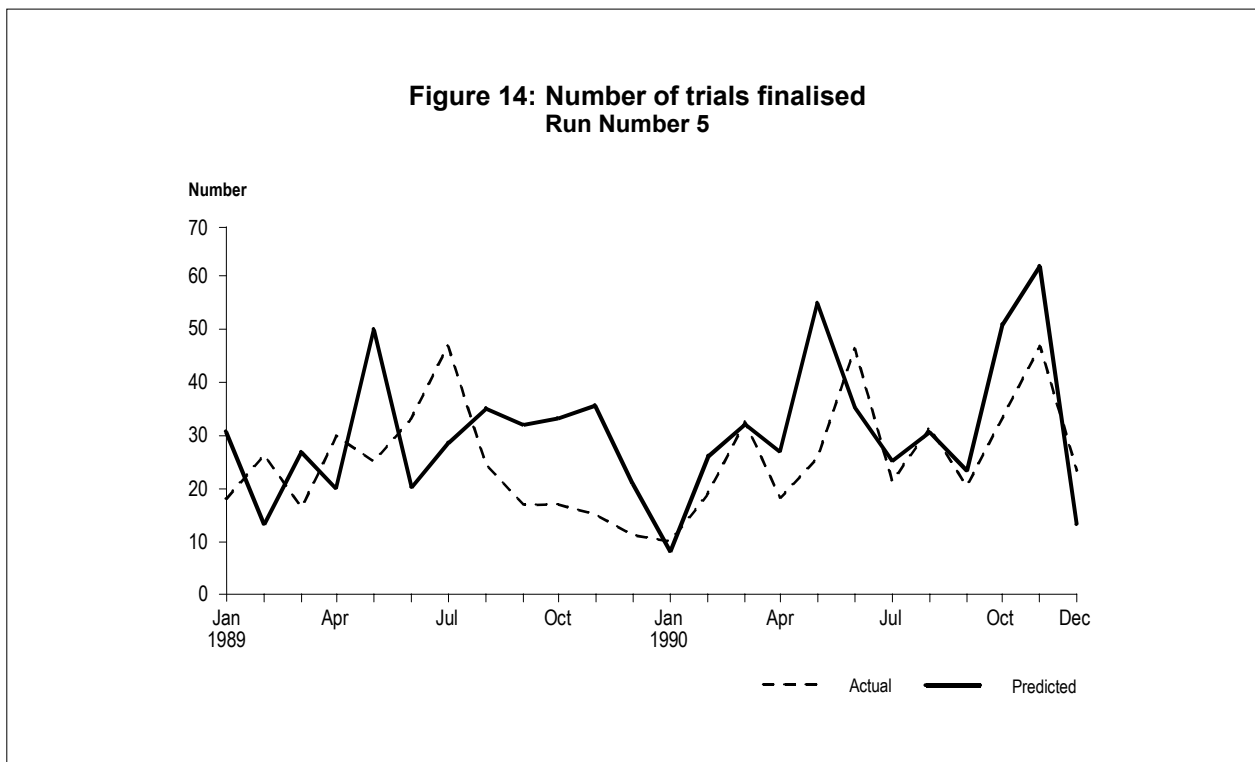
**Figure 13: Number of short matters finalised
Run Number 4**



Run Number 5

A possible cause mentioned by the Listing Directorate of the excess number of short matters finalised was that estimates of their hearing durations were too short because no allowance had been made for the time taken for people to move in and out of the court room between hearings. For this run, therefore, five minutes was added to each short matter hearing length in the distribution. Otherwise the parameters were identical to those used in Run Number 4.

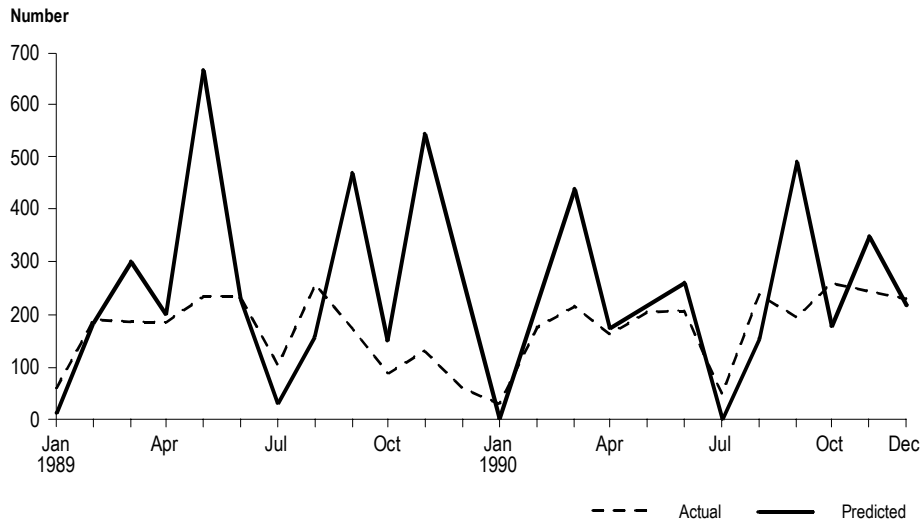
From Figures 14 and 15 it is apparent that the predicted number of short matters finalised still exceeded the actual number of short matters finalised.



Run Number 6

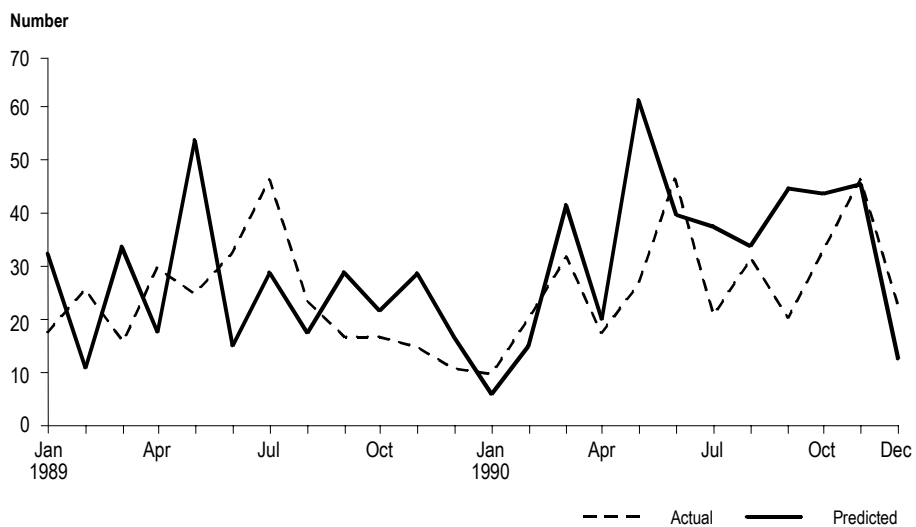
Further consultation with the Criminal Listing Directorate highlighted another difference between their operation and the operation of the model which may have resulted in inaccuracies in the predicted number of short matters finalised. In particular, at the start of the current week the Criminal Listing Directorate listed cases which were to be heard in the current week. In contrast, in the current month the model listed cases which were to be heard in the following month. For example, in March, the model would list the number of cases specified in the March listing quota, but these cases were listed to be heard in April. In other words, the listing quotas being used in each month in the model were actually applied to the following month.

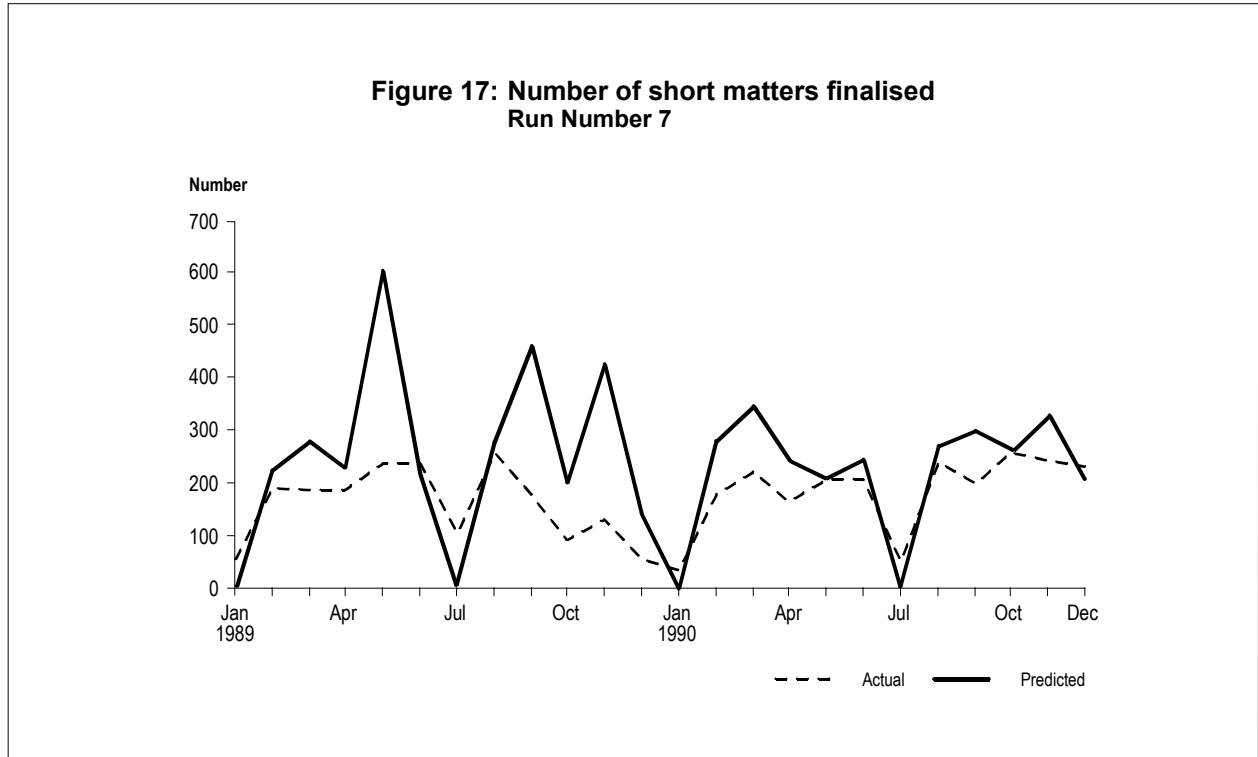
**Figure 15: Number of short matters finalised
Run Number 5**



In this run, therefore, the listing quotas were changed to match the month in which the cases listed were going to be heard. For example, the April listing quota was applied to cases listed in March but which were to be heard in April. All other parameter values were the same as for Run Number 5.

**Figure 16: Number of trials finalised
Run Number 6**





The results of this run (Figures 16 and 17) show that the adjustment in the listing quota made a marked improvement particularly for short matters finalised in 1990. There was, however, still a difference between the predicted number of short matters finalised and the actual number finalised. The model over-estimated the number of short matters finalised especially in the first 12 months of the run.

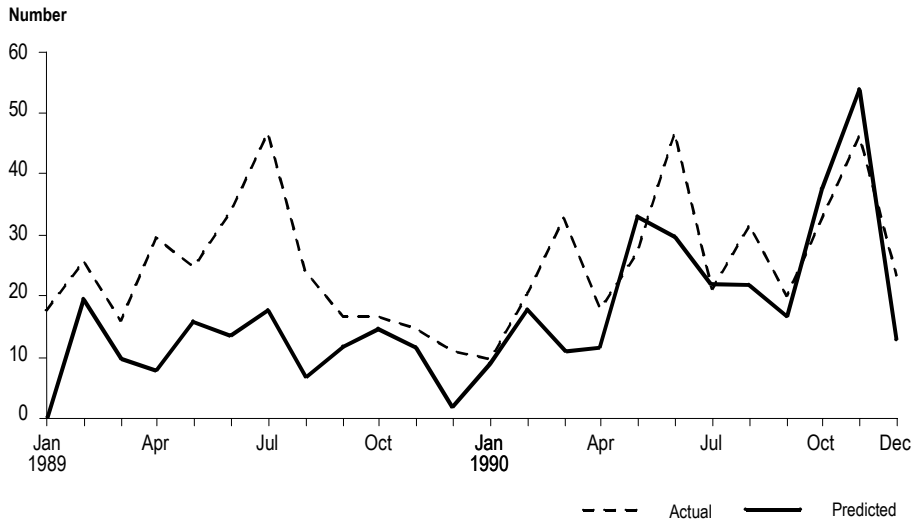
Run Number 7

Detailed examination of the operation of the listing process in the model showed that preference was being given to cases that had previously been listed. This was in fact a logical error in the program. The model was designed to give preference to cases which had been not reached twice rather than listed twice. In addition, these not reached cases were intended to be given preference in listing rather than by-passing the listing process and being given priority in being heard.

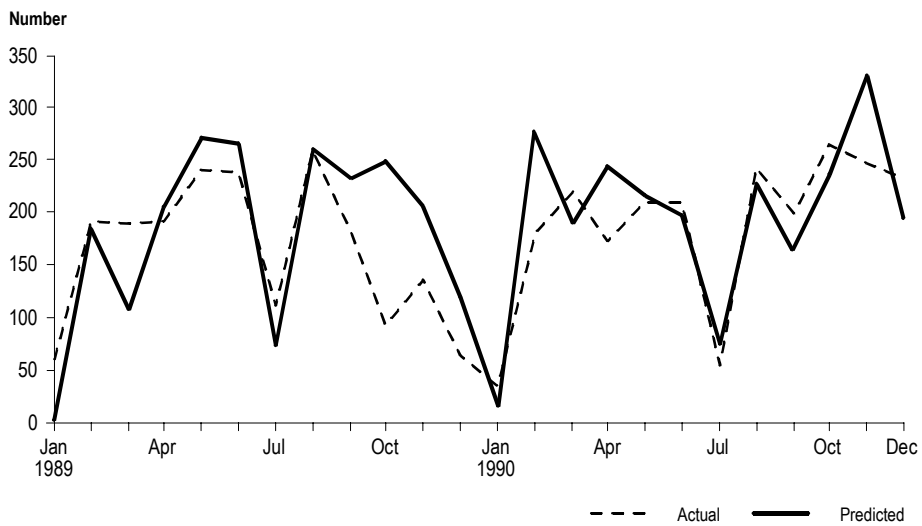
These problems in the model were corrected and the model was run again. The parameters were set with the same values used in Run Number 6.

Figures 18 and 19 show the predicted and actual numbers of trials and of short matters finalised, respectively, during the test period for this run. It can be seen from the graphs that the shapes of the curves for the predicted and actual values were now very similar, particularly in the second year. The seasonality apparent in the actual data as a result of vacation periods had been accurately modelled. In addition, the predicted numbers of trials and short matters finalised each month were very similar to the actual numbers finalised. This indicated that the allocation of court resources and the assignment of durations to cases in the model accurately reflected the real world. This output was considered to be sufficiently accurate to proceed to the examination of scenarios.

**Figure 18: Number of trials finalised
Run Number 7**



**Figure 19: Number of short matters finalised
Run Number 7**



PART 5: APPLICATION OF THE MODEL

5.1 SCENARIOS - THE PROBLEM OF COURT DELAY

The model was designed to allow the user to analyse options aimed at alleviating court delay. To illustrate the way in which the model can be used for this purpose, the output from three scenarios concerning court delay reduction options will now be described.

5.1.1 THE BASELINE

As noted earlier, in order to be able to assess the effects of any change in the operation of the court system it is necessary to have a baseline run in which all parameter values reflect the actual operation of the court system at some point in time. Initially the parameter values of the model were set up so that the model simulated the operation of the District Criminal Court as established by the validity testing. The numbers of trial, sentence and appeal cases waiting for hearing in the District Criminal Court at the start of 1989 were also entered. In addition, in order to simulate the annual increase in the number of cases being registered in the District Criminal Court, a 10 per cent per annum increase in the number of cases arriving at the District Court for hearing was applied.⁸ Finally, the listing quotas for short and long matters were set to match those used in validation Run Number 7. The model was then run for a 5 year period to provide a baseline for comparison with other scenarios.

Five output measures from the baseline run of the model were examined. They were:

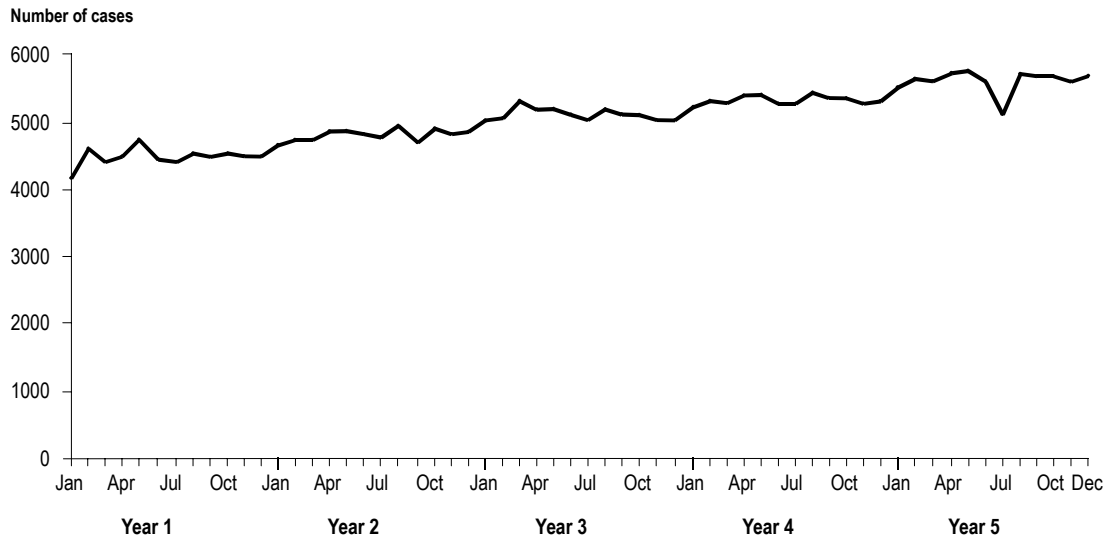
- the total size of the backlog;
- the size of the backlog of trials;
- the size of the backlog of short matters (sentence cases, severity appeals and all grounds appeals);
- the amount of court time used to hear trials relative to the amount of court time available to hear trials;
- the amount of court time used to hear short matters relative to the amount of court time available to hear short matters.

These measures were chosen as those which are most important when considering the problem of court delay. In each case the output variables were examined month by month for a 5 year period. The findings for each one will now be considered in turn.

Figure 20 shows the total backlog of cases (trials, sentence cases and appeals) per month in the District Criminal Court for the 5 year period. As can be seen from the figure there is a steady increase in the total number of cases in the backlog across the period.

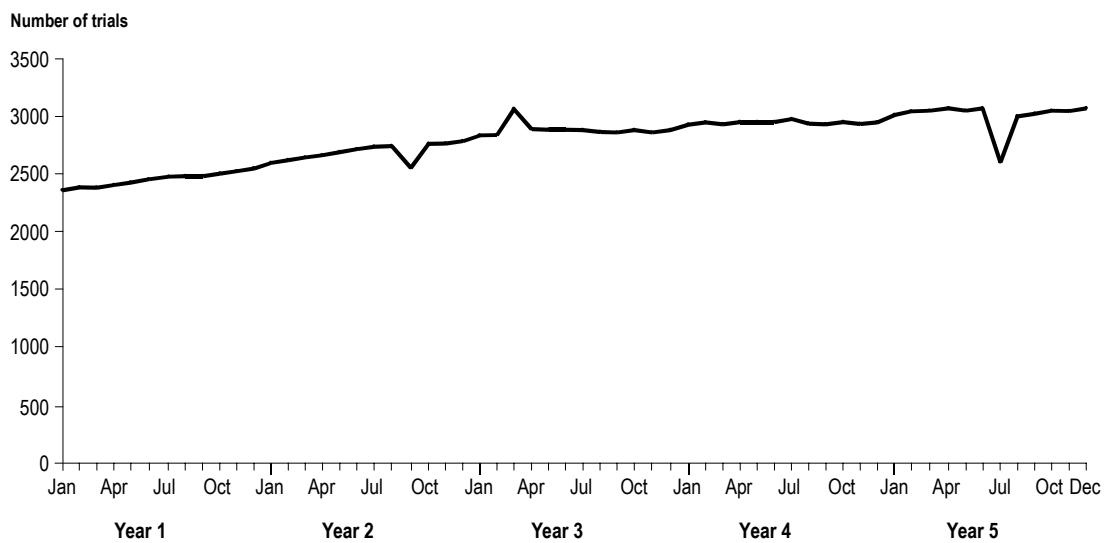
This increase is evident for trials (see Figure 21) and for short matters (see Figure 22) considered separately. In other words, with the level of court resources which were available and given the assumptions about the District Criminal Court employed in the model, it was still not possible for the courts to process those cases which were arriving for a hearing at the same rate as they were arriving. The queue of cases awaiting a hearing continued to increase in length.

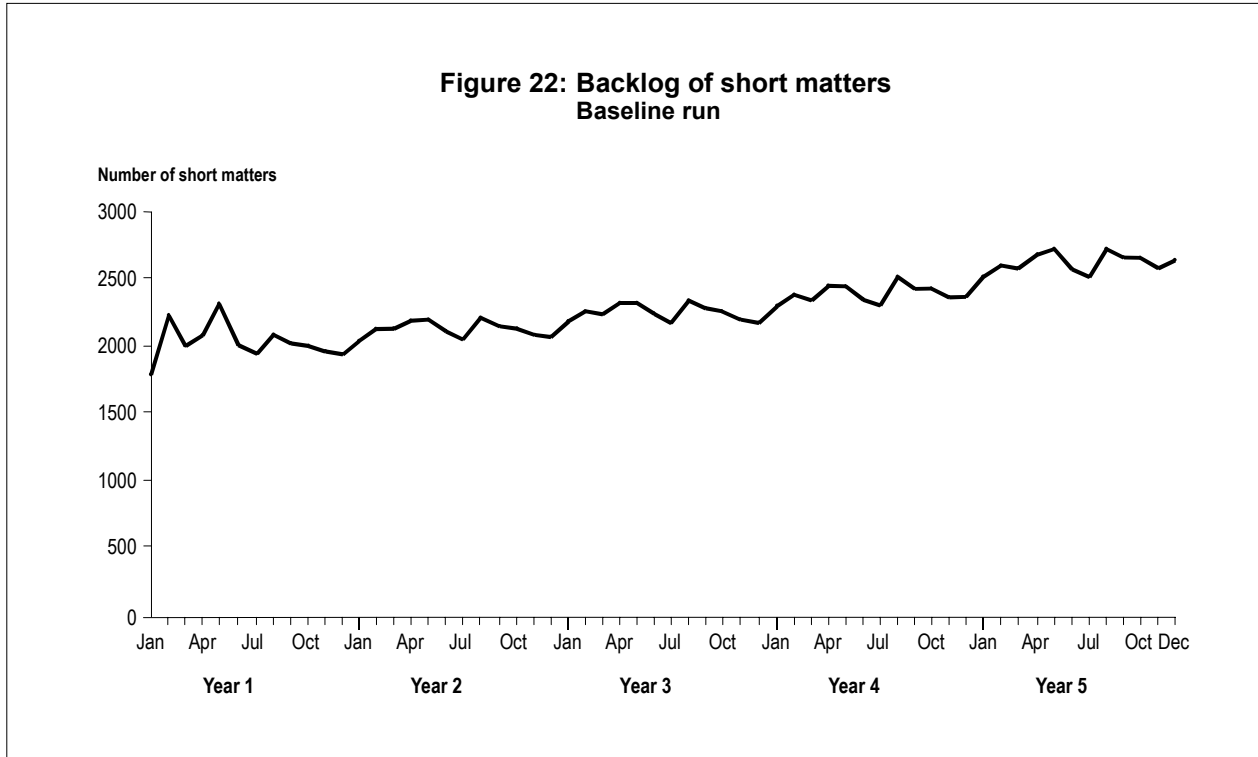
**Figure 20: Total backlog of cases
Baseline run**



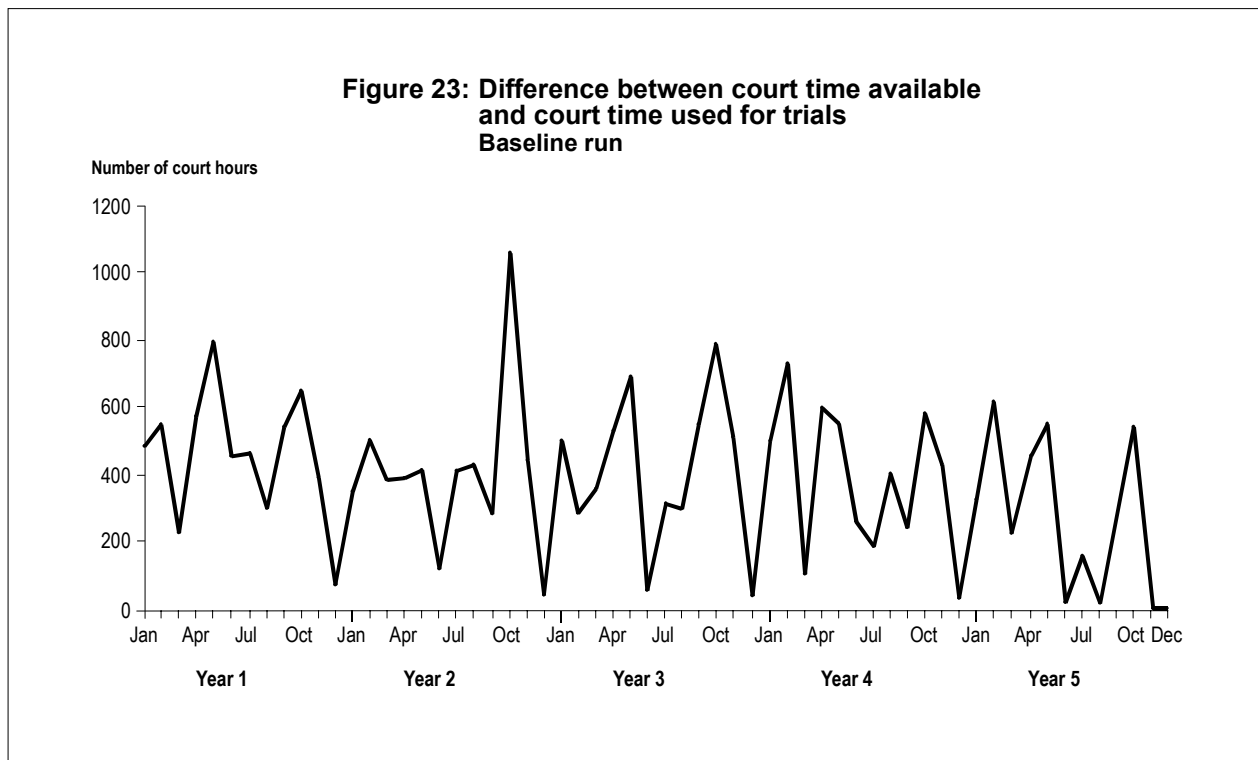
One possible cause of the increase in the backlog which can be examined using the model is that not all available court time is being used. In particular, it is possible that the division of court time into the categories of long matter time and short matter time results in time

**Figure 21: Backlog of trials
Baseline run**





remaining unused in one category while there is a shortage of time in the other. Figures 23 and 24 show the difference between the number of court hours available and the number of court hours used to hear long and short matters respectively.



In these figures an excess of available court time over that required is shown as a positive value. From Figure 23 it can be seen that, for the majority of months in the 5 year period, there was unused long matter court time. Figure 24 shows that in most months this is also the case for short matters. This apparently anomalous finding is due to the fact that the listing quotas set were insufficient to fill court time left vacant by adjourned or exited cases. These quotas were, however, those used in the final validation run. As was shown in the results of the validation testing the number of cases finalised in the model accurately reflects the actual number finalised.

The negative values in Figure 24 indicate that in some months short matters used more court time than was nominally allocated to them. This indicates that short matters were heard in time which was nominally allocated to long matters but was not used by the model for this purpose. In other words, although it appears from Figure 23 that there is a large amount of long matter court time unused, Figure 24 shows that this was in fact used for hearing short matters.

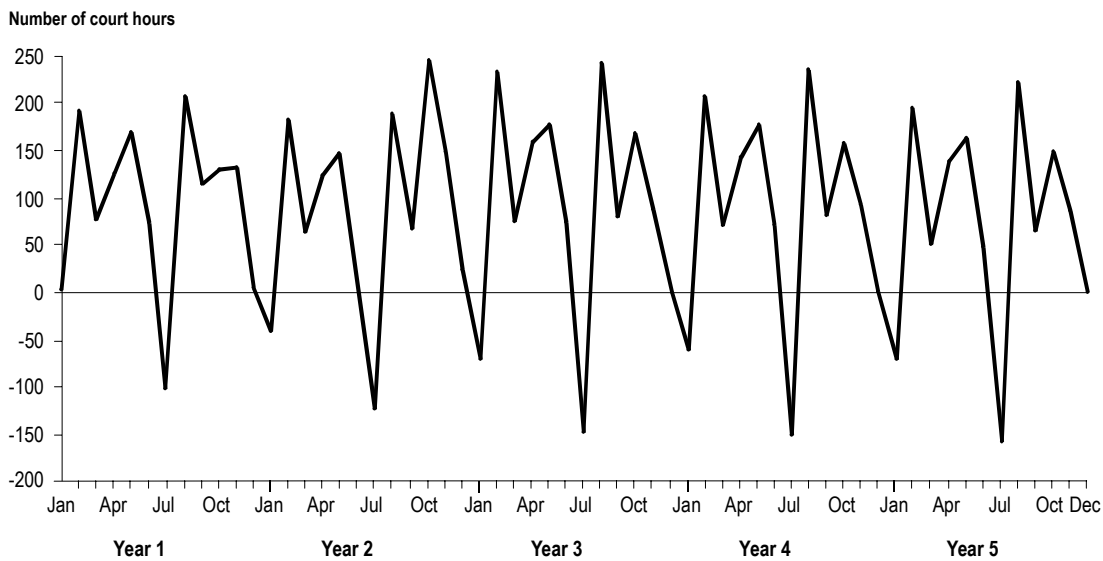
In summary, therefore, with the District Criminal Court operating as it was in 1989 and 1990 and assuming a 10 per cent per annum increase in caseload, the baseline run of the model shows that the size of the backlog is increasing. In addition, in most months there is unused court time for both long matters and short matters because the excess of cases listed was not sufficient to offset the combined attrition rate due to adjournments, plea changes and other similar factors.

5.1.2 INCREASED COURT CAPACITY

Sixteen new courts

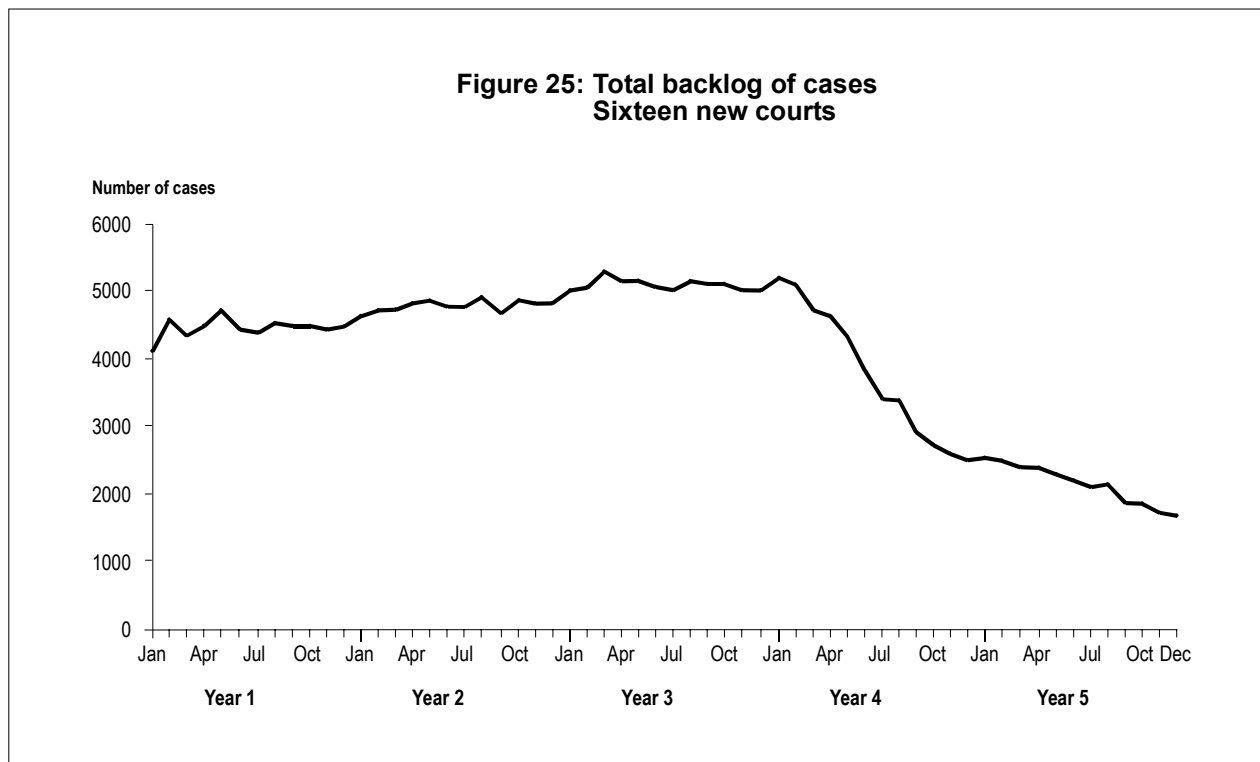
In this scenario the model is used to assess the impact on the baseline court delay of a major capital works initiative. For this simulation, available court hours in the model were increased to represent the addition of a 16 court complex at the start of Year 4.

**Figure 24: Difference between court time available and court time used for short matters
Baseline run**



The additional available court time was divided between long and short matters in the same proportions as in the baseline run. The listing quotas for short and long matters were increased by an amount proportional to the increase in the number of courts. In all other ways the parameters used for this simulation were the same as those used in the baseline run. In particular, as with the baseline run, it was assumed that there was a 10 per cent increase per annum in the number of new case registrations in the District Criminal Court for all case types. The simulation was run for the same 5 year period as the baseline run and the same output measures were examined.

Figure 25 shows the total backlog of cases awaiting a hearing per month in the District Criminal Court.

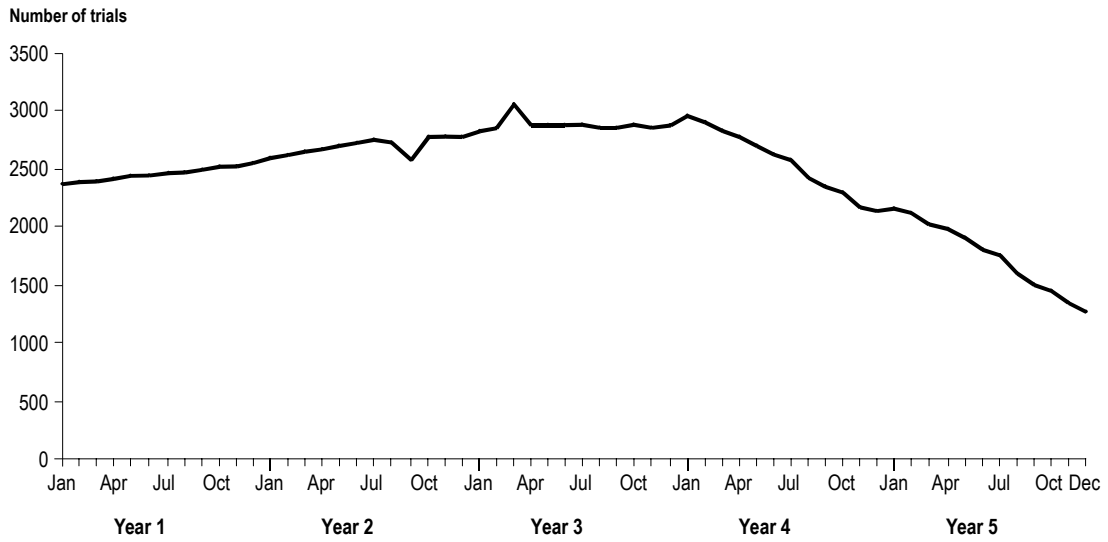


As can be seen from the figure the size of the backlog increases from January of Year 1 to December of Year 3, the period before the introduction of the court complex. From January of Year 4, when the new courts become available, the backlog starts to decrease rapidly and continues to decrease until the end of the run. The same pattern is evident in both the backlog of trials (see Figure 26) and the backlog of short matters (see Figure 27).

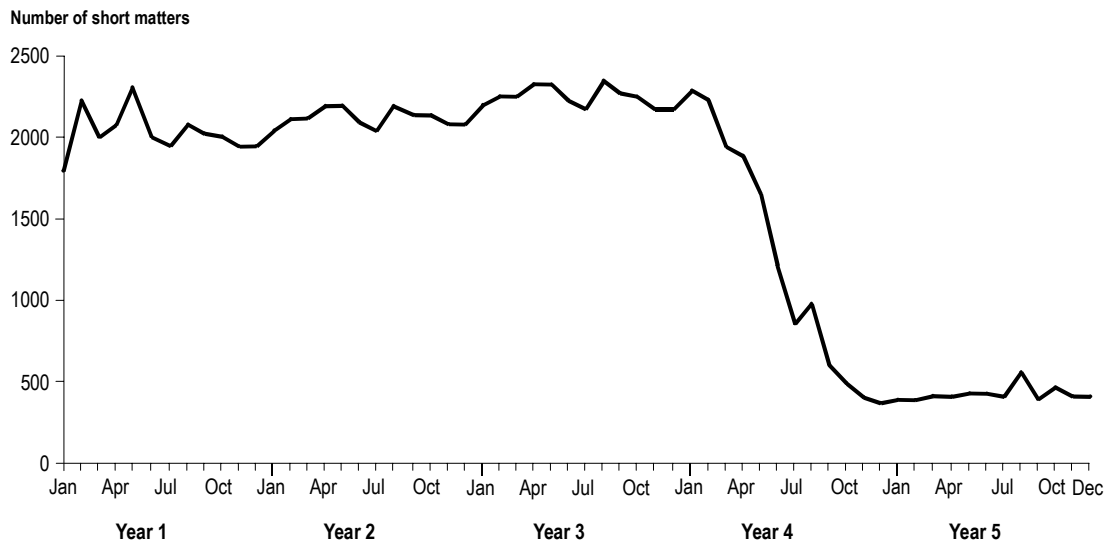
In particular, the backlog of trials is reduced by approximately two-thirds by December of Year 5. The backlog of short matters appears to reach a minimum by the end of Year 4 and stays at this level until the end of the run. This means that the only short matters present in the backlog each month are those which were registered in the previous month.

Figure 28 shows the difference between the amount of available long matter court time and the amount of long matter time actually used. Comparing this with Figure 23, it is evident that the amount of court time unutilised increases following the opening of the new courts. It would appear, therefore, that with 16 new courts, there are not always enough cases ready to go on for a hearing so a certain amount of court time goes unused.

**Figure 26: Backlog of trials
Sixteen new courts**

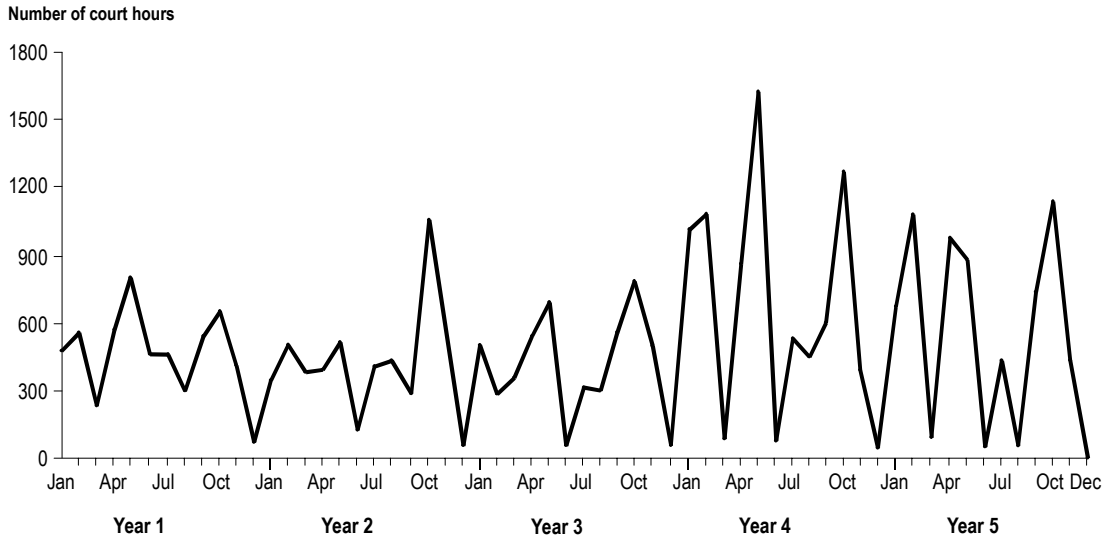


**Figure 27: Backlog of short matters
Sixteen new courts**

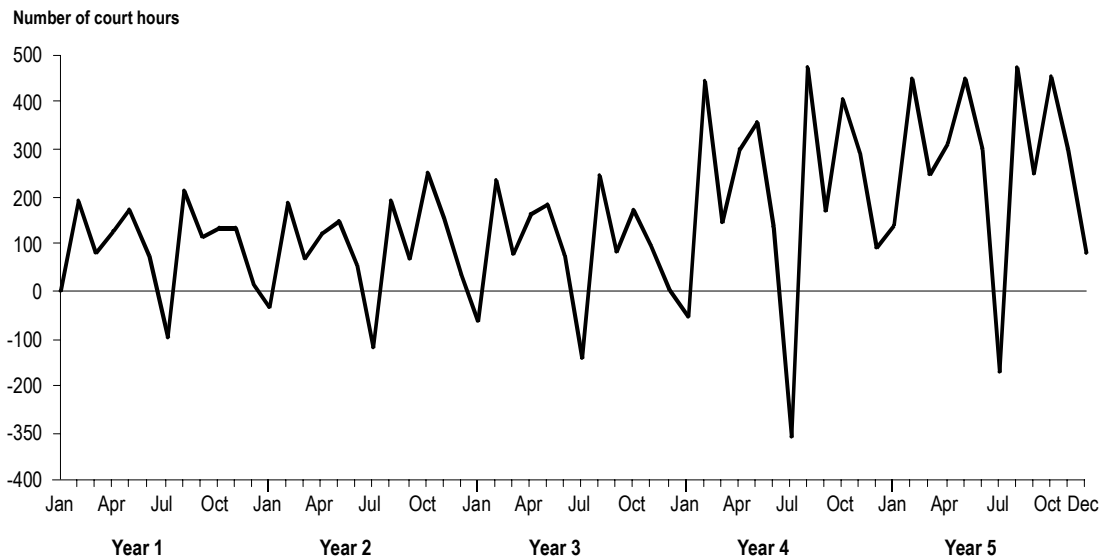


This is also the case for short matters (see Figure 29). In addition, the amount of long matter court time which is used to hear short matters (those points on Figure 29 where used court time exceeds available court time) per month tends to be greater following the introduction of the new court complex.

**Figure 28: Difference between court time available and court time used for trials
Sixteen new courts**



**Figure 29: Difference between court time available and court time used for short matters
Sixteen new courts**



In summary, the addition of 16 courts at the start of Year 4 results in a dramatic reduction in the backlog of trials. In addition, the backlog of short matters is effectively eliminated by the end of Year 4. At the same time there is an increase in the amount of unused court time. This suggests that, once the existing backlog is removed, the addition of 16 courts provides available court time in excess of demand.

Eight new courts

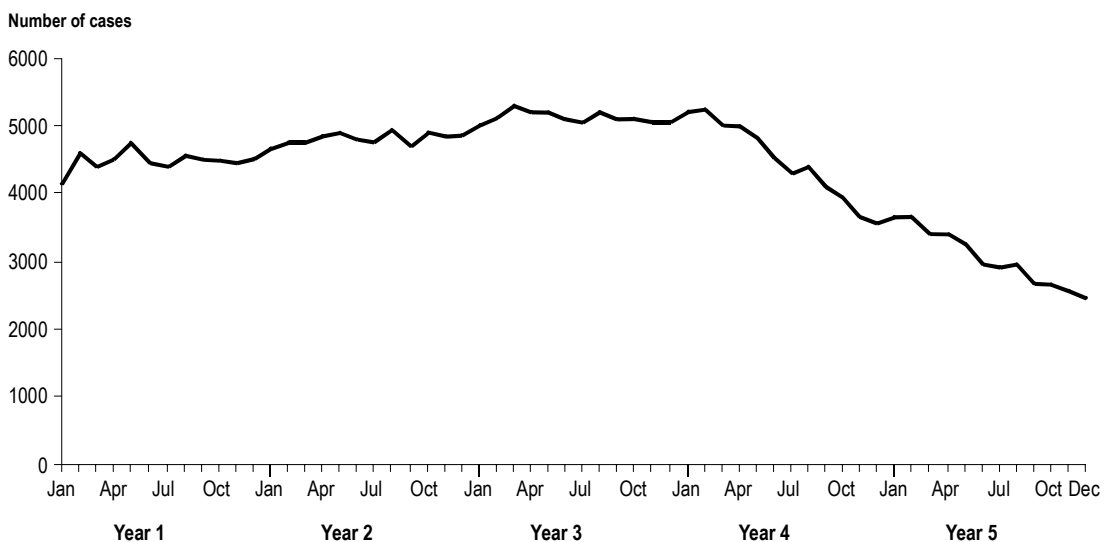
Since it would appear from the model that 16 courts is in excess of what is required to meet the underlying demand for court time, a second simulation was run to examine the effects of the addition of only 8 courts. Again the new courts were introduced in January of Year 4. To compensate for the smaller number of courts, the listing quotas were increased by an amount equal to only one-half of that added in the previous run. In every other respect the 8 court simulation was the same as that for 16 courts.

Figure 30 shows the total backlog of cases over the 5 year period. The backlog decreases from the point of introduction of the new courts but at a slower rate than seen in Figure 25 where 16 courts were added.

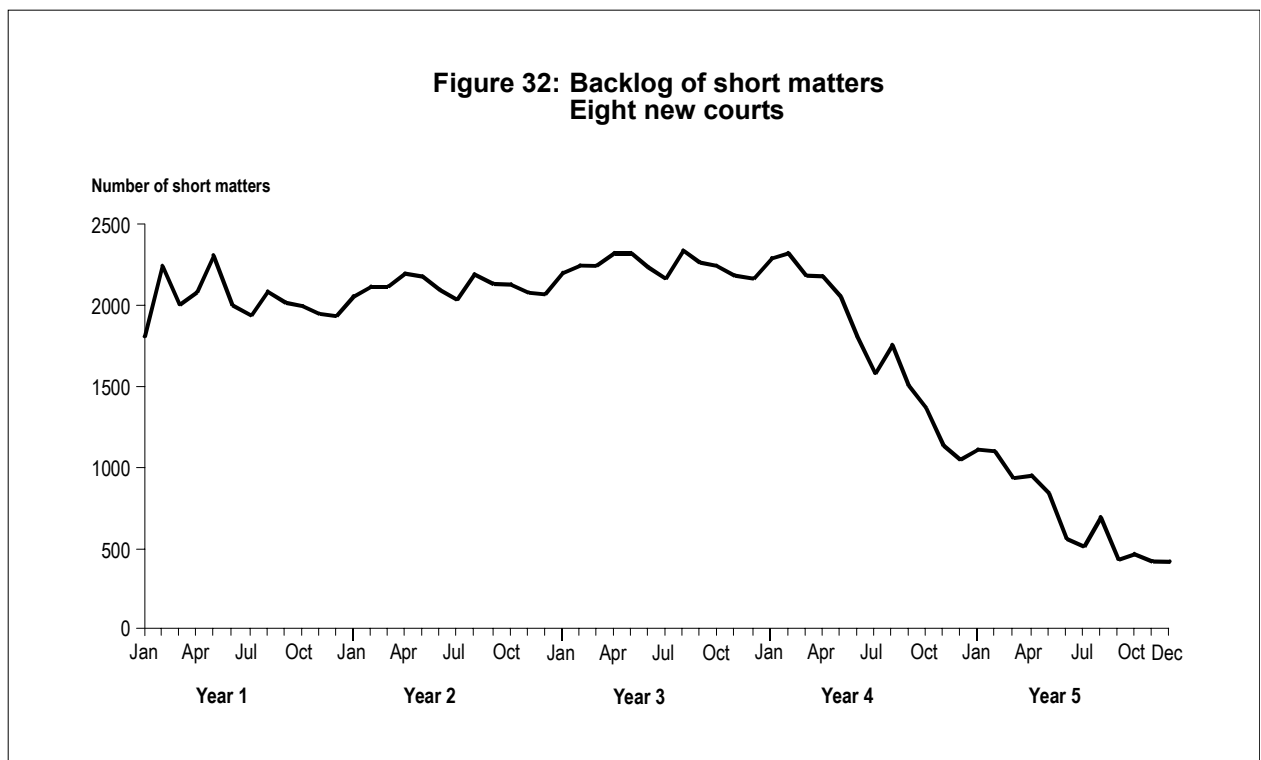
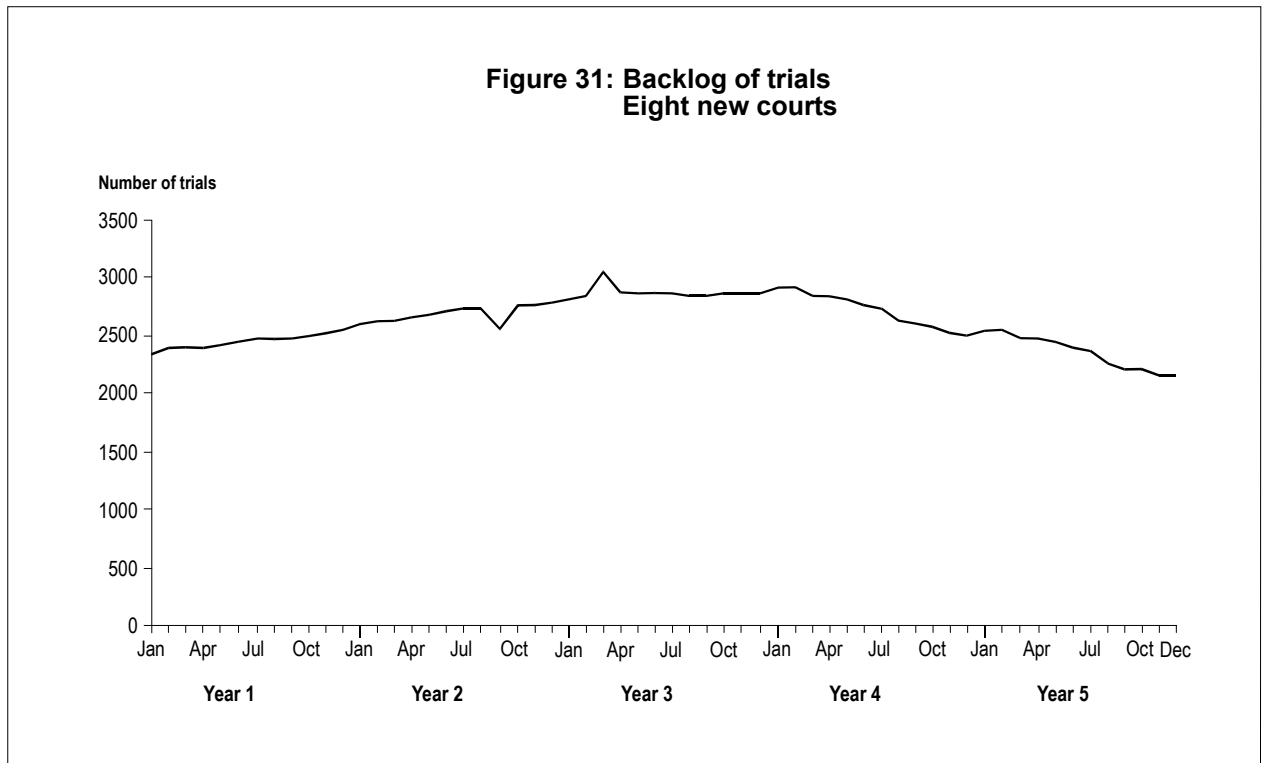
Similarly, the backlog of trial cases decreases (see Figure 31) but at a slower rate than in the previous simulation (see Figure 26). In fact the backlog of trials only decreases by one-third by the end of Year 5. At the same time, the backlog of short matters reaches a minimum only towards the end of Year 5 (see Figure 32).

This contrasts with the previous simulation where the backlog of short matters was eliminated within one year. Although the backlog is reduced more slowly with the opening of only 8 courts, it can be seen that this is achieved with less unutilised court time. Figure 33 shows that there is less trial time which is not used for trials in this option than in the 16 court option. Similarly, Figure 34 shows that there is less unutilised short matter time, and less trial time is used to process short matters.

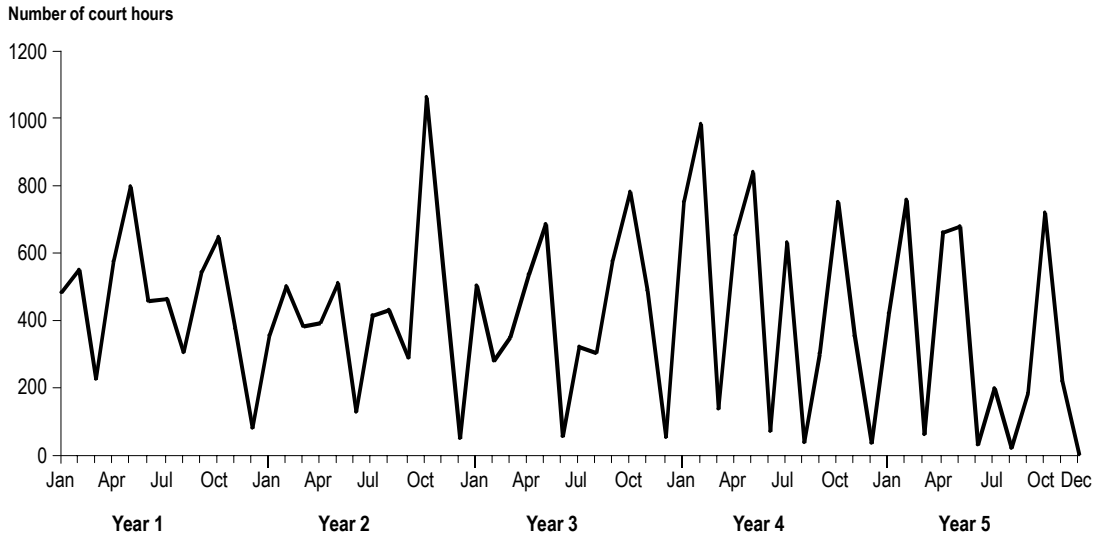
**Figure 30: Total backlog of cases
Eight new courts**



Comparison of these three runs of the model makes it clear that, according to the model, the building of new courts results in a reduction in the size of the backlog of cases as a consequence of increasing the number of cases finalised. When 16 new courts are added the reduction in the backlog occurs rapidly and at the expense of leaving large amounts of

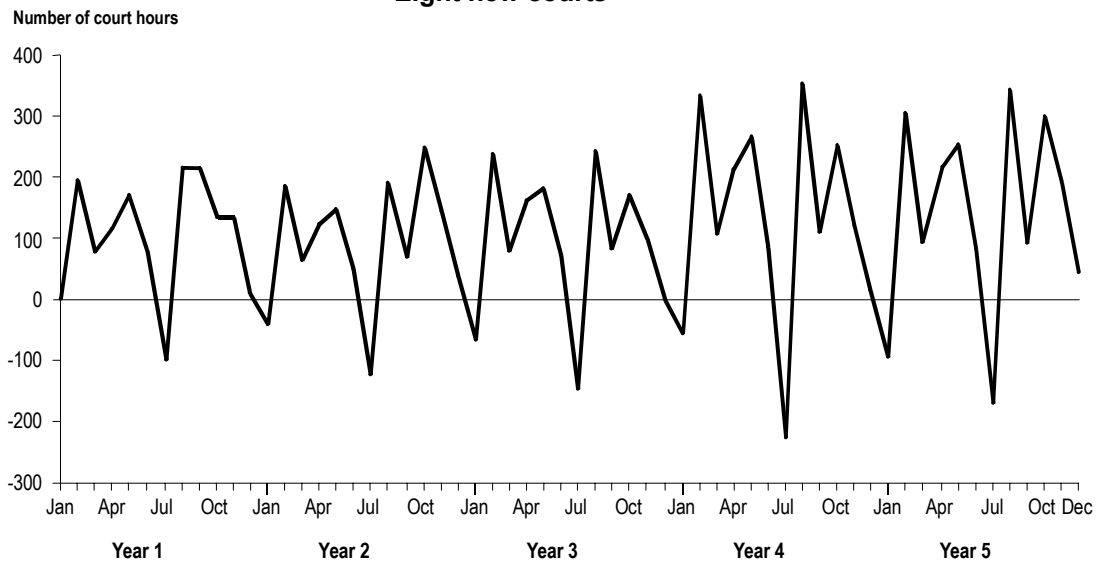


**Figure 33: Difference between court time available and court time used for trials
Eight new courts**



unused court time. When 8 courts are added the reduction in the backlog occurs more slowly but with less court time left unused. The relative merit of these two outcomes is obviously for the administrator to decide. The exact nature of the choice, however, has been made clear by the use of the model.

**Figure 34: Difference between court time available and court time used for short matters
Eight new courts**



PART 6: CONCLUSION

The preceding sections have shown that the DCC model is a useful analytical tool for examining policy options relating to the problem of court delay. The accuracy of the model has been demonstrated with respect to 1989 and 1990, the years for which the parameters were estimated. The court system is, however, continually changing, so it cannot be assumed that these parameters will remain as an accurate representation of the system. It is obvious, therefore, that in order for the model to be a useful predictive tool, the parameter values must be continually updated.

NOTES

- 1 Weatherburn, D. & Nguyen da Huong, M.T. 1992, *Aspects of demand for District Criminal Court time*, NSW Bureau of Crime Statistics and Research, Sydney.
- 2 This contrasts with the practice of the Listing Director in 1989 of listing on a weekly basis as described earlier. As will become apparent this difference is not a matter of major concern.
- 3 This is in contrast to the practice of the Listing Director in 1989 who listed only trials of two weeks or longer as long matters, with shorter trials and other case types being treated as short matters. This difference does not affect the accuracy of the model results.
- 4 NSW Bureau of Crime Statistics and Research 1990, Higher Courts Statistics, unpublished data.
- 5 This is in contrast to the practice of the Listing Director in 1989 according to whom cases were allocated to available court time on a weekly basis. This difference is not a major concern.
- 6 The user must first determine the amount of additional court time made available by the new facilities. This includes availability of judges and ancillary staff.
- 7 The hearing duration for mentions was estimated from a sample of 924 mentions selected from all mentions held in the short matters court in the Downing Centre in the first 6 months in 1991. Data were obtained from tapes maintained by Recording Branch of the Sydney District Criminal Court. The tape counter values at the start and end of each mention were used to determine the duration of each mention.
- 8 With the benefit of hindsight, this annual increase has been shown to be incorrect. In fact, the number of cases arriving at the District Court for hearing has declined since 1991. This does not, however, invalidate the scenario analysis.