CRIME & PUNISHMENT

A SYSTEM DYNAMICS ANALYSIS

by

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Signature of Author. ₍
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ABSTRACT

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"The land is full of bloody crimes, and the city is full of violence." This was Ezekiel several centuries before Christ expressing a conviction put forth with some regularity by moralists every generation since. Many approaches have been proposed or tried to eliminate or reduce the crime problem. None with notable success.

This thesis is a first application of System Dynamics to the overall criminal justice system to improve the understanding of the forces that affect crime and its costs to society and to provide a structure to evaluate proposed changes.

The System Dynamics model developed describes the gross behavior of the Commonwealth of Massachusetts criminal justice system and has been used to evaluate potential alternative policies over a thirty year time period.

No simplistic modifications (such as increased police) were found to be as effective as a combined approach of more punishment, prison reform and an additional shift in police emphasis to repeating offenders. This resulted in increased direct (from taxes, etc.) cost to the public but a discounted total cost reduction (including the cost of crime) of more than five billion dollars. This was in addition to the intangible benefits of lower crime rates.

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of the necessary model parameters.

Special mention is due Ms. Joan Coughlan who typed this

thesis and to my wife and sons for their patience, support and

understanding.

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INTRODUCTION

In the United States, the crime rate and the human and dollar costs of crime are increasing despite a continuing and escalating attack. The current emphasis on increased police activity is a recent response to the deteriorating situation.

Many proposals for more police, longer prison sentences, better prisons, more or less probation and other changes to the criminal justice system have been proposed or implemented. In general, these are made without a clear understanding of their effects on all aspects of the system of crime and punishment and may, in some cases, be counterproductive. For example:

More police (or more effective police) are proposed to both deter crime and increase the apprehension of criminals. The time delayed effects may cause increased prison crowding, and decrease the effective average sentence by increases in parole and other discretionary releases to alleviate the crowding. This could then lead to increases in the crime rate due to the decreased deterrent of prison and the increased numbers of people that have been exposed to the "ultimate" training school for crime. The final result may be to not substantially affect the costs to the public.

Everyone associated with crime and punishment has an

intuitive model of how the criminal justice system (CJS) functions and bases his actions or recommendations on his understanding. From the policeman deciding who to arrest, the district attorney negotiating a plea, the judge operating his court, the parole board deciding on how much time a man must serve and others (to the President proposing more police): each is operating on their models of cause and effect. While these individual models may accurately represent a local portion of the overall system, they fail to:

a. Provide a framework or structure to evaluate the inter-related behavior of the entire system.

b. Document and quantify the hypotheses assumed for

1. discussion,

2. verification by research,

3. future evaluation.

c. Provide for the systematic evaluation of alternative strategies tested against a common set of assumptions.

d. Require that all assumptions and hypotheses be consistant and that, when taken together, they lead to conclusions which match the observable world.

e. Evaluate the net cost to the public of any changes proposed (total direct cost change -- paid through taxes plus ex-pected changes in the losses due to crime).

System Dynamics

One approach to overcome the above limitations is to link

the individual models and assumptions through a formalized mathe-

matical model.

The model, if a computer is used to handle the arithmetic,

can be used to easily evaluate:

a. Proposed policy changes (like increasing police effec-

tiveness).

b. The consistency of current beliefs about the criminal

justice system.[1]

c. Estimated direct and indirect costs to society of various

approaches to "solving" the "crime problem".

This thesis describes the overall system simulation model[2]

(including feedback) that was developed to represent the gross

behavior of the criminal justice system of the Commonwealth of

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[1] An example would be assertions about the percentages of those arrested that are put on probation that -- when coupled with crime rates, etc. -- lead to changes in the probation population that are not observed. A more complete example is provided when the model determination of arrest and crime rates do not match those observed after initializing with your best understanding of the overall system characteristics.

[2] This simulation model is another application of the approach to system dynamics developed by Professor Jay W. Forrester, Massachusetts Institute of Technology (Principles of Systems [Cambridge: Wright-Allen Press, 1968, 2d ed.]). Programming was done for the DYNAMO II compiler (Alexander L. Pugh, DYNAMO II User's Manual [Cambridge: The M.I.T. Press, 1970]).

Massachusetts.[1]

The project was initiated due to the author's belief that the development of a grossly simplified dynamic-feedback model of the criminal justice system (CJS) could significantly improve the understanding of the system. In addition, the model could be useful for some of the items in the preceding paragraph and might identify some areas in which future research could have a substantial payoff.

The model developed is a representation of the Massachusetts CJS and incorporates the best information that could be found. As a result, it is a tool which can be readily used to identify and evaluate the long term effects of existing policies and of proposed changes. This includes direct and indirect costs in addition to the usual measure of the reported crime rate.

Comments Regarding Modeling

The results of any analysis, evaluations or future projections are critically dependent on the underlying formulations about how the real world behaves and interacts. Once the foundations have been established, the validity of the results depend on the avoidance of clerical errors. The results described in the following chapters are no exception. Whether there is agreement or disagreement, the keys

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[1] The specific system described is that of Massachusetts. However, it could be readily adapted to other geographical or political boundaries.

to the results are in the relationships discussed in Chapter IV, not in the approach to the arithmetic. For example: the model, as presently defined, projects that the single change to the criminal justice system of prison reform would increase the crime rate over that for no change seven years after the increase was effective. This is primarily due to the resulting decrease in deterrence from a better prison overcoming the lower crime rate of employed exconvicts and parolees. The computer program that eases the arithmetic burden is not the culprit that causes the unexpected result. It is due to the inter-relationships in the description for the attractiveness of crime.

The model described in this thesis simulates the future with an appearance of great precision. Results are typically printed with three or more significant figures. However, the simplifications of the overall system and, more significantly, the uncertanties in the underlying structure make it unrealistic to expect the model to more than represent the trend of future events -- not their exact magnitude or timing. The real strength of the model is its ability to compare precisely the probable future results of different policies based on a common--if complex--understanding of how the CJS is interrelated. Specifically, more weight should be attached to (1) the model projection that policy A results in a 50% lower crime rate fifteen years from now than policy B; than to (2) the model projection that policy A re-

sults in a crime rate of 10,000 crimes per 100,000 population fifteen

years hence.

CHAPTER II

CRIME AND PUNISHMENT SYSTEM MODEL

Introduction

The model developed is a simplification of the criminal

justice system of the Commonwealth of Massachusetts. It has been

built around the flow of people through the entire system and incorpo-

rates feedback from system conditions (or states) which influence

population flows and the resulting crime rates. In addition, it

calculates both direct and indirect costs related to crime and punish-

ment.

The Model

Figure 1 illustrates the flow of people the model utilizes. All

flows from one area to another are affected by system conditions.

Appendix A includes detailed documentation of the criminal justice

system model.

The flows are primarily influenced by the auxiliary variables

ATTRACTIVENESS OF CRIME (AOC) and POLICE

EFFECTIVENESS (POLEFF) which relate all aspects of the model.

These are discussed in detail in Chapter IV. The following paragraphs

provide simplified descriptions of two of the many feedback loops and

how they control the flow of people and the crime rate.

Typical system interrelationships are illustrated by the closed

loop operation in figures 2 and 3. For figure 2 an increase in the
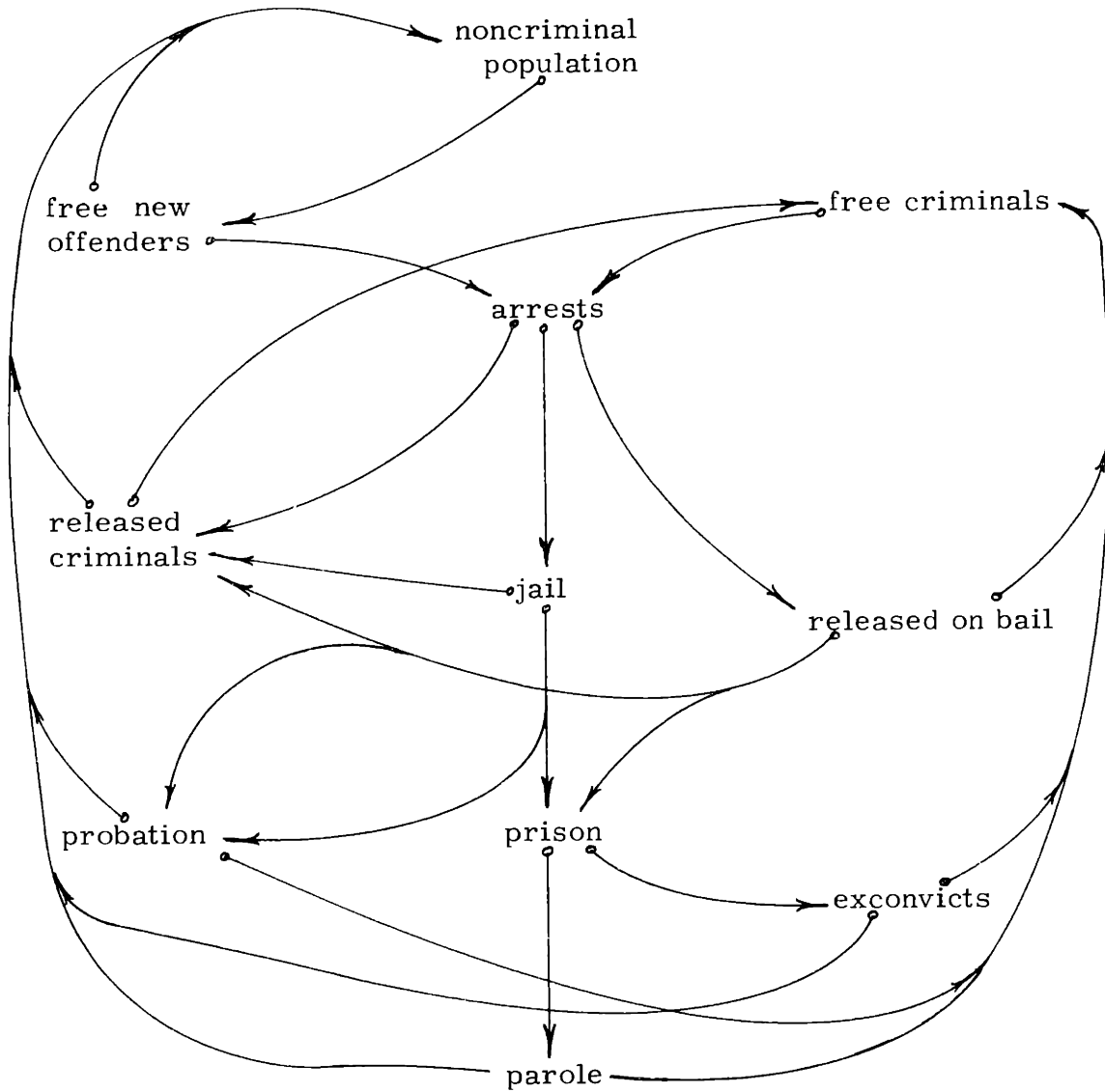
Criminal Justice System Model Structure

FIGURE I
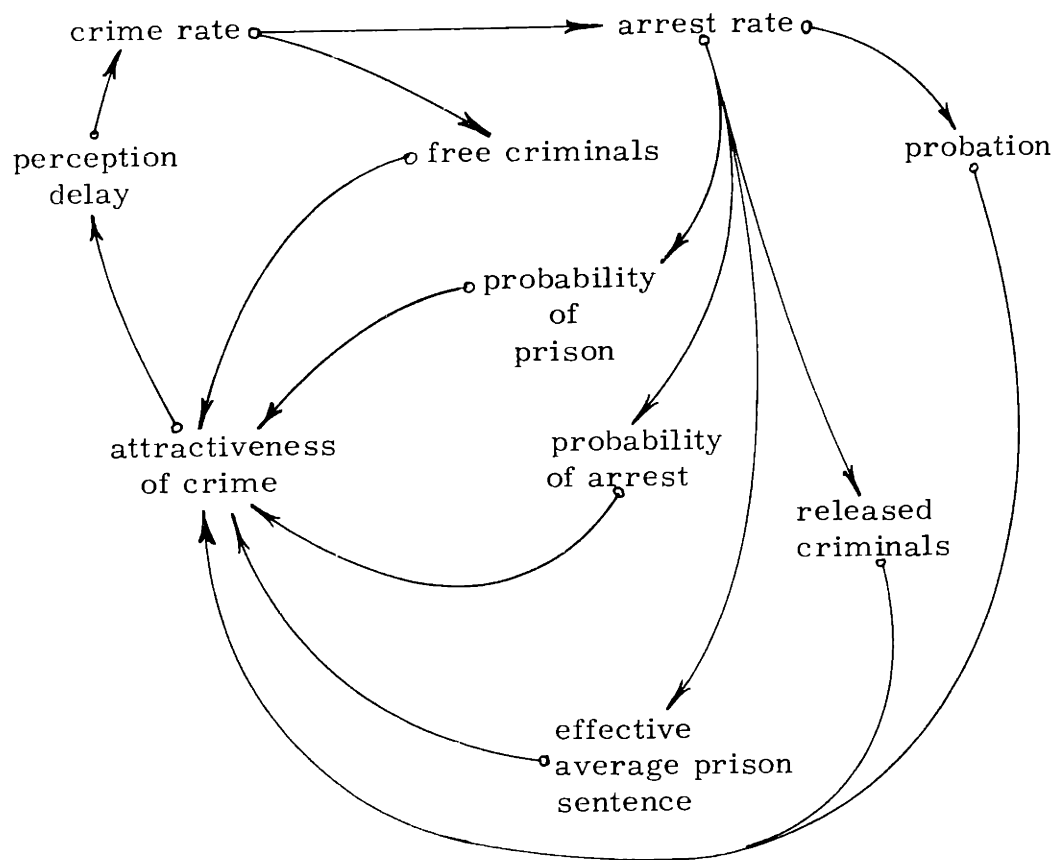
Simplified Partial Feedback Loop For Crime Rate

FIGURE 2

crime rate results in a less than proportionate increase in the arrest rate. The increased arrest rate leads to an increase in the number on probation and a decreased effective average prison sentence due to the prison population being maintained relatively constant by parole board, county commissioners and judicial actions.[1] In addition, the number of released and free criminals and the probability of arrest increases. This causes a reduced attractiveness of crime (due to the short time required to recognize the change in arrest probability). After a perception delay, the population recognizes the increased attractiveness of crime due to the combined influences of more released criminals and reduced sentences. After a time, this effect overpowers the influence of increased risk of arrest, the crime rate increases and the cycle continues.

For figure 3, an increase in the number of police increases the police effectiveness. The increased police effectiveness raises the arrest rate. This causes an increase in the court backlog and the jail population. The higher court backlog results in minor increases in the trial rate after the time lag necessary to perceive the problem and change operations to handle a higher case load. The larger jail

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[1] For example, the average daily populations of state institutions were 1982 and 2073 in the years 1959 and 1969 respectively. (Commonwealth of Massachusetts, Statistical Reports of the Commissioner of Correction for 1969, Public Document No. 115 [Boston: Department of Correction], p. 14)
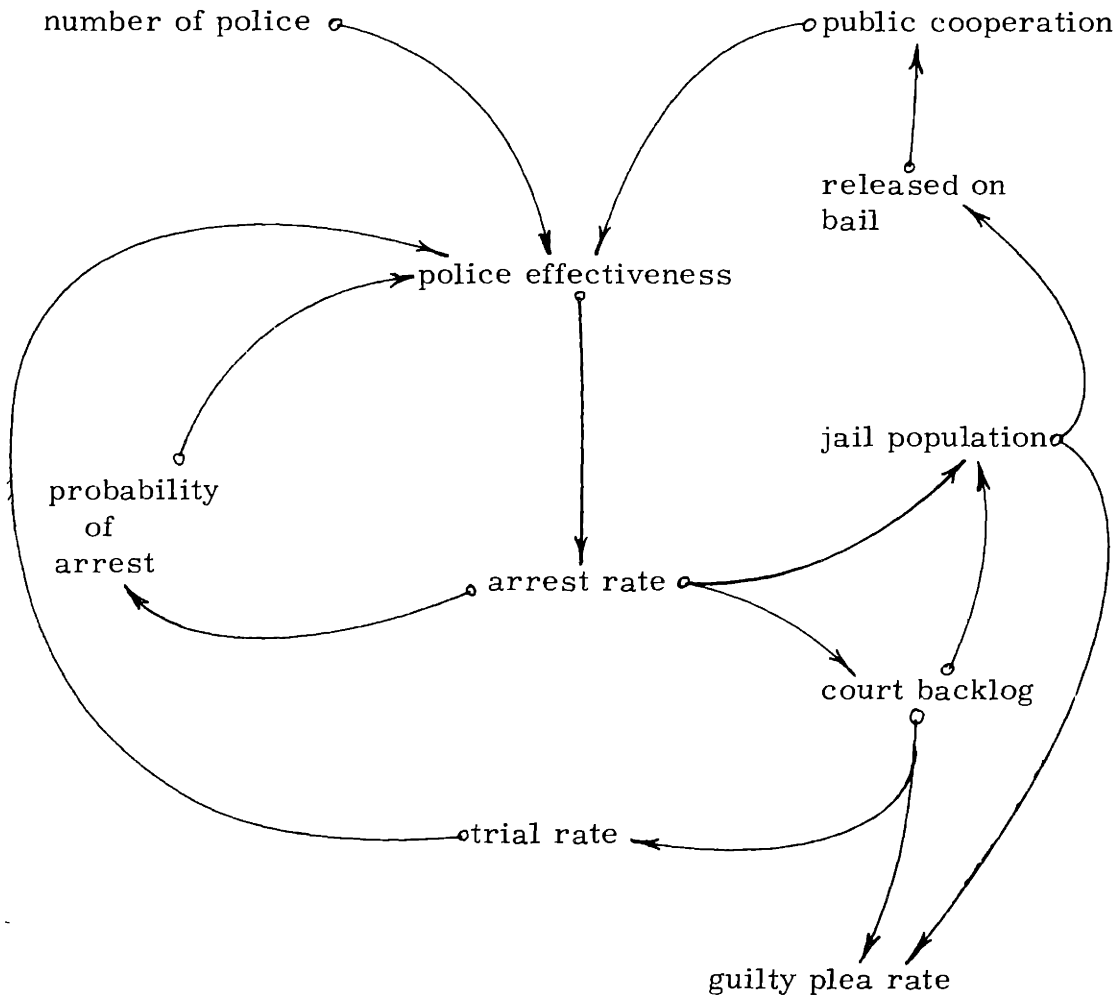
Partial Feedback Loop for Arrest Rate

FIGURE   3

population and more crowded conditions increase the percentage of
those arrested that are released on bail. After a time delay, the
public becomes aware that a larger percentage of those arrested
are returning rapidly to the street. Then, through decreasing con-
fidence in the effectiveness of the law enforcement system and in-
creased fear of reprisals from freed criminals, the public coopera-
tion decreases. The net effect is to increase immediate direct costs
and slow the rate of increase in the crime rate without a significant
total discounted cost benefit. A 50% step increase in the number of
police has been evaluated and is described in Chapter III and illus-
trated in figure 4 for a thirty year time period.

For additional information on how the areas are inter-
related, refer to Chapter IV or Appendix A.

Simplifying Assumptions

The actual criminal justice system is a very complex set
of interrelated police jurisdictions, courts and detention facilities.
In addition, the individual courts have their own probation systems
and the cities, counties, and Commonwealth have overlapping deten-
tion facilities. The different governmental units have their own ap-
proaches to releases from prisons and jails. A further complication is
the variations in types of offenses and the different characteristics of
different age groups with regard to type of criminal activity, probabil-

ity of moving from the criminal population into the non-criminal

population and crime rate.

The following paragraphs discuss the simplifications that

were made to reduce the system model to manageable size while ad-

equately representing the aggregate behavior of the criminal justice

system.

Offenses

Drunkenness and motor vehicle traffic violations (excluding

drunken driving) represent the overwhelming majority of the offenses

handled by the police and the courts. However, most of these offend-

ers plead guilty and spend little or no time in detention. Drunkenness

and traffic violations do not constitute a class of crime that is of

serious concern to the average citizen. Therefore, they have not been

included in the model, have been removed from all statistics used to

develop initial conditions and are not incorporated in the costs or

crime rate determinations.

All other activities defined as criminal by the Commonwealth

have been included and grouped in the single category -- CRIME. It

can be argued that offenses such as prostitution and gambling are not

"serious" crimes and should be excluded. However, under the present

laws, they do contribute to the cost of the criminal justice system and

provide an entry for people to become educated in and exposed to more serious criminal activity. For these reasons they have been included. The model provides the capability to evaluate the probable impact of legalizing these activities.

Offenders

People have been separated into essentially four categories. The non-criminal population, free new offenders, free criminals and people in the criminal justice system who have not returned to one of the other categories.

There has been no provision made for innocent people arrested by the police and either subsequently released or convicted. This is because members of the law enforcement community interviewed were of the opinion that a very small number of those arrested (less than 5%) were not guilty of some crime. This small number should not affect the overall model behavior. The influence could be incorporated if it became an important factor.

The non-criminal population is comprised of (1) all individuals who have never committed a criminal offense and (2) those whose previous criminal behavior has changed to the point where their crime rate can be considered to be the same as individuals who have never committed a crime.

Free new offenders are those from the non-criminal population who have committed an offense and have not been arrested. This

category was identified due to the significantly different character-

istics of the occasional casual offender from those who have been

arrested and exposed to the educational "benefits" of the CJS. An-

other reason for separate population was the greater effectiveness of

the police against criminals with whom they have had recent exper-

ience. [1]

The free criminal category aggregates all individuals who

are subject to arrest other than the free new offenders. Drug addicts

are identified separately due to their high crime rate, and, for this

initial study, have been assumed to be a population of constant size. [2]

The people in the CJS have been further identified as to

whether they are on parole, on probation, in jail, etc. However,

they are not identified as to type of offender or age group.

Detention

In the Commonwealth, as in other political divisions, the

detention facilities range from minimum security youth farms to maxi-

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[1] Personal interview with William Taylor, Superintendent of the
Boston, Massachusetts Police Department, January 13, 1972.

[2] The assumption of a constant drug addict population is not realis-
tic. However, the author has found no evidence that characteristics
of the CJS affect the number of addicts. The number can be varied as
a function of time if estimates are provided.

mum security, walled prisons. In addition, the various types of institutions are controlled by different political entities. Cities have jails; counties have jails, prisons and correctional facilities; and the Commonwealth has a wide range of detention capabilities.

Since drunkenness was excluded, facilities devoted primarily to this crime have also been eliminated from consideration. In addition, activities related to mental health were not incorporated. They are of limited number and do not directly relate to the CJS for the purpose of the model.

In the Commonwealth of Massachusetts, it is required that individuals being held for trial be physically separated from those sentenced and awaiting release. Therefore, the approach taken in the description of the CJS was to consolidate all individuals detained while awaiting trial into a single category referred to as JAIL.

All individuals sentenced and being detained are aggregated into a category defined as PRISON. This is an area that might profitably be expanded to more accurately match the real world if it is believed (or if there are data to support) that different types of detention have different deterrent factors and different recidivism rates. But, since this model has been designed to represent the aggregate behavior of the CJS, this consolidation should not affect the trend of the results. Any proposed shift in the facility mix can be incorporated by changing the characteristics of the aggregate PRISON.

Probation

Probation from all courts has been consolidated into a single category.

Courts

The system of lower, superior and other courts was consolidated into a single court system with no considerations of the appeal process. A large number of court reforms have been proposed to change the effective court capacity or modify their operations. For the purposes of this model, these proposed changes can be incorporated by merely changing the court capacity.

Constant Ratios

To properly represent the flow of people through the CJS, it is necessary to identify separately several places where the flows diverge. For example, the percentages given probation after conviction from jail and after conviction from bail are different and have been segregated. These, and other similar items, have been represented as constants (they can be changed as desired) even though they are probably influenced by the conditions within the CJS. However, at the present time, the influences on these ratios are very elusive. As a result the use of constants was selected.

Model Initialization

To simulate future trends in the crime rate and other areas, initial values must be identified for the location of the population.

How many are on parole? How many are free criminals? How many have completed parole but not returned to the non-criminal or the free criminal population, etc? Statistics for the free new offenders, free criminals and other areas are non-existant. However, based on estimates of the crime rates, the police effectiveness and the percentage of each group that returns to the non-criminal population each year; a population distribution can be calculated that will result in arrest and crime rates consistent with those observed. The CJS model developed incorporates the capability to semi-automatically generate the needed initial conditions in an interactive mode when it is being adapted to a new set of boundary constraints (Texas instead of Massachusetts).

The process of initialization requires that many of the usually unidentified assumptions about the CJS be clearly stated and quantified. Two examples are:

a. The relative crime rates between different population groups. Here, the only data available are for arrest rates (and these are very limited) which are not necessarily correlated with crime rates. Lacking better data, it was assumed that arrest rates were directly related to crime rates.

b. What percentage of those who have completed parole return each year to the non-criminal population? For these and other population groups, there are no data available. The

approach taken was to use the FBI re-arrest studies[1] to provide re-lative rankings and to select values that were internally consistant and that provided calculated arrest and crime rates that correspond to those observed.

Data Sources -- Constants and Initialization

The data necessary for initialization and constant determ-inations are, in many cases, either not available, conflicting, or reported only for the index crimes used for the uniform crime reports. As a result, data for Massachusetts were used when available. When data were not available or there were conflicts, the author made judgments or estimates. In some instances, it was necessary to infer Massachusetts conditions by extrapolating from studies or data for different political units or different crime categories. In all areas, available information has been adjusted to account for the elimination of drunkenness, traffic violations and mental health.

The primary data and information sources were:

a. Statistical Reports of the Commissioner of Correction[2]

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[1] John Edgar Hoover, Crime in the United States Uniform Crime Reports - 1970, (Washington, D.C.: U.S. Government Printing Office, 1971), p. 39.

[2] Commonwealth of Massachusetts, Statistical Report of the Commissioner of Correction for the Year Ending 1969.

b. The Quality of Justice in the Lower Criminal Courts

of Metropolitan Boston.[1]

c. The FBI Uniform Crime Report.[2]

d. The Massachusetts Comprehensive Criminal Justice

Plan For Crime Prevention and Control.[3]

All constants and initial conditions used are detailed in

Appendix C with their sources or the rationale that was used. Based

on the results of the large number of model evaluations done during

development and checkout, it is the author's opinion that modest

changes to any or all of the values would not significantly affect the

general conclusions about the relative influence of changed policies.

However, this has not been tested.

Sensitivity Testing

It initially appeared that sensitivity testing would be straight

forward and could be used to point the way to immediate action and

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[1] Stephen R. Bing, and S. Stephen Rosenfeld, "The Quality of Justice in the Lower Criminal Courts of Metropolitan Boston" (unpublished report by the Lawyers' Committee for Civil Rights Under Law to the Governor's Committee on Law Enforcement and the Administration of Justice, 1970).

[2] John E. Hoover, Crime in the United States Uniform Crime Reports- 1970.

[3] Commonwealth of Massachusetts, A Comprehensive Criminal Justice Plan for Crime Prevention and Control, (Boston: The Committee on Law Enforcement and Criminal Justice, 1969), Vol. I.

additional research.

As the model developed, two things happened. The first was that the model became relatively complex to provide even a gross representation of the operation of the CJS. The second was the discovery that there are virtually no substantiated data (in many areas there are not even quantized opinions) that can be used for model parameters. These factors essentially eliminated the value of a systematic sensitivity analysis until there are some general agreements on what baseline conditions should be used.

CHAPTER III

CRIME AND PUNISHMENT MODEL PROJECTIONS

Introduction

The following pages and illustrations present the results of some of the evaluations done of the modeled CJS behavior under the constraints discussed in other chapters.

The approach is to start at the end of 1969 and project thirty years into the future. (The selection of thirty years was an arbitrary one). Model projections were made for no changes to the present approach, some of the more popular proposals to "solve the crime problem" as individual items and then a combination of changes that result in a projected long term improvement.

The author has not found any single change to the overall system of crime and punishment that significantly affects the costs to society over the thirty year time span investigated. This is not surprising since most of the approaches have been previously tried on society without noticeable success.

However, the combination of the following factors substantially reduce the discounted cost to the public:

    a. Larger prisions with more effective rehabilitation programs.

    b. Less unsupervised release after conviction or guilty pleas.

    c. Increased real average sentences.

d. Decreased use of bail coupled with court capacities appropriate to short delays to trial.

e. Reduction in crime due to dope addiction.

f. An increase in jail capacity to accomodate the increased inflow due to a reduced percentage being put on bail.

This approach requires substantial increases in direct expenditures now but reduce total costs rapidly due to the large decrease in the crime rate.

There are undoubtably other combinations which would be more practical to implement or result in lower costs. Unfortunately, time constraints prevented additional investigations.

Warnings

Before proceeding to the model results, the reader is again cautioned about their credibility. Results are critically dependent on the modeling of attractiveness of crime (AOC) and police effectiveness (POLEFF). In particular, the relative weights assigned to the factors which influence AOC and POLEFF are very important in determining whether or not trends in the crime rate will continue or will change direction. The author attempted a rational balance but the choices should be critically examined.

As currently formulated, the model causes large step changes in the crime rate, the arrest rate and the annual cost at the initiation

of the run for the majority of the evaluations. The step changes are due to the way the initial conditions are calculated.

This is not the way the real world will (or can) react and the model should be modified to correct this for future use. However, it should not materially influence the relative rankings of the results because the system will respond to accomodate the changes within two years to approximately match what is shown as time zero. The major influence on the model results will be to increase the discounted costs due to the initally higher crime rate. This effect has been estimated and is included in the discounted total costs given.

Model Results

The total crime rate (crimes/year), the arrest rate (arrests/year) and the annual cost (dollars/year) for a variety of system conditions are illustrated by figures 4 through 14.

The general order of presentation is to start with the criminal justice system in its present form (figure 4), incorporate some of the more popular proposals individually (figures 5-11), and then sequentially add the system changes that, collectively, result in both lower crime rates and lower costs to the public (all discounted at an interest rate of six per cent). The results should be interpreted as smooth curves. Apparent step changes in plotter points are

due to quantization in the plotter.

The discussion of the results has been limited to the most significant aspects. A great deal of additional detail is available in printed values for all parameters.

Present Conditions (standard)

The projected CJS behavior for no changes is shown in figure 4.

Crime Rate

The crime rate increase is driven by the increasing number of free criminals and the decreasing deterrent effects caused by declines in the effective average sentence (caused by prison crowding) and a reducing probability of arrest (8% to 2%), with a resulting decrease in prison probability. A minor influence is the increasing recidivism rates of parolees and ex-convicts due to deteroriating prison conditions. However, after seven years, the effective average sentence begins to increase due to the earlier decline in arrest rate. This, coupled with approaching saturation in the numbers of free criminals, results in a slowing in the rate of growth of the crime rate from years eighteen to thirty. Saturation in the number of free criminals occurs when there are so many that the number going "straight" each year (44% of the total) is equal to the number being added through police activities.

STANDARD CONDITIONS
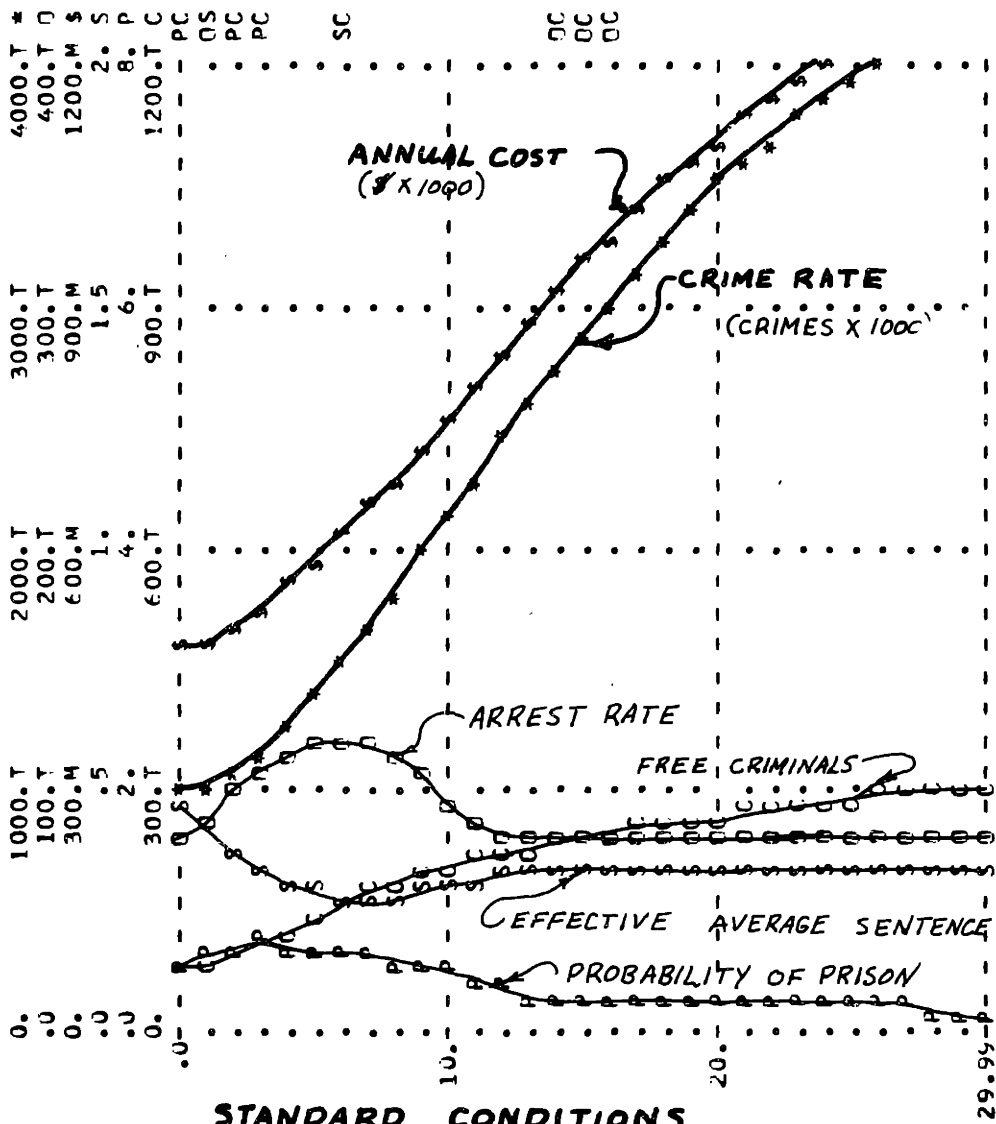
FIGURE 4

During this time, the effective average prison sentence has continued to increase.

The saturation in the number of free criminals and a slightly decreasing attractiveness of crime due to increasing effective sentence lengths causes the crime rate growth to almost stop after thirty years. If the model is run for a longer time, the crime rate eventually declines until another cycle occurs.

Arrest Rate

The increasing arrest rate for the first five years is due to the increasing numbers of free criminals more than offsetting the decline in police effectiveness from decreasing public cooperation. At five years, the police have reached their maximum capacity to make arrests.[1] When this occurs, the declining public cooperation and the negative influence of the free criminal ratio combine to reduce police

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[1] This selection of the police capacity is discussed in Appendix B. Increasing capacity only changes the timing of the peak arrest rate and, as a result, does not effect the general model behavior.

effectiveness. This continues until the system is again balanced at approximately twelve years.

If the run were extended, the total crime rate would begin to decline and this would cause a small decrease in the free criminal ratio which increases police effectiveness and the arrest rate would start to increase. This would influence public cooperation and the cycle would repeat.

Cost

The annual costs include:

a. Prison costs.

b. Jail costs.

c. Probation supervision costs.

d. Parole supervision costs.

e. Police costs.

f. Cost of crime at an average cost of $250 per crime.

The cost of crime dominates all the other costs when the total crime rate is close to 3,000,000 per year.

In addition, the majority of the other costs are fixed. As a result the total annual cost of crime follows the total crime rate.

The model also calculates the total cost of crime and discounts it to the present for any selected interest rate. At 6%, the present value cost of crime for thirty years is approximately eleven billion dollars.

50% Increase in Police

One fairly popular proposal to "solve" the crime problem is to increase the number of police. For the model evaluation, the total number of police in the Commonwealth of Massachusetts were increased from 10,500 to 15,500 at the initiation of the evaluation period. Results are shown in figure 5. The net result was to delay police saturation (to twenty-two years) and the time the crime rate reached a maximum value (it was still rising after thirty years). The same factors influenced the rise

in crime and the decline in arrest rate as in the case with

no changes.

Crime Rate

The reason increased police were not effective

in elim. _ing the continual rise in crime is in the relative

influence of the attractiveness of crime multipliers. With-

out other changes to the overall CJS, the increased fear of

arrest is more than counteracted by the increased numbers

of free criminals, increased probation (as a result of larger

percentage of guilty pleas), shorter effective average

prison sentences and reduced probability of prison.

Cost

The annual cost follows the total crime rate. How-

ever, in the initial years, the annual cost is higher than the

standard case due to increased police costs. The discounted

cost over the entire time period is approximately nine

billion dollars.

Reduced Police

To evaluate both sides of the "law and order" position, police

CRIME-P CRIM JUSTICE SYSTEM DYNAMIC MODEL   4/18/72   INCREASED

SMTCR=*,AK=0,ACOST=$,EAVESEN=S,PROBPSN=P,FCRIM=C

ANNUAL COST
(\$X1000)

ARREST RATE

CRIME RATE
(X1000)

FREE CRIMINALS

PROBABILITY OF PRISON

EFFECTIVE SENTENCE LENGTH

INCREASED POLICE
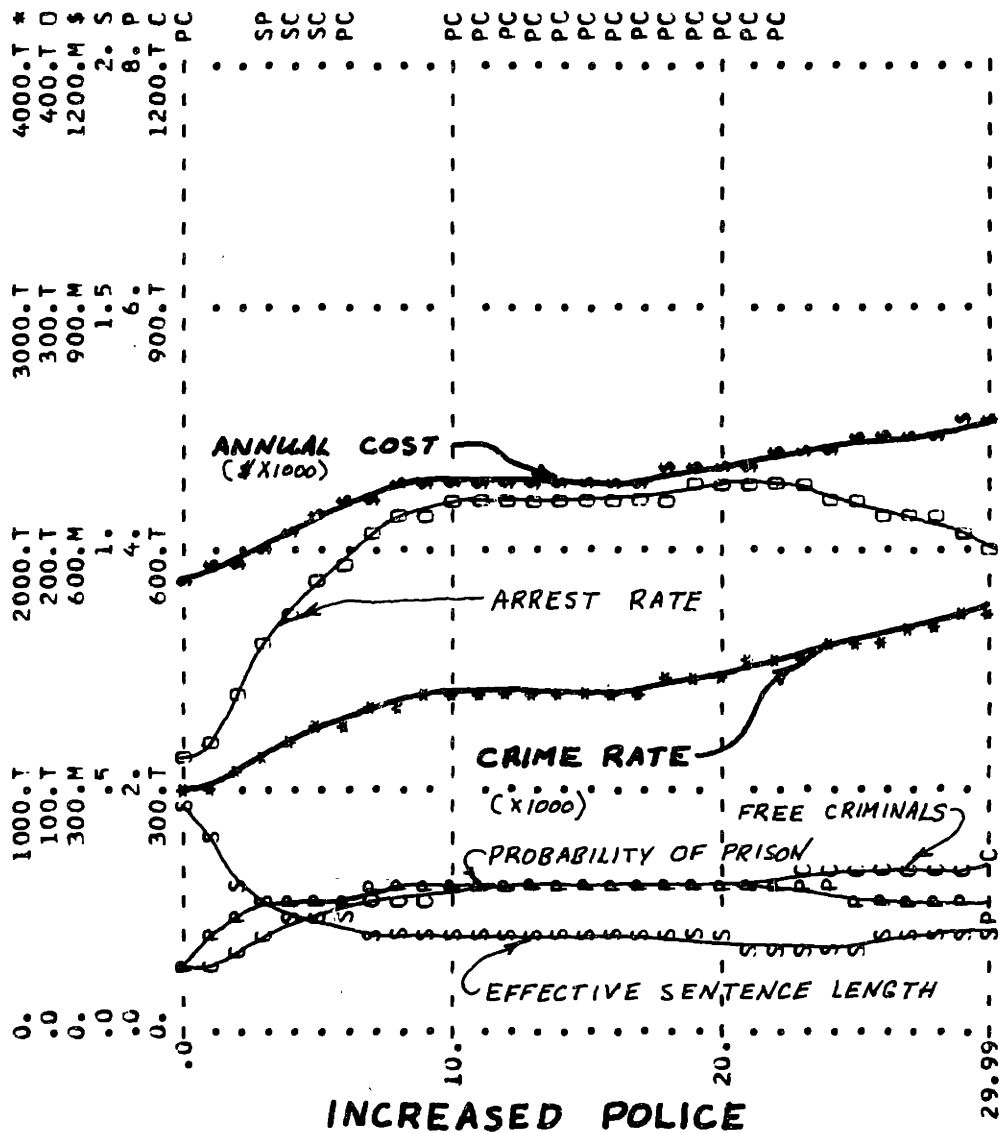
FIGURE 5

were reduced from 10,500 to 7,500. The results are shown by figure 6.

Crime Rate

The same factors contributed to the increasing crime rate as for the standard conditions. However, it does not rise as rapidly to as high a maximum level. This is due to exposing fewer individuals to the "benefits" of the CJS. For the model relationships, this has a larger influence than the slight decrease in the probability of prison.

Arrest Rate

The arrest rate drops at the run initiation due to the fewer police. It rises with increasing numbers of free criminals until it peaks at six years due to the police capacity limitation. It then declines due to reduced public cooperation until it stabilizes at ten years.

Cost

The cost increases with the rising crime rate. Even though the initial annual costs are reduced due to fewer police, the total discounted cost is slightly greater than the previous case with increased police. In addition, the intangible costs of crime will be much greater due to the higher crime rates.

Reduced Bail

Crimes are committed by individuals on bail. As a result, there are arguments that the use of bail should be curtailed. This proposal was evaluated by reducing the ratio of those arrested that are

CRIME-P CRIM JUSTICE SYSTEM DYNAMIC MODEL   4/18/72   REDUCED

SMTCR=*,AR=0,ACOST=$,EAVESEN=S,PROBPSN=P,FCRIM=C

REDUCED POLICE
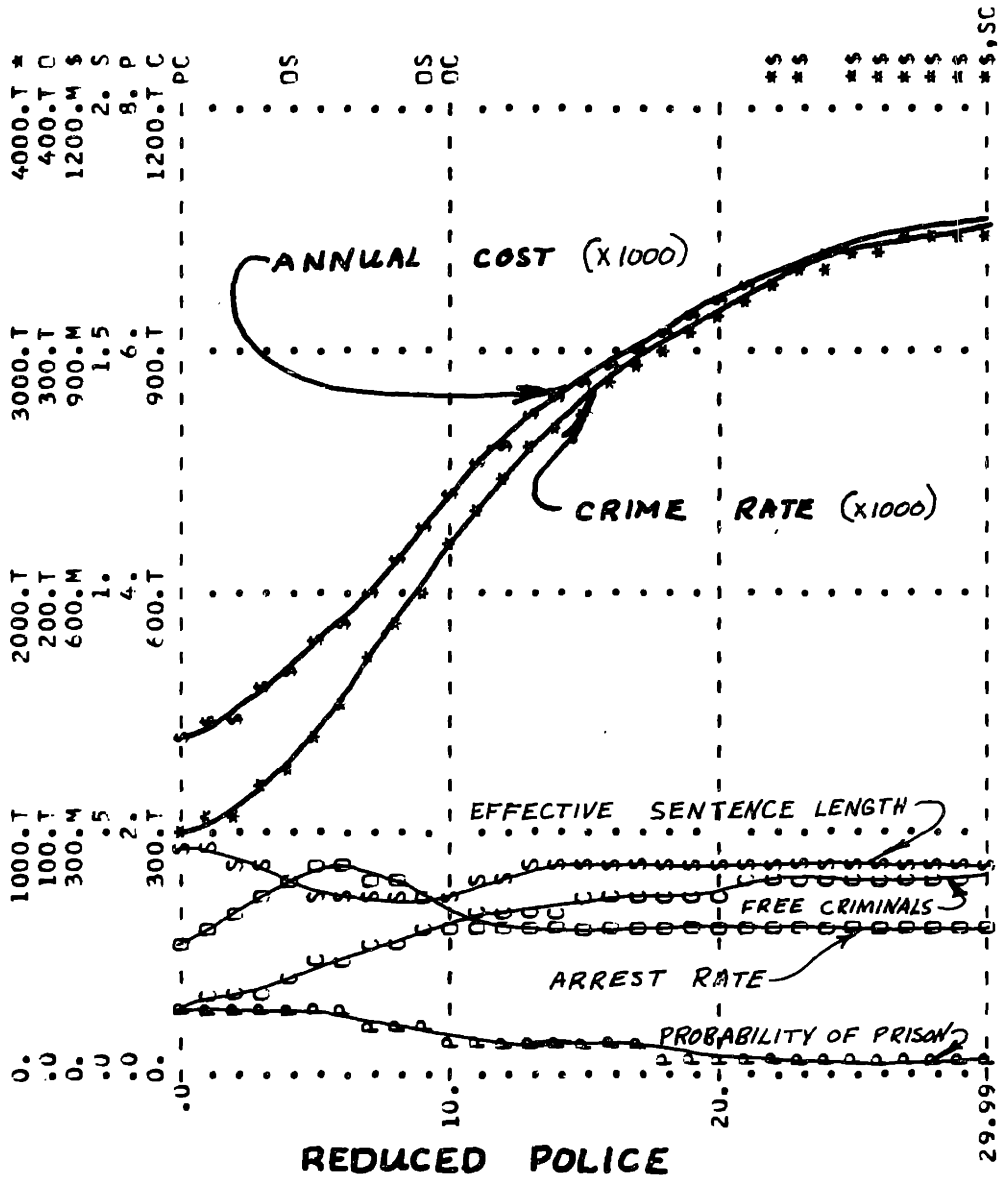
FIGURE 6

given bail by a factor of two. The results are illustrated in figure 7.

Crime rate

Compared to standard conditions, initally the crime rate is decreased. However, it ultimately rises to approximately the same value. This is caused by.

a. The released criminal ratio initially decreases and makes crime less attractive.

b. The jail becomes overcrowded and increases the incentive to plead guilty.

c. More of those arrested plead guilty and the released criminal ratio begins to increase.

d. The increase in the released criminal ratio more than counteracts decreases in the free criminal ratio and attractiveness of crime increases.

The net result of these interrelated factors is to initially slow the increase in the crime rate. However, without other system changes, there is not a substantial long term benefit.

Arrest Rate

The factors influencing the arrest rate are the same as those for the standard case. However, the slower rate of increase in the crime rate delays the time maximum police capacity is reached to twelve years.

FIGURE 7

Cost

The discounted costs are reduced to approximately eight billion dollars due to delaying the cost increases associated with a rising crime rate without significantly increasing other costs.

Reduced Dope Addicts

One of the factors that has contributed to the rising crime rate has been narcotics addiction. To evaluate the impact on the total crime problem of reducing crime due to narcotics addiction, the number of addicts committing crimes were reduced to 500 from the current estimates of 4,000 at the initiation of the run and held constant. The results are shown in figure 8.

Crime Rate

The immediate removal of approximately 175,000 crimes per year slows the rate of increase in the crime rate. However, the other factors affecting the attractiveness of crime are adequate contributors to result in a continual rise in the crime rate.

Arrest Rate

The same factors affect the arrest rate as in the standard case.

Cost

The total discounted cost is reduced to approximately 9.5 billion dollars due to the lower crime rate over the entire run.

CRIME-P CRIM JUSTICE SYSTEM DYNAMIC MODEL   4/18/72   REDUCED DOPE

SMTCR=*,AR=O,ACOST=$,EAVESEN=S,PROBPSN=P,FCRIM=C

REDUCED DOPE

4000.T	*
400.T	O
1200.M	$
2.	S
8.	P
1200.T	C

| 3000.T |
| 300.T |
| 900.M |
| 1.5 |
| 6. |
| 900.T |

| 2000.T |
| 200.T |
| 600.M |
| 1. |
| 4. |
| 600.T |

| 1000.T |
| 100.T |
| 300.M |
| .5 |
| 2. |
| 300.T |

| 0. |
| .0 |
| .0 |
| .0 |
| .0 |
| 0. |

PC
SC

OC
DC
NC

ANNUAL COST
(x1000)

CRIME RATE
(x1000)

ARREST RATE

FREE CRIMINALS

EFFECTIVE SENTENCE LENGTH

PROBABILITY OF PRISON

.0   10.   20.   29.99

REDUCED DOPE ADDICTS
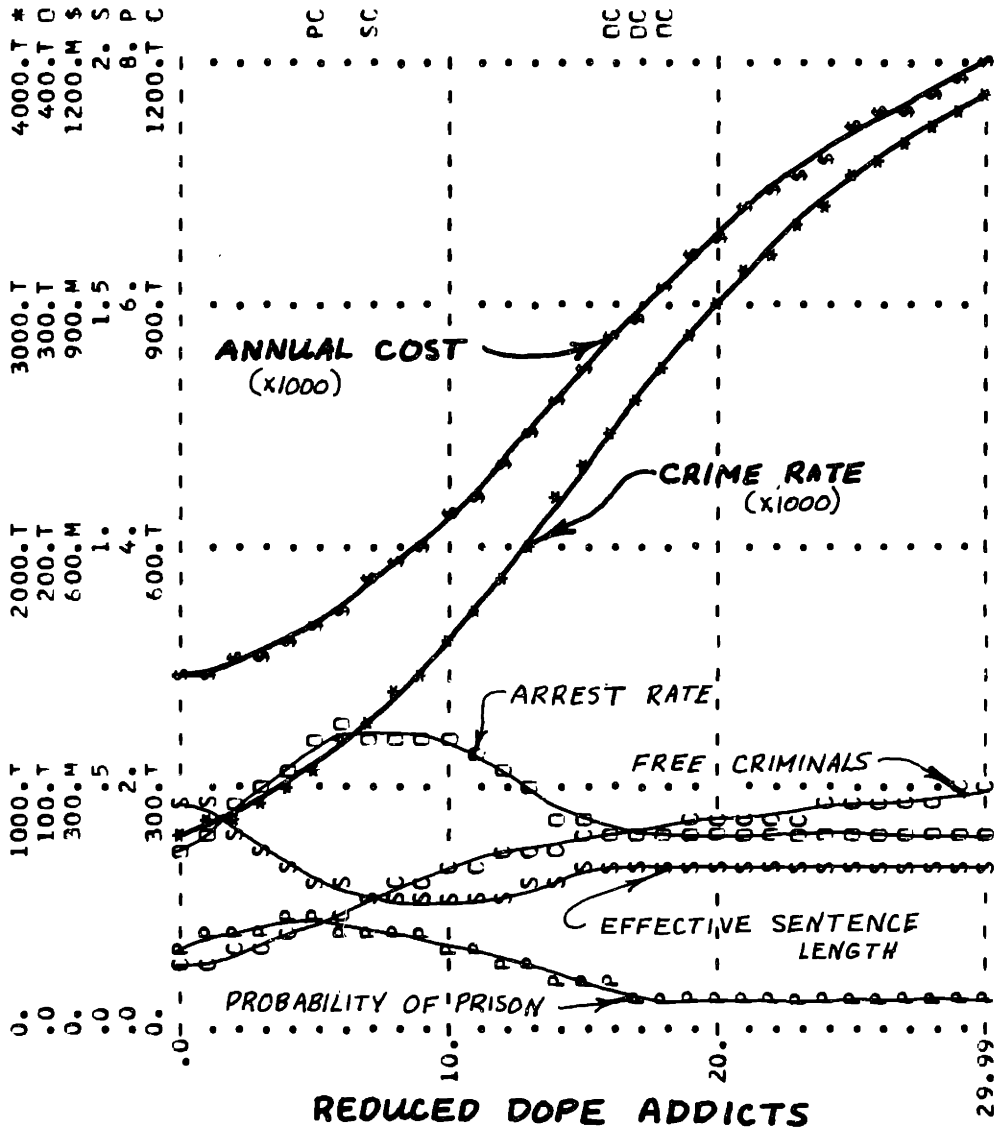
FIGURE 8

Increased Court Capacity

To evaluate the assertions that court reform and more rapid justice would significantly influence the crime rate, nominal court capacity was increased from 41,600 to 65,550 trials per year. The results are not plotted.

This change has virtually no effect. There are insignificant changes in the crime rates (both lower and higher at different times) and increases in the discounted total cost. The lack of effect is primarily due to a decrease in the incentives to plead guilty with shorter court backlogs. This results in more criminals being freed and counteracts any changes in the percentages put on probation or being released with fines and suspended sentences.

Attractiveness of Crime Change

Former Attorney General Ramsey Clark and others have stated that the essential action in crime control is to create a healthy environment.[1] To evaluate the potential benefits of a general environmental change, two approaches were investigated. The first reduced the attractiveness of crime (AOC) 20% at one year. This provided a depressing effect on AOC and on all crime rates.

_____

[1] Ramsey Clark, Crime in America (New York: Simon and Schuster, 1970), p. 19.

The results are shown in figure 9.

The second approach was to reason that a change in the environment would not significantly influence those who have already been arrested. The potential for change would be in reducing the rate non-criminals committed crime. This was tested by lowering the crime rate of the non-criminal population to 80% of its value under standard conditions. The results are shown in figure 10.

In both cases, the rate of increase of the crime was decreased. However, these changes were not large enough to stabilize crime at a reduced level.

Additional Punishment

There are officials who believe the continual rise in the crime rate is due to the courts letting too many criminals go free and giving sentences that are too light.[1] To test the effect of additional punishment, the average sentence imposed by the courts was increased from .75 years to one year.

The result of this evaluation follow almost exactly those of the standard run. As a result, they have not been included as a plot. The increased sentence length does have a slight effect on the attractiveness of crime. This results in a minor reduction in

[1]This is the viewpoint ascribed to New York City Police Commissioner Patrick Murphy in "Murphy Indicts the Courts for Rise in City's Crime" (New York Times, December 21, 1971), p. 1.

CRIME-P CRIM JUSTICE SYSTEM DYNAMIC MODEL   4/18/72   REDUCED ATT

SMTCR=*,AR=O,ACOST=$,EAVESEN=S,PROBPSN=P,FCRIM=C
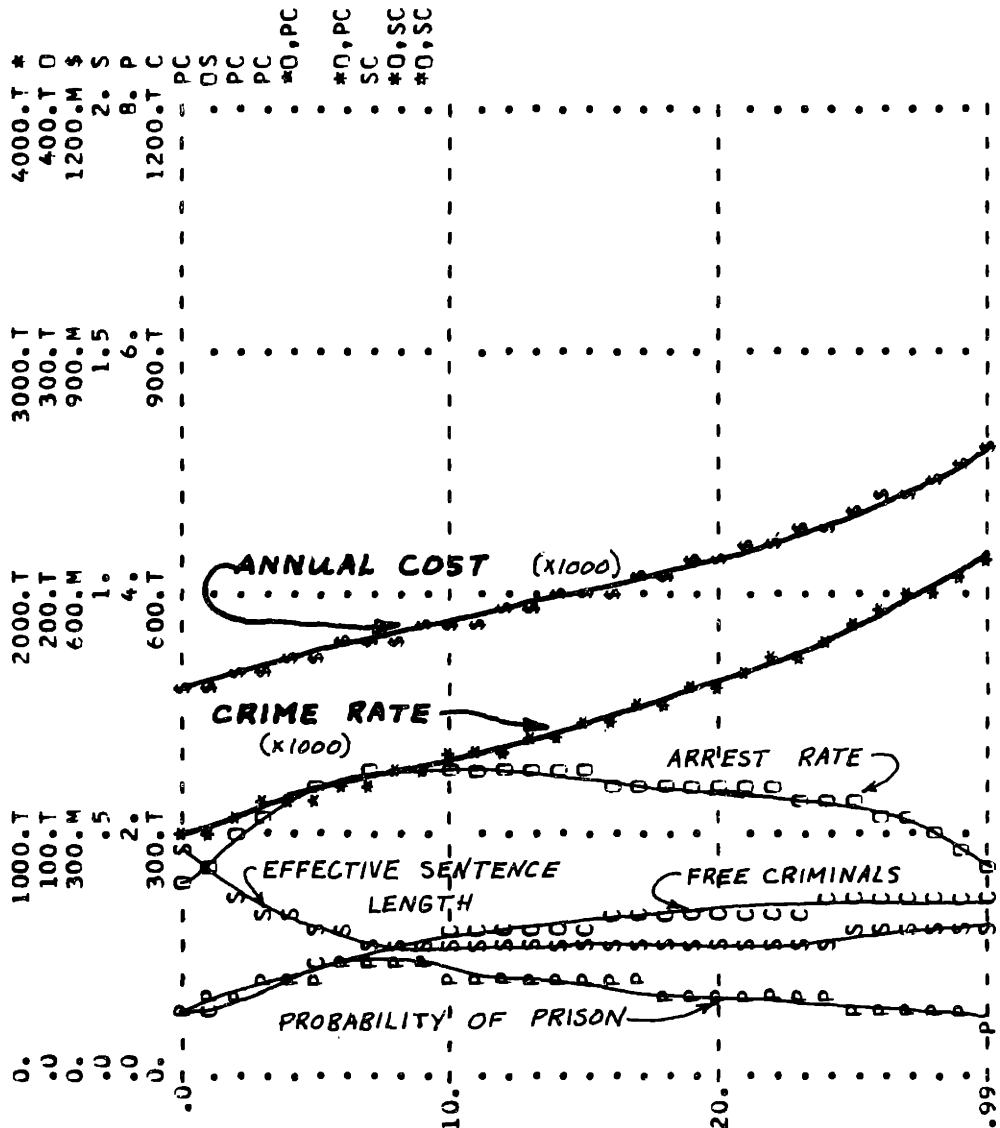
ANNUAL COST (x1000)

CRIME RATE (x1000)

ARREST RATE

EFFECTIVE SENTENCE LENGTH

FREE CRIMINALS

PROBABILITY OF PRISON

REDUCED ATTRACTIVENESS OF CRIME
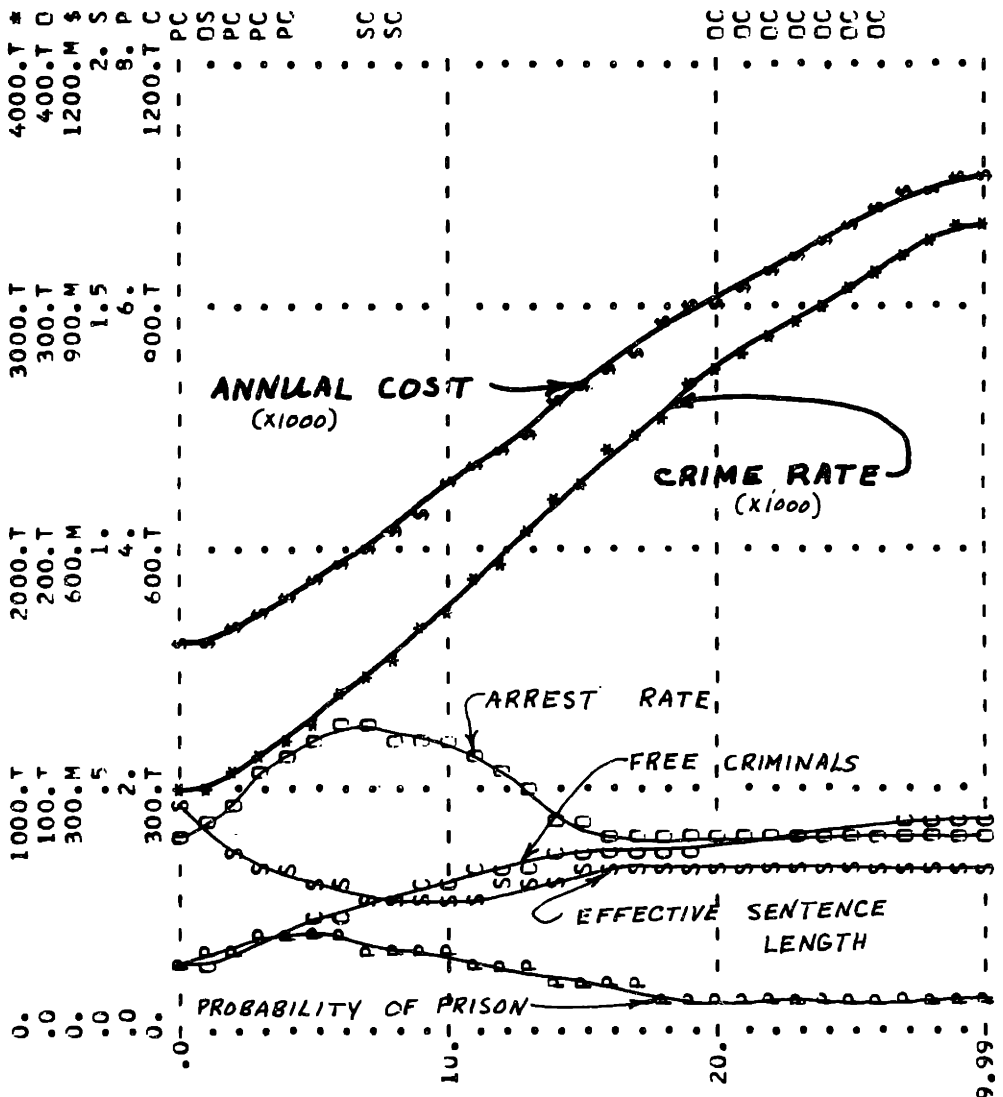
FIGURE 9

REDUCED FIRST OFFENSE CRIME RATE

FIGURE 10

the total crime rate over the thirty year period. However, the

effects on the crime rate and total costs are insignificant.

The primary reason for the small effect is the ability of

the parole board and the county commissioners to use discretion

in deciding how much of his sentence a prisoner must serve. As the

prisons become overcrowded (due to longer sentences), the parole

board can start to bias their decisions to alleviate the situation. In

county institutions, prisoners can be released by permit prior to

sentence completion. The numbers released by permit are roughly

equivalent to the number paroled.[1] Since additional prisoners re-

quire additional budgetary funds and can represent a political

liability if prison conditions draw the attention of the news media;

the author has assumed that releases by permit would be influenced

by prison crowding. The combined influences of the parole board

and the county commissioners act to keep the prison population re-

latively stable in the face of changing sentences. This keeps the

effective sentences approximately constant. As a result, a substantial

increase in the sentences imposed by the courts has only a minor

effect on the attractiveness of crime.

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[1] Commonwealth of Massachusetts, A Comprehensive Criminal
Justice Plan for Crime Prevention and Control (Boston: Committee
on Law Enforcement and Criminal Justice, 1969), Vol. I, p. 223.

The author has no direct evidence for the models of the behavior of the parole board and county commissioners that can be referenced. However, the remarkable stability of the populations of the Massachusetts prison system over the last ten years[1] could be explained by the type of mechanisms proposed. This stability has been achieved with fluctuations in the rate criminals were sentenced to incarceration and continuing increase in the arrest rate.

A similar result could also be achieved if judges based their sentencing patterns on feedback regarding prison crowding. The author unsuccessfully attempted to test this hypothesis through personal interviews and a literature search. The universal opinion was that, while judges may shift with public opinion, changes in prison conditions have little or no influence on the sentences judges impose. As a result, this was not included in the model.

Prison Reform

From a humanitarian point of view, there is undoubtedly a need for a great deal of prison reform.[1] In addition the high rates of recidivism leads to proposals that crime could be

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[1] Commonwealth of Massachusetts, Statistical Reports of the Commissioner of Correction, pp. 3-6, 21.

[2] John Wilpers, "U.S. Prison System Crises in Corrections", Government Executive, September, 1971, pp. 74-79.

substantially reduced by providing adequate rehabilitation programs.

Nationally, recidivism rates are typically above 60%.[1] Massachu-

setts has had similar recidivism experiences.[2]

The model incorporates feedback from prison conditions to the

recidivism rates for both ex-convicts and parolees. The feedback

includes both prison crowding and rehabilitation program influences.

To evaluate the potential impact of improved rehabilitation pro-

grams, the following changes were made to the CJS model.

    a. The rehabilitation cost per prisoner per year was increased

       from $20 to $2000.

    b. The time required for unemployed ex-convicts to find mean-

       ingful employment was reduced from .5 years to .1 years.

The change in paragraph "b" was assumed to be the result of

the increase in the funding to rehabilitation programs. In addition,

it was assumed to occur simultaneously

---

[1] John E. Hoover, Crime in the United States Uniform Crime Reports-1970, p. 39.

[2] Frank Carney, "Summary of Studies on the Deviation of Base Expectancy Categories for Producing Recidivism of Subjects Released From Institutions of the Massachusetts Department of Corrections" (unpublished report, October, 1966).

with the rehabilitation change when it would actually be delayed. The lack of a delay influences only the cost calculations and the time of any improvements and it should not affect the general trend of the results shown in figure 11.

Crime Rate

For this case, the crime rate is influenced by attractiveness of crime and the crime rate multipliers for employed ex-convicts and parolees.

The small increase in attractiveness of crime due to improved prison conditions operates on, and affects, the entire population. The decrease in the crime rates for employed ex-convicts and parolees due to improved prison rehabilitation programs affects only a small population. The long term result is to have virtually the same crime rate after thirty years as for no changes.

Arrest Rate

The arrest rate follows the same pattern as it does under standard conditions.

Cost

The total discounted cost is slightly increased, compared to the standard, due to the increased prison cost.

Additional Punishment and Prison Reform

Neither additional punishment or prison reform resulted in

CRIME-P CRIM JUSTICE SYSTEM DYNAMIC MODEL 4/18/72 PRISON REFORM

SMTCR=*,AR=0,ACOST=$,EAVESEN=S,PROBPSN=P,FCRIM=C

ANNUAL COST (x1000)

CRIME RATE (x1000)

ARREST RATE

FREE CRIMINALS

EFFECTIVE SENTENCE LENGTH

PRISON PROBABILITY
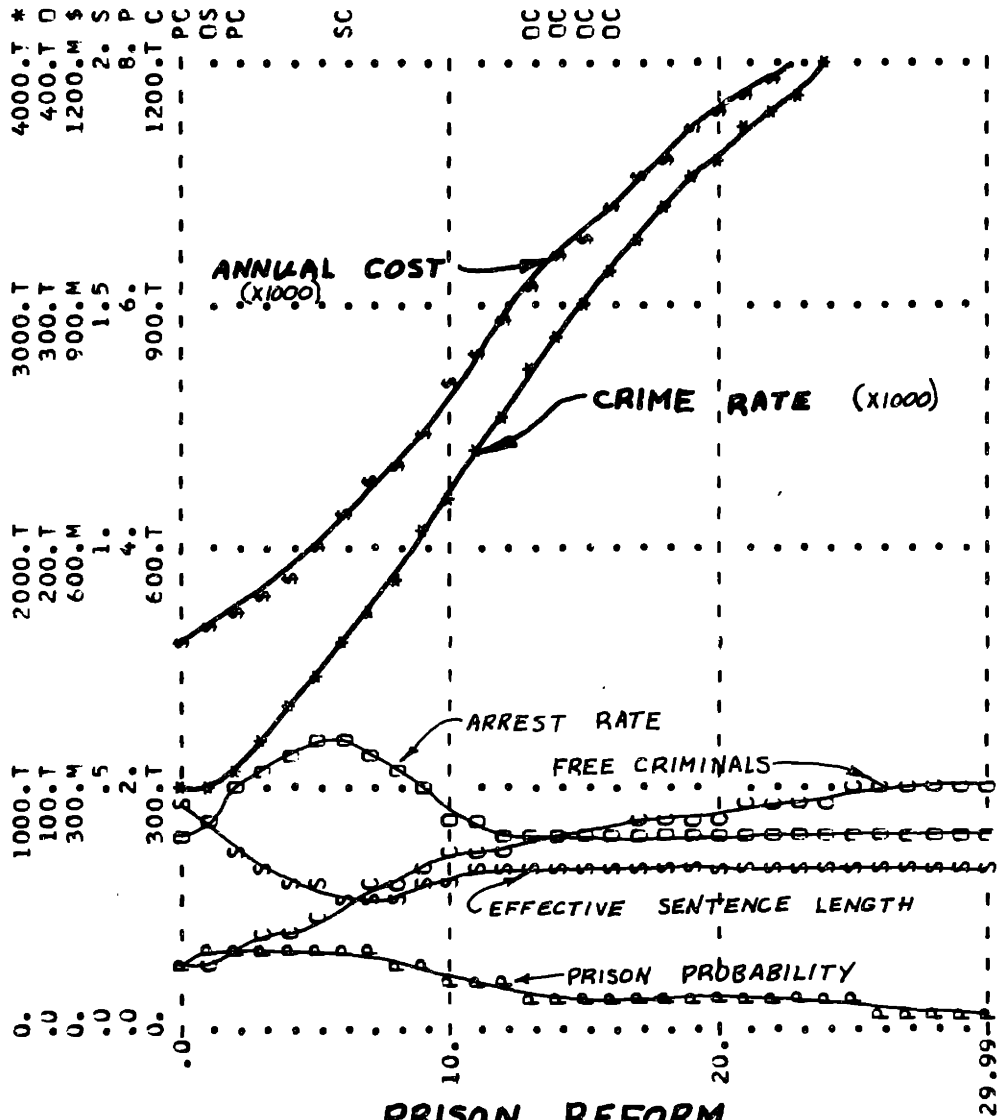
PRISON REFORM

FIGURE II

a significant change in the trend of increasing crime when applied

separately. To test the hypothesis that merged additional punish-

ment, prison reform, court reform and reduction of the nar tic

problem could have a synergistic effect, the following changes

were added to the previous modifications for prison reform:

a. The average prison sentence was increased from .75 years

to one year.

b. The prison capacity was increased from 2440 to 7500

individuals.

c. The percentage of those released after conviction while on

bail was reduced from 70% to 50%.

d. The percentage of those released after conviction from

jail was reduced from 64% to 44%.

e. The percentages of those released after a guilty plea

while on bail was reduced from 75% to 55%.

f. The percentage of those released after a guilty plea

while in jail was reduced from 73% to 53%.

g. The percentage of those arrested and put on bail was

reduced and jail facilities were increased to accomodate

the additional prisoners.

h. Dope addicts were reduced from 4000 to 500.

i. Court capacity was increased 50%.

The percentages put on probation were not changed and the individuals not released were put on probation and an equivalent number shifted from probation to prison. There were no changes in the number of police. The results are shown by figure 12. There is a similar, but less dramatic, result with no change in the number of drug addicts and drug related crime.

The increase in crime rate is reduced and the net long term cost of the public has been substantially reduced. However, it appears that these actions have only delayed the total problem approximately thirty years. They have not stabilized the crime rate at a low level.

Crime Rate

After initially decreasing, the increasing crime rate at two years is due to the expanded prison capacity being completely utilized. As this occurs, the effective average sentences begin to decline with a declining arrest rate and an increasing released criminal ratio. The rising released criminal ratio is due to a lower court backlog (which reduces the guilty plea incentives) and a larger percentage going to trial and an increase in the percentage that are released to the street. The net effect is to cause a continuing increase in the attractiveness of crime and the crime rate.

As the crime rate increases, public cooperation increases,

PAGE 95   CRIME-P CRIM JUSTICE SYSTEM DYNAMIC MODEL   4/18/72

SMTCR=*,AR=O,ACOST=$,EAVESEN=S,PROBPSN=P,FCRIM=C

PROBABILITY OF PRISON

EFFECTIVE SENTENCE LENGTH

ANNUAL COST (x1000)

CRIME RATE (x1000)

ARREST RATE

FREE CRIMINALS
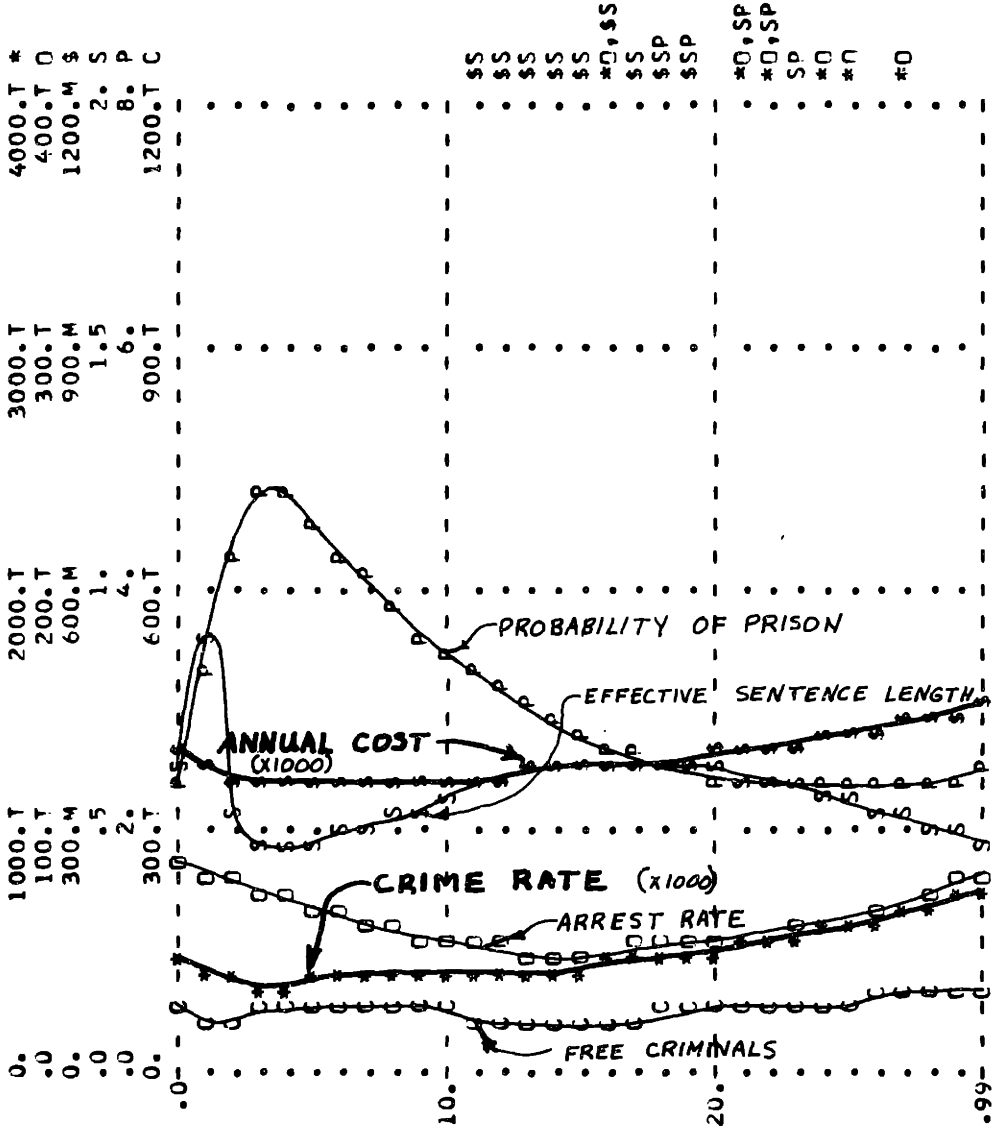
MORE PUNISHMENT AND PRISON REFORM

FIGURE 12

but, it is delayed due to reporting and perception delays. As a result, the deterrent effects of police action lag the rising crime rate. If the evaluation were continued beyond thirty years, it is anticipated that the crime rate would hit a maximum and then begin to decline to repeat the cycle.

Arrest Rate

The initially declining arrest rate is due to the decreasing public cooperation and numbers of free criminals and free new offenders. After two years, the number of free criminals is relatively stable but the number of free new offenders is increasing. This leads to an increasing arrest rate for the duration of the run. At no time is police capacity the limiting factor. The arrest rate is primarily controlled by the number of individuals available for arrest and public cooperation.

Cost

Even though the initial annual costs are higher, the discounted total cost is substantially lower due to the decrease in the costs of crime. The discounted cost (after compensation for the transient caused by the initial condition calculations) is approximately 5.5 billion dollars.

Shift Police Emphasis to Free Criminals

To evaluate the potential benefits of reallocating police

resources (in addition to the changes for less bail, more

punishment, prison reform, more court capacity and less dope

addiction), police emphasis was shifted from free new offenders

to repeat offenders (free criminals). The results are illustrated

in figure 13.

Crime Rate

The increased police emphasis on free criminals effectively

holds the rate of increase of the crime rate down during the entire

thirty years. However, the actual crime rate is slightly higher

for the first twenty-five years, primarily due to the effect of the

decreased probability of arrest for new offenders increasing the

crime rate slightly. The overall effect is to maintain a deterrent

to crime while not bringing as many new individuals into the actual

CJS.

Arrest Rate

The arrest rate behaves as it did without the shift in police

emphasis to free criminals.

Cost

Dollar costs are virtually the same as in the previous situation.

However, there are two other less tangible costs. The total crime

rate does not rise to the previous level, even though the total number

of crimes committed over the thirty years are approximately the

CRIME-P CRIM JUSTICE SYSTEM DYNAMIC MODEL   4/18/72   SHIFT POLICE

SMTCR=*,AR=0,ACOST=$,EAVESEN=S,PROBPSN=P,FCRIM=C

PROBABILITY OF PRISON

ANNUAL COST (×1000)

EFFECTIVE SENTENCE LENGTH

ARREST RATE

CRIME RATE (×1000)
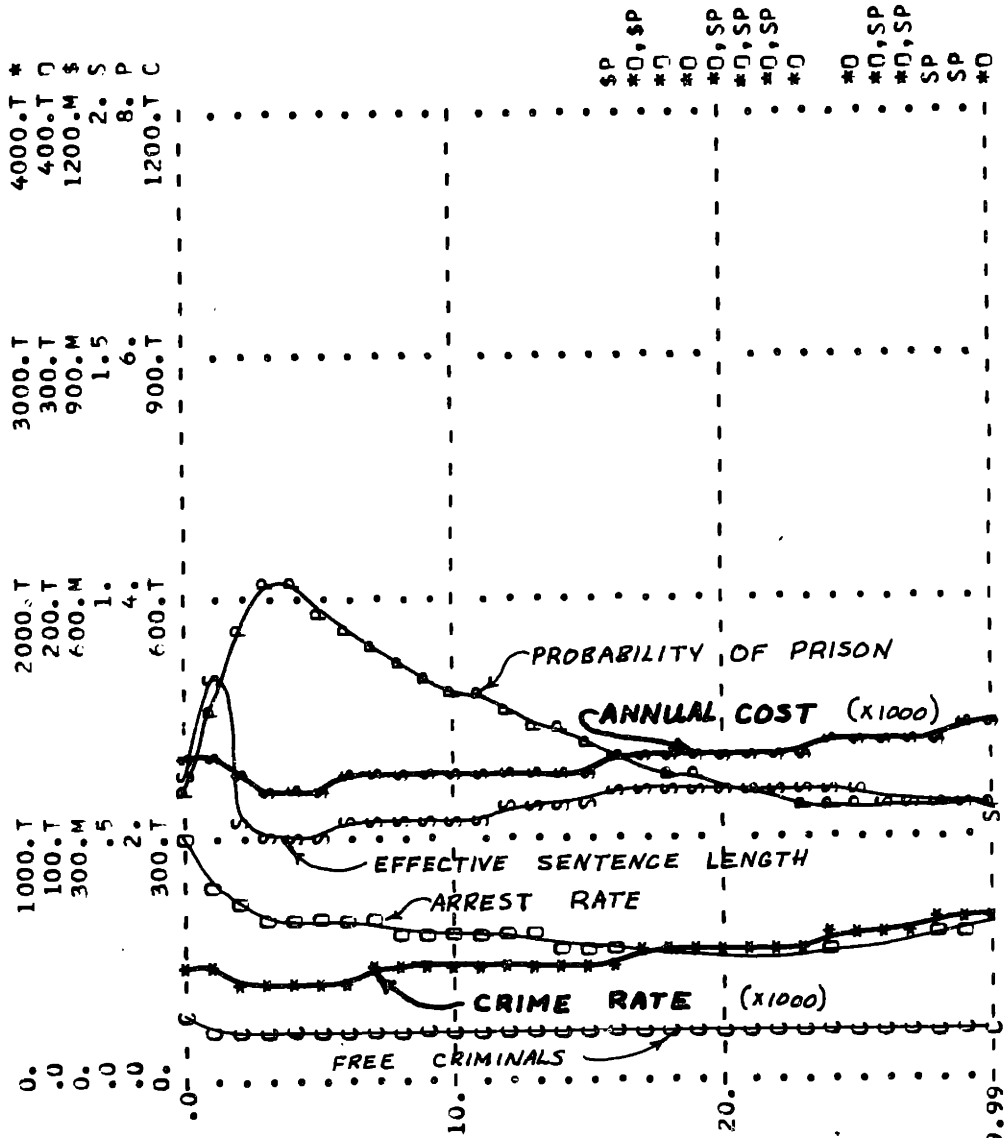
FREE CRIMINALS

PUNISHMENT, REFORM, AND POLICE SHIFT-FC

FIGURE 13

same. With the police attention shifted to free criminals, the free new offender population is larger over the entire time span.

Shift Police Emphasis to Free New Offenders

It could be proposed that the long term solution to the crime problem is to deter new offenders by increasing the probability of arrest. Increasing the arrest probability might provide a long term benefit by reducing the flow of new people into crime. To test this hypothesis, the police effectiveness against new offenders was increased 100% while being reduced by a factor of three against repeat offenders.[1] The results are illustrated in figure 14.

Crime Rate

The increasing crime rate is primarily due to the increasing numbers of free criminals that result from police emphasis on new offenders. However, the deterrent effect of higher arrest rates and police arrests reduce the free new offender population.

After twenty years, the combined effects of fewer people moving from the non-criminal population and individuals leaving the free criminal population result in the crime rate beginning to decrease. After thirty years, the crime rate again starts to increase.

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[1]The reduction of police effectiveness against repeat offenders was included to incorporate the limited total capacity of the police.

CRIME-P CRIM JUSTICE SYSTEM DYNAMIC MODEL 4/18/72 SHIFT

SMTCR=*,AR=O,ACOST=$,EAVESEN=S,PROBPSN=P,FCRIM=C

PROBABILITY OF PRISON

ANNUAL COST (x1000)

CRIME RATE (x1000)

EFFECTIVE SENTENCE LENGTH

ARREST RATE

FREE CRIMINALS
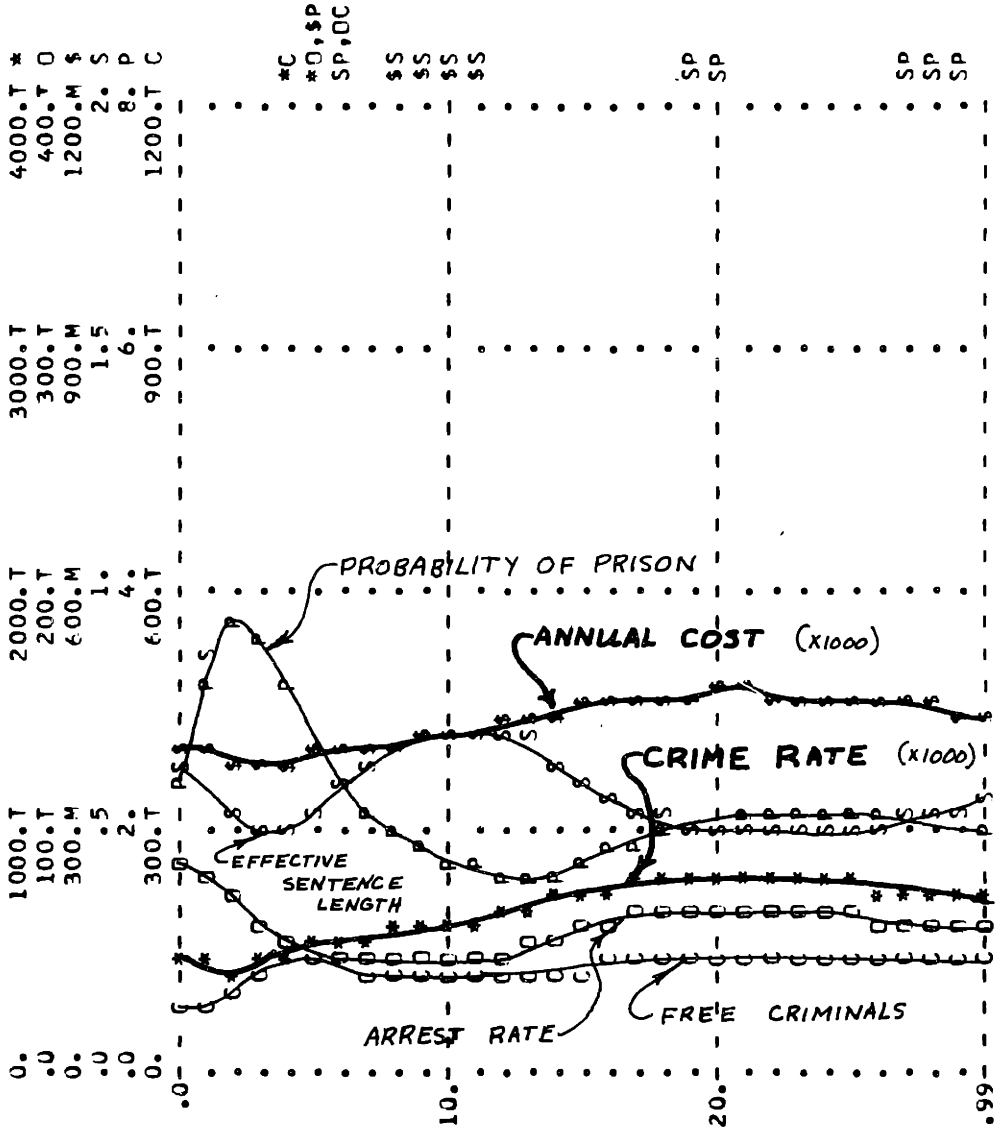
PUNISHMENT, REFORM, AND POLICE SHIFT-FNO

FIGURE 14

Arrest Rate

The arrest rate follows the same pattern, for the same reasons, as the previous two situations.

Cost

The discounted cost is approximately six billion dollars (500 million more than the case with emphasis on free criminals).

In addition to the higher crime rate, the number of free new offenders arrested and exposed to the entire criminal justice system is almost twice as large as when police emphasis is placed on free criminals.

CHAPTER IV

CRITICAL MODEL CONSIDERATIONS

Introduction

The most significant factors in the behavior of the model are:

a. Attractiveness of crime.

b. Police effectiveness.

c. Recidivism rates.

d. The percentages of the various populations that

return to the non-criminal population each year.

For items "c" and "d", the concept is straightforward and

changes are easily evaluated. As a result, they will not be discussed

in detail. In addition all are constants -- in the model -- with the

exception of the recidivism rates for parolees and ex-convicts.

Changes in the ex-convict and parolee recidivism rates have little

effect on the model behavior.

Correct formulation of the expressions for Attractiveness of

Crime (AOC) and Police Effectiveness (POLEFF) are essential if

the model is to approximate the behavior of the real world.

More importantly, a correct understanding of the forces that

affect these quantities and their relationships with the entire CJS

is critical if public policies are to be developed that are not counter-

productive.

For these reasons, the approach taken to AOC and POLEFF outlined in the following paragraphs should be critically reviewed.

Attractiveness of Crime (AOC)

Attractiveness of crime has been defined as an auxilliary variable that is used as a common multiplier (after a perception delay) for all crime rates. In addition, it is used to modify the percentage of the people that "go straight" each year from the various population groups. The factors incorporated are illustrated in figure 15.

The relationship is of the form:

$$AOC = (CBM + SLM * PRISPM + RCRM + FCRM + PCM + ARPROBM)$$

Equation Form

The linear combination form (for all but the prison probability multiplier) was chosen based on the belief that attractiveness of crime is affected by an addition of factors in which some have the opportunity to become dominant. An extreme example would be the case where the average effective sentence length was zero. In this situation, it is not likely that court backlog, released criminal ratio, prison conditions or arrest probabilities will have

Prison Probability (PRISPM)

and

Sentence Length (SLM)

Court Backlog (CBM)

Released Criminal

Ratio (RCRM)

Attractiveness

of

Crime

Prison Conditions (PCM)

Free Criminal

Ratio (FCRM)

Arrest Probability

(ARPROBM)
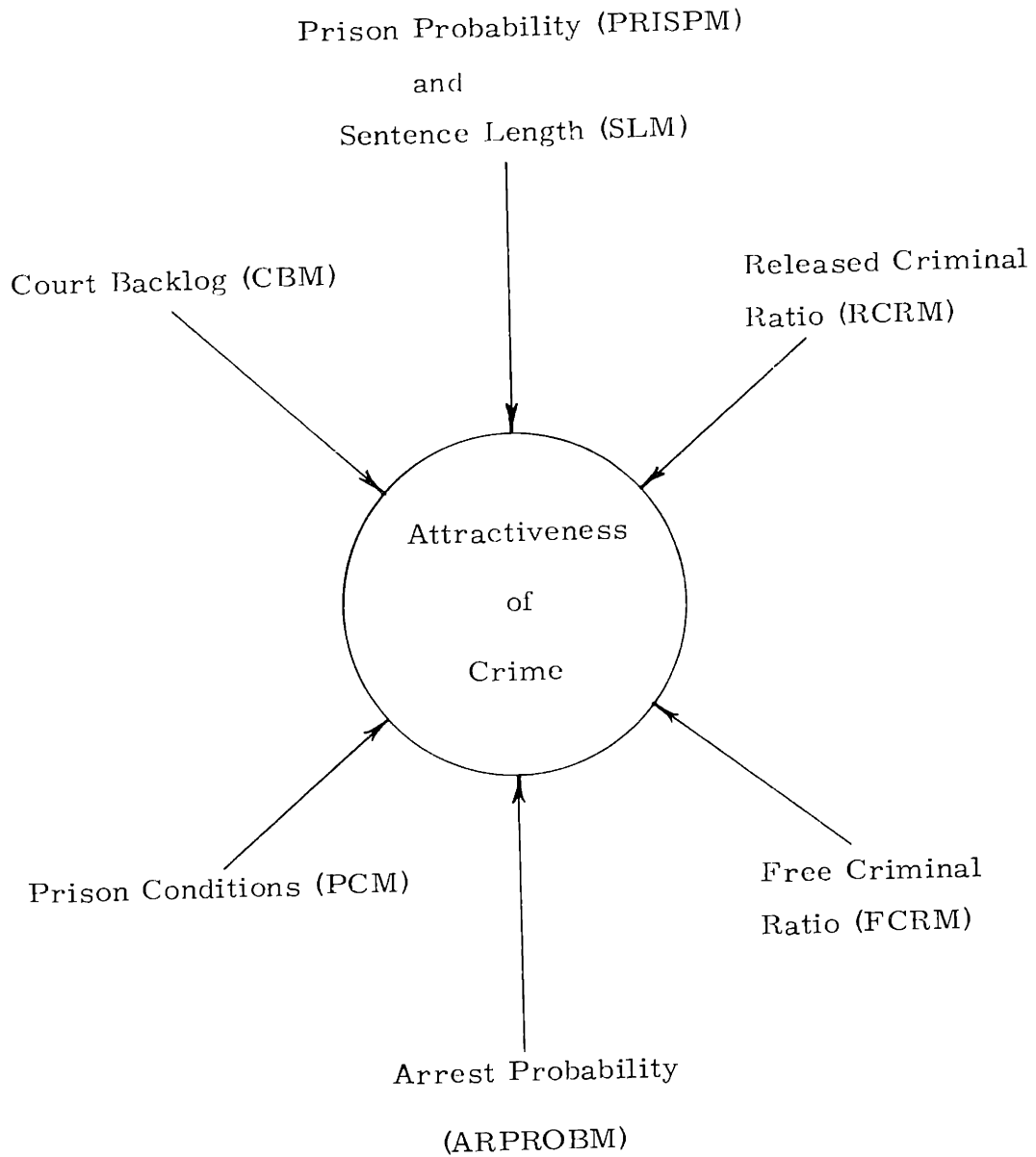
Attractiveness of Crime

FIGURE 15

the same relative effect on the attractiveness of crime as when the sentences are significant. However, the attractiveness of crime should still be influenced.

CBM

CBM is the court backlog multiplier. It is related to the court backlog at any given time as shown by figure 16. The argument is that speedy trials are an important part of the deterrent process. If this is true, a reduction in backlog to zero (instant trial) should reduce the attractiveness of crime and the resulting crime rate.

Conversely, long trial delays should make crime more attractive. It has been indicated that the maximum length of time to trial should be 60 to 90 days if it is not going to contribute to the attractiveness of crime.[1] Therefore, figure 16 has only a small change from .0 to 0.2 years delay and an increasing effect up to the maximum at 0.8 years.

Qualitative models of the effects of changes in court back-logs are implicit in all proposals to divert public resources (dollars) to the improvement of the court system. If a different curve has a greater appeal (the author knows of none validated by research), it should be tried to evaluate the effect on the system.

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[1]Personal interview with John Lynch, Esq., Assistant District Attorney, Suffolk County, Massachusetts, January 14, 1972
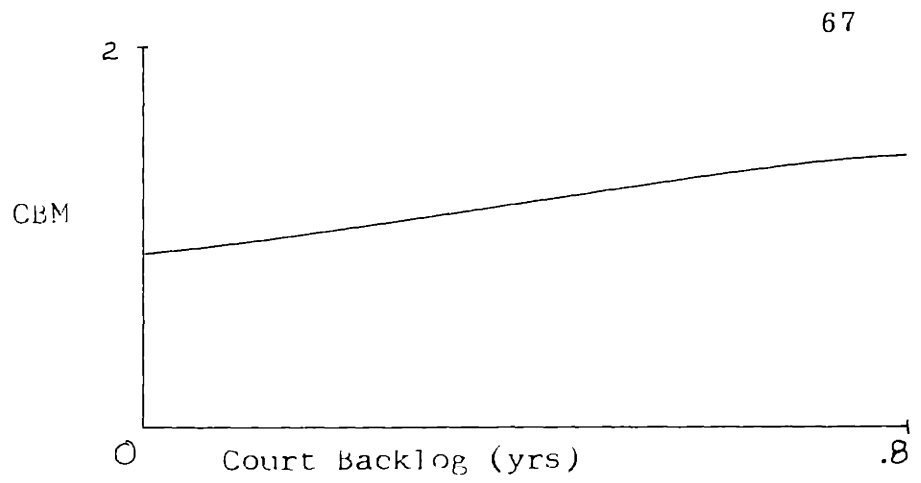
Court Backlog Multiplier

FIGURE 16
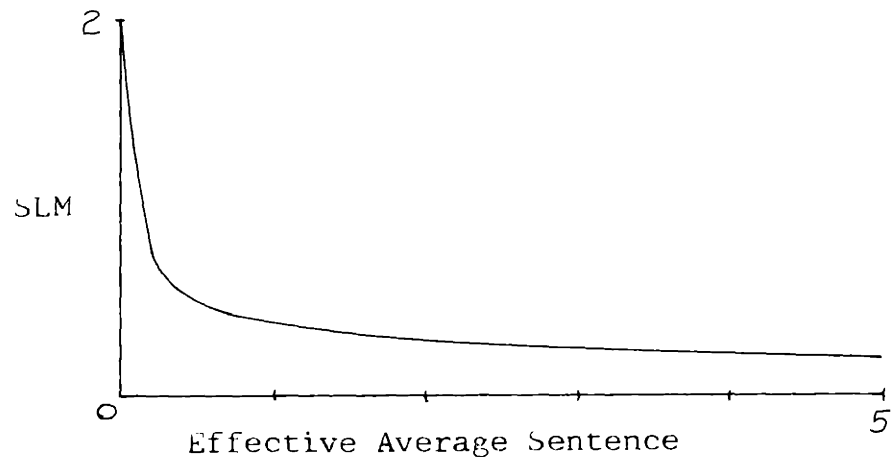
Sentence Length Multiplier

FIGURE 17

SLM

SLM is the sentence length multiplier. It is related to the effective average prison sentence at any time as shown in figure 17. The effective average sentence is defined as the amount of time the average prisoner spends in prison. By this definition, the effects of parole, early release for good behavior, etc. are incorporated. The relationship is based on the rationale that as the effective sentence approaches zero, crime becomes much more attractive while increasingly long sentences do not increase the deterrent effect proportionally.[1]

For example, the assumption that attractiveness of crime decreases rapidly when short sentences are imposed is implicit in proposals to decrease drunken driving by mandatory prison penalties.

The diminishing influence of increasingly harsh sentences

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[1]James S. Campbell, Joseph R. Sahid, and David P. Strang, Law and Order Reconsidered, (New York: Praeger Publishers, 1970), pp. 6-8.

is more difficult to demonstrate. However, Great Britain's

experience in attempting to suppress infanticide does provide an

extreme example.[1] Another approach is to consider the obvious

reduction in deterrence as real sentences approach the expected

life span.

While not explicity stated, a relationship of this type is

implicit in the establishment of prison sentences for various types of

crime (with the assumption that prison sentences are established for

purposes other than revenge).

PPROBM

PPROBM is the prison probability multiplier. It relates

the probability that a crime will result in time spent in prison to the

attractiveness of crime shown by figure 18. It is multiplied by the

sentence length multiplier to attempt properly to reduce the deterrent

effect of a high probability of prison if the average sentences served

are short and a low probability of prison with long sentences. The

value for SLM and PPROBM have been chosen to allow their product to

dominate AOC for short sentences with a small probability of prison.

There is some support for this hypothesis in cases where

individual communities begin to impose mandatory harsh (by con-

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[1] J. Andenaes, "Deterrence and Specific Offenses", University of Chicago Law Review, XXXVIII (Spring, 1971), pp. 537-42

10

PPROBM

0

Probability of Prison   (%)   5

Prison Probability Multiplier

FIGURE 18

10

RCRM

0   .5   1
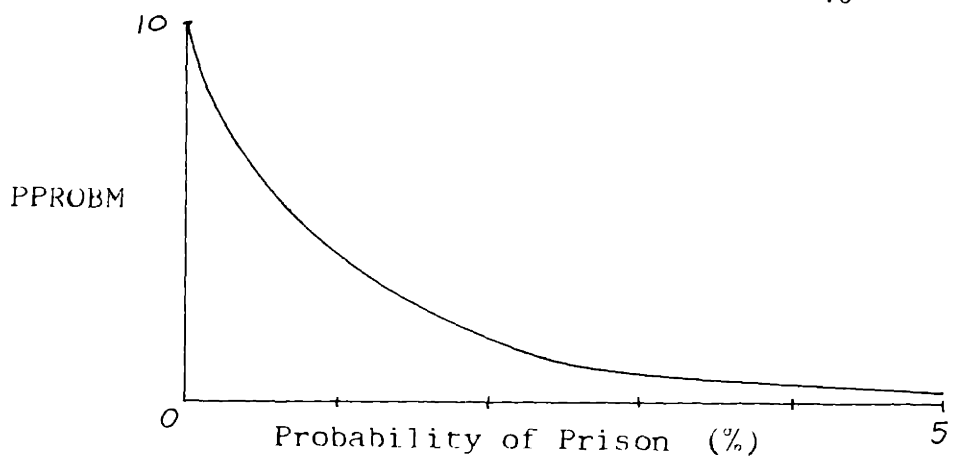
Released Criminal Ratio
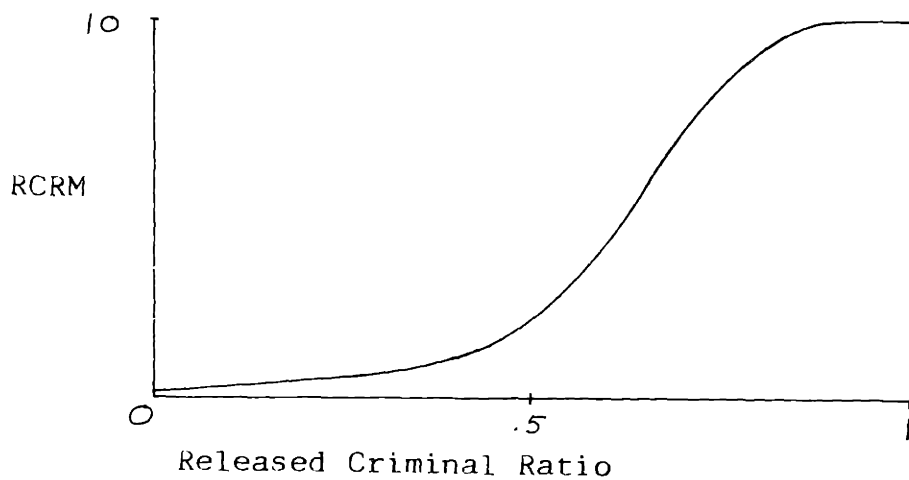
Released Criminal Ratio Multiplier

FIGURE 19

temporary standards) prison sentences with a resulting decrease in local crime.[1] The decline in kidnapping after it was made a federal offense punishable by death (with the resulting increase in probability of punishment) could also be used to support the representation.

RCRM

RCRM is the released criminal ratio multiplier. It is related to the released criminal ratio at any time as shown by figure 19. The released criminal ratio is the sum of all arrested that are released (directly by the courts, through continuances, dismissal, bail and acquital or probabation) divided by the total arrested.

The rationale is that the larger the percentage released back to the streets, the less the deterrent effect of the law enforcement system.

Even though discretionary releases are being made every day, there are no estimates or studies on the aggregate effect on the attractiveness of crime.

FCRM

FCRM is the free criminal ratio multiplier and is related to the free criminal ratio at any time as shown by figure 20.

[1] Samuel Grafton, "Of Crime and Punishment", In Crime and Its Prevention, ed. by Stephen Lewin (New York: The H.W. Wilson Company, 1968), pp. 185-93.

72
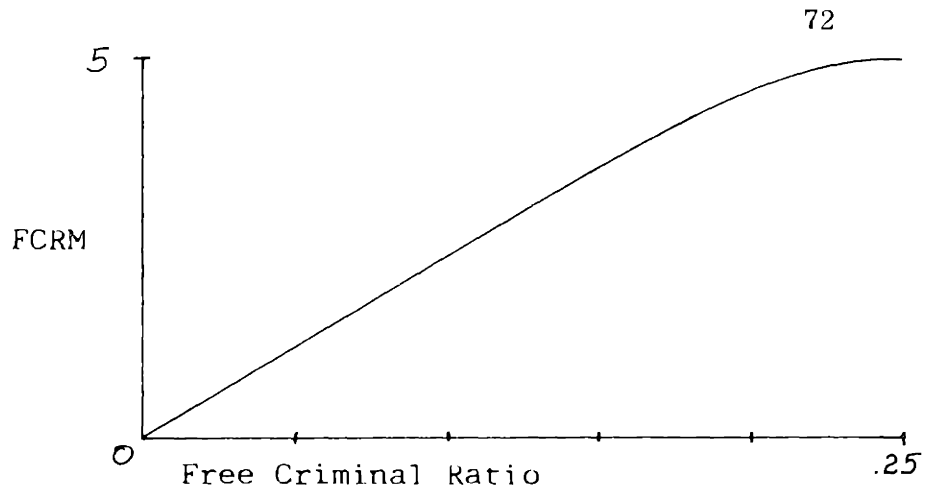
Free Criminal Ratio Multiplier

FIGURE 20
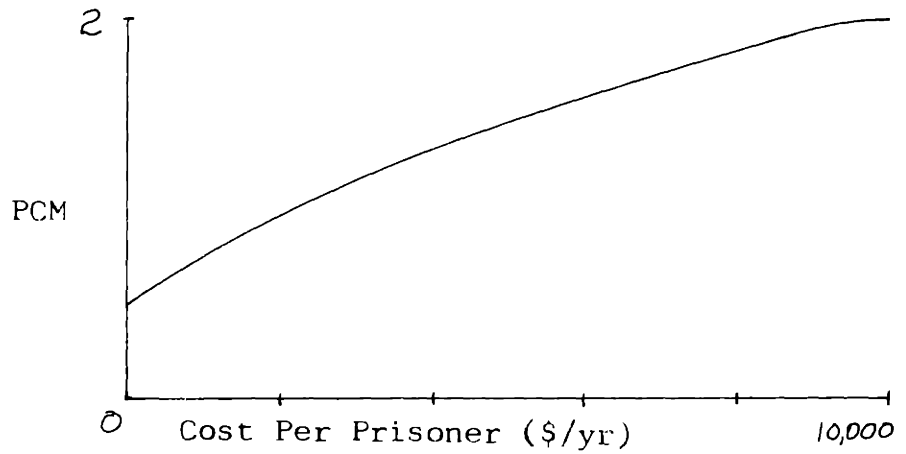
Prison Condition Multiplier

FIGURE 21

The free criminal ratio is the sum of all free criminals (those not apprehended for their current crimes), criminals released without conviction and criminals released on bail divided by the remainder of the total population.

The reasons for including this term are the theories that relate deviant behavior to the opportunities for reinforcement through peer groups. As there are more criminal activities, the more attractive crime is going to appear to be, and the more pressure there will be to achieve the same success.[1]

This term also includes some deterrent influence of police effectiveness. As the police become more effective, the arrest rate will increase and the number of free criminals will decrease, reducing the attractiveness of crime.

While data are not available to support the particular relationship proposed here, the knowledge is necessary if an intelligent allocation is to be made between police and correction.

PCM

The prison condition multiplier, PCM, relates the attractiveness of crime to the quality of life within the prison system

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[1] Donald R. Cressey and David A. Ward, Delinquency, Crime and Social Process (New York: Harper and Row, Publishers, 1969), pp. 316-20, 332-48, 404-32, 557-77.

(as represented by dollar costs per prisoner) as shown in figure 21.

The curve of figure 21 is based on the logic that, since many criminals are from low socio-economic status, as prison life become less austere and educational-vocational programs are added that were unavailable to them as private citizens, the deterrent effect decreases (or the attractiveness of crime increases).

Again, data are not available to support the specific relationship. However, politicians assert that a similarly shaped curve, if not the same one, represents life as they vote on additional funds for the penal system. At the same time, advocates of more resources argue that they will reduce the recidivism rate (this effect is incorporated in the model relationships for ex-convict crime rates). Both may be correct and neither quantify their assertions or evaluate the total CJS impacts of their positions.

ARPROBM

The arrest probability multiplier ARPROBM, relates the attraction of crime to the probability that a criminal will be arrested for a crime as shown by figure 22.

The curve of figure 22 is based on the assertion that fear of arrest is considered when individuals are considering a criminal act. While this may not be true of crimes of passion, these are a relatively small portion of the total crime picture. The effect of fear of arrest
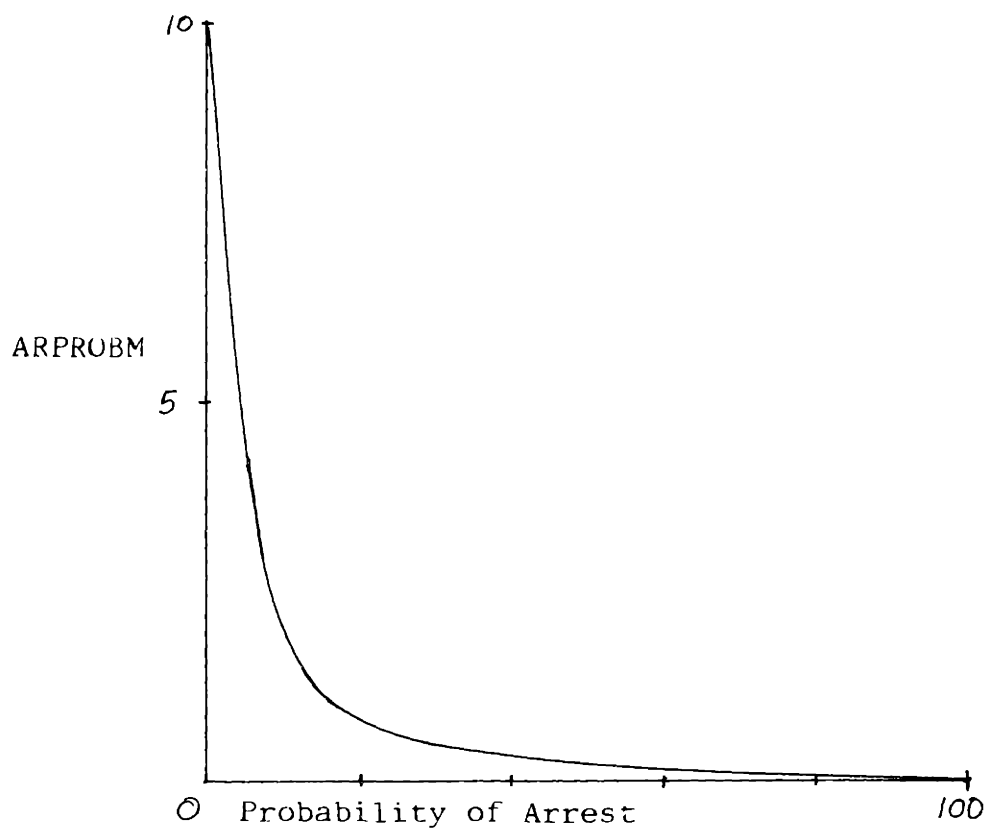
Arrest Probability Multiplier

FIGURE 22

is illustrated by the experience of New York City with intensive

police patrol. In this case, the number of patrolmen in a precinct

was increased 40% and the aggregate crime rate decreased dram-

atically. There was evidence also that crime was displaced to

neighboring areas indicating that the probability of arrest is taken .

into consideration for a significant sector of criminal activity.[1]

It could be argued that this experience does not reflect fear

of arrest but that the effect is due to fear of prison. It is the author's

opinion that there would be some deterrent effect due to the arrest

procedure and probable time in jail even if the probability of prison

and the average sentence lengths were both low. The values selected,

by the author, give a significantly greater weight to probability of

prison and sentence length than to probability of arrest.

Inthe opinion of one experienced individual in the law enforce-

ment field, fear of arrest would be a stronger deterrent for indivi-

duals who had never been arrested than for those who already had

the stigma of arrest.[2] As a result an additional multiplier has been

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[1]S. James Press, "Some Effects of an Increase in Police Manpower in the 20th Precinct of New York City" (unpublished report, New York City - Rand Institute, 1971).

[2]Confidential discussion with an undercover agent, February, 1972.

used to modify the crime rates for free new offenders and for the non-criminal population. The relationship used is shown in figure 23.

The author has been unable to find any research or data that could be used for the derivation of the specific relationships chosen. However, there are similar relationships implicitly assumed when resources are allocated to the police.

Police Effectiveness (POLEFF)

The arrest rate influences all parts of the CJS by affecting jail crowding, court backlog and other areas. In the model, the arrest rate is determined by the number of criminals and the police effectiveness. The factors that have been included in the model to determine police effectiveness (POLEFF) are illustrated in figure 23.

The relationship is of the form:

$$POLEFF = FCRIMM*POLICEM*TRIALRM*(PCOOPM +$$

$$PCOOPM\ 1 + PCOOP\ 2)$$

Equation Form

The product form was chosen for those items where they should change POLEFF by the same percentage regardless of the other factors. For example, if the police multiplier (POLICEM) were to increase by a factor of two due to a large increase in the number of police, POLEFF (and the arrest rate) would be expected

Free Criminals (FCRIMM)

Public Cooperation
Related to Probability
of Arrest (PCOOPM 1)

Number of Police
(POLICEM)

Police Effectiveness

Police Time Required
by Trials
(TRIALRM)

Lack of Public Coopera-
tion Due to Fear of
Reprisals
(PCOOPM)

Public Cooperation Due
To Concern Over The
Crime Rate (PCOOPM 2)
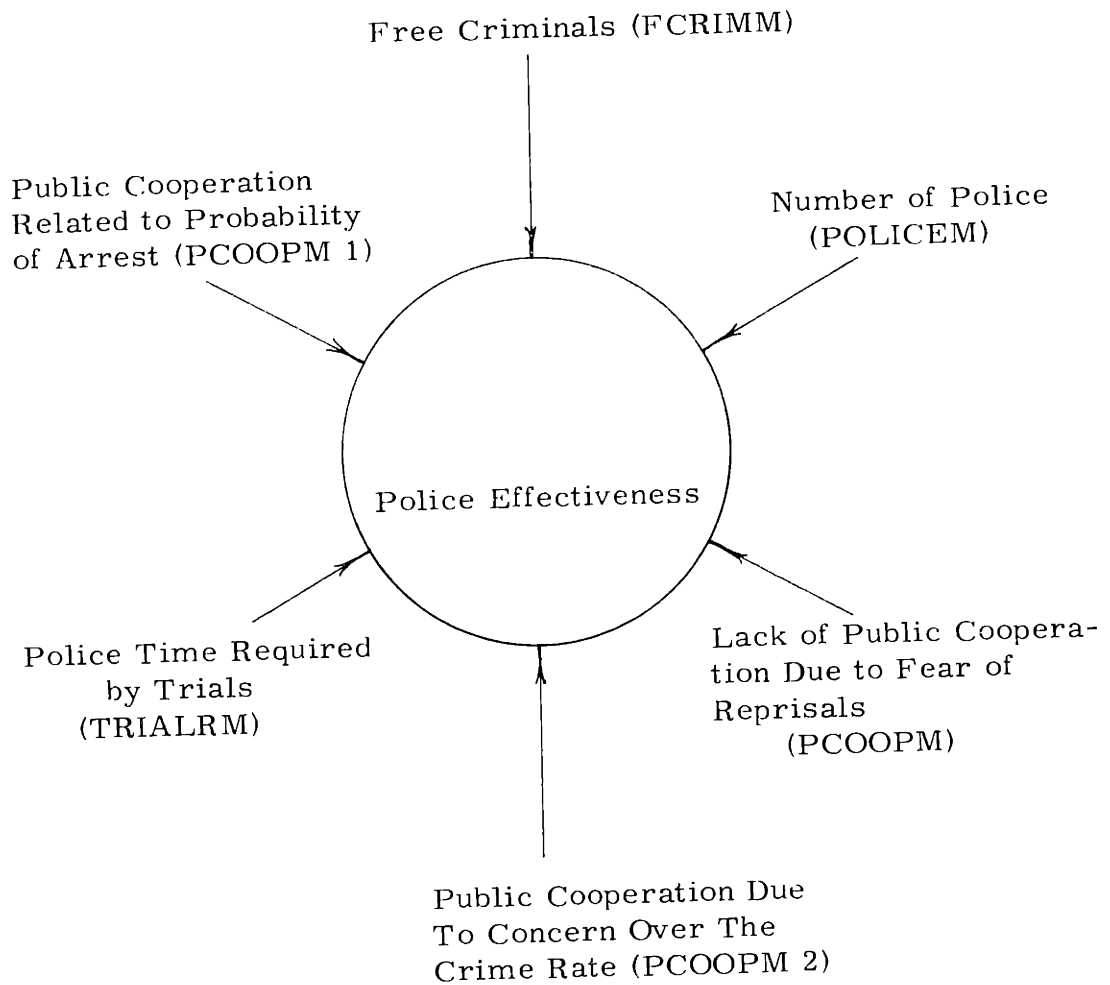
Police Effectiveness

FIGURE 23

to also increase by a factor of two for any levels of the other factors.

However, in the case of the public cooperation multipliers (PCOOPM, PCOOPM 1, and PCOOPM 2), the causes of change are operating on a single entity -- the public -- and superposition seemed to be more appropriate.

FCRIMM

The free criminal multiplier (FCRIMM) has been included to incorporate the effect of police concentration on their effectiveness. The rationale is that as the ratio of free criminals to police decreases, the police effort can be concentrated on fewer individuals. This concentration then increases the probability of arrest for the free criminals remaining. The specific relationship used is shown by figure 24.

As usual, there is no direct support for either the shape of the curve or the particular values chosen. However, the trend of arrest rates not increasing as rapidly as the overall crime rates[1] is evidence that factors similar to FCRIMM and the public co-operation multipliers are influencing the situation.

[1] John E. Hoover, Crime in the United States Uniform Crime Reports -- 1970, (Washington, D. C.: U. S. Government Printing Office, 1971), p. 34.

Free Criminal Multiplier

FIGURE 24
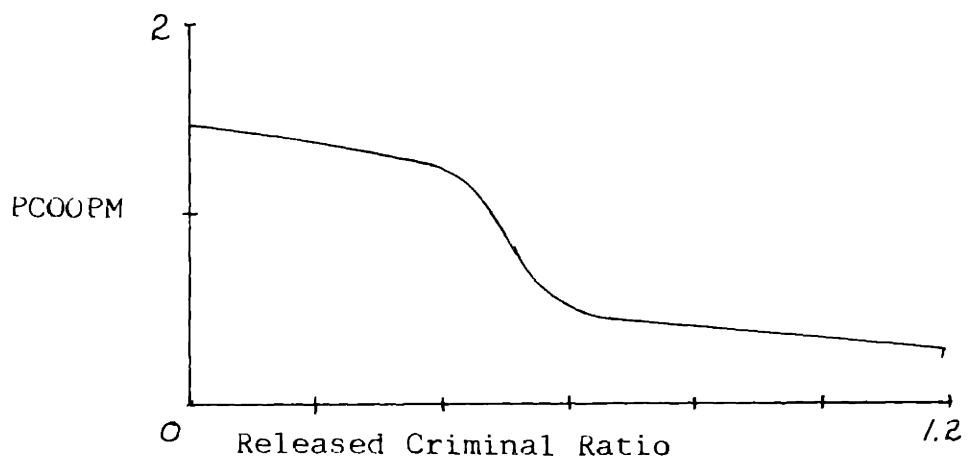
Public Cooperation Multiplier

FIGURE 25

TRIALRM

The trial rate multipler (TRIALRM)   has been included to account for the amount of man days lost to the police while they are preparing for and testifying in court.   The formulation (see appendix A) is based on a straight percentage of time lost and a one man day loss for every trial up to the nominal court capacity.   After nominal court capacity has been reached there is no further de-crease in police effectiveness due to greater trial rates.   This is based on the assumption that the procedures used to operate the courts at greater than nominal capacity should also cause a corresponding reducation in police time per trial and result in no net decrease in POLEFF beyond that caused by operating at court capacity.

PCOOPM

This public cooperation multiplier (PCOOPM)   is included to incorporate the effect of fear of reprisals on public cooperation with the law enforcement system.   This is done by relating PCOOPM   to the released criminal ratio, as shown in figure 25. When no one that is arrested is released back to the community prior to going to trial or pleading guilty, there should be less fear of reprisals and a higher level of cooperation (if only to report

crimes). As the percentage arrested and immediately released

increases, fear of reprisal will rise and cooperation decreases.

In addition to being intuitively appealing, the fact that fear

of reprisal does effect the public attitude about cooperating with

police has been found in opinion surveys[1] and is supported by at

least one law enforcement official.[2]

This approach does not include those merely fined or

placed on probation as released criminals. Perhaps they should be

incorporated. Since there are no data to support the relative merits

of the two positions or the absolute levels chosen, either approach

could be selected.

PCOOPM 1

Opinion surveys have also indicated that the most

significant factors in public cooperation was the feeling that nothing

could be done.[3] This effect is incorporated by relating

PCOOPM 1   to the probability of arrest as shown in figure 26. As

_____

[1] Albert D. Biderman, et al., Report on a Pilot Study in the District
of Columbia on Victimization and Attitudes Toward Law Enforcement,
(Washington D.C.: U.S. Governemt Printing Office, 1967), pp. 153-60.

[2] Personal interview with Superintendent William Taylor, Jan. 14,
1972.

[3] Albert D. Biderman, et al., Report on a Pilot Study in the District of
Columbia on Victimization and Attitudes Toward Law Enforcement,
pp. 153-60.
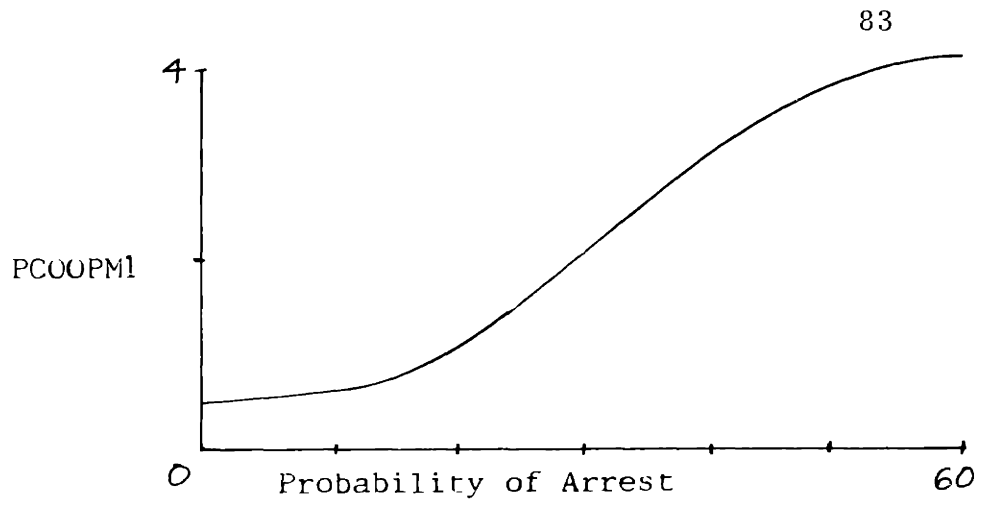
Public Cooperation Multiplier One

FIGURE 26
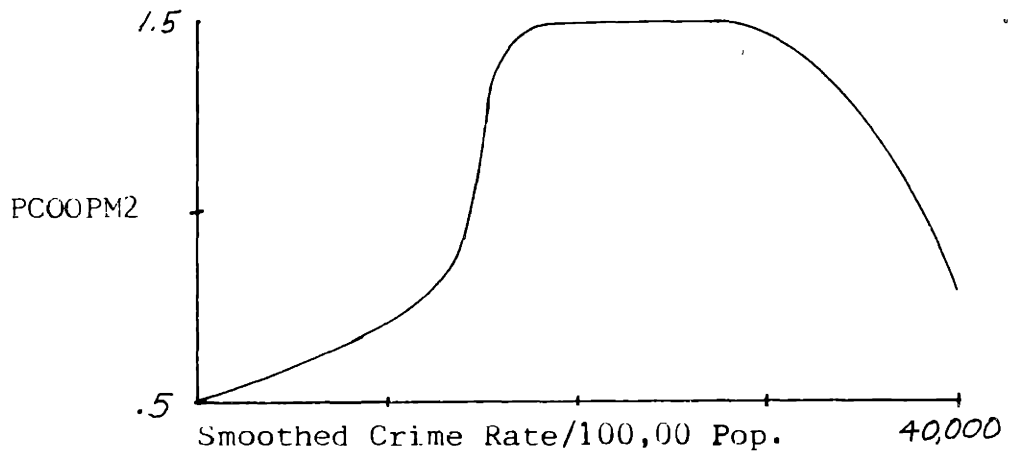
Public Cooperation Multiplier Two

FIGURE 27

illustrated, when the probability of arrest is high, public coopera-
tion is also at a maximum and vice versa.

After the probability of arrest changes, there is some time
required for the public to appreciate the change and begin to adjust
their behavior accordingly. This lag is incorporated by averaging (or
smoothing) both the crime and arrest rates for one year before
determining the arrest probability.

PCOOPM 2

The public cooperation multiplier (PCOOPM 2) is included
to incorporate the effect of the public's perception of the extent and
magnitude of the crime problem on their cooperation and this is done
by relating public cooperation to the actual crime rate per 100,000
population as shown in figure 27.

Public opinion surveys done for the President's Crime
Commission indicate that one of the aspects of public cooperation is
their perception of the effectiveness of the law enforcement system.[1]
There are several ways the public's determination of effectiveness
could be approached. PCOOPM2 incorporates two concepts. At low
crime rates, there will be little concern about the problem and the
tendency to "not get involved" will dominate. As a result, public
cooperation will be low. If the crime rate increases, concern about

---

[1]Ibid.

the problem will raise the level of cooperation (and POLEFF).

However, if the crime rate continues to increase, the public will

begin to feel that law enforcement is not effective and their co-

operation will begin to decrease.

The perception will not respond immediately to a change in

the crime rate. To provide a delay, the crime rate is averaged

over a one year period.

Total crime rate has been used instead of the more available

reported crime rate because informal communications with the

community will result in a good understanding of the situation with-

out reliance on the yearly reported statistics.

The percentage of actual crime that is reported will also

affect police effectiveness. Since this percentage relies completely

on the public, this investigation has not attempted to separate it

from the public cooperation terms already incorporated.

Another factor that affects the public cooperation is the way

individuals are required to be involved with the police and the courts.

This factor is related to the personal sacrifice involved (inconvenience

and financial) if trials are delayed and finally ended with probation

or with a trivial (to the witness or victim) sentence. With the

exception of the probation and sentence question, this area is not

related to the variables in the present CJS description. For example,

it should be possible to operate the courts to meet the citizens

needs regardless of the backlog or the arrest rate. Therefore,

this effect has not been included explicitly. Its influence can be

investigated by incorporating the necessary additional costs (if

any) into the court costs and adjusting the police effectiveness

scaling multiplier the desired amount or by adding another variable.

POLICEM

The police effectiveness multiplier (POLICEM) is used to

include the effect of changing the number of police. This is done

by relating the police effectiveness multiplier to the ratio of police

to the population as shown in figure 28.

When there are no police, it is evident that the police

effectiveness will be zero. As police are increased, police

effectiveness should increase. This will cause an increase in the

arrest rate. However, there is obviously a point where adding

more police does not result in a proportionate rise in the arrest

rate. At the limit, if 90% of the population are police, it is very

unlikely that increasing the police to population ratio 5 per cent

would result in an equivalent rise in the arrest rate.

The author was not able to obtain data to establish the

quantitative relationship required for the model. As a result,

figure 28 represents the authors estimate. The rationale used is
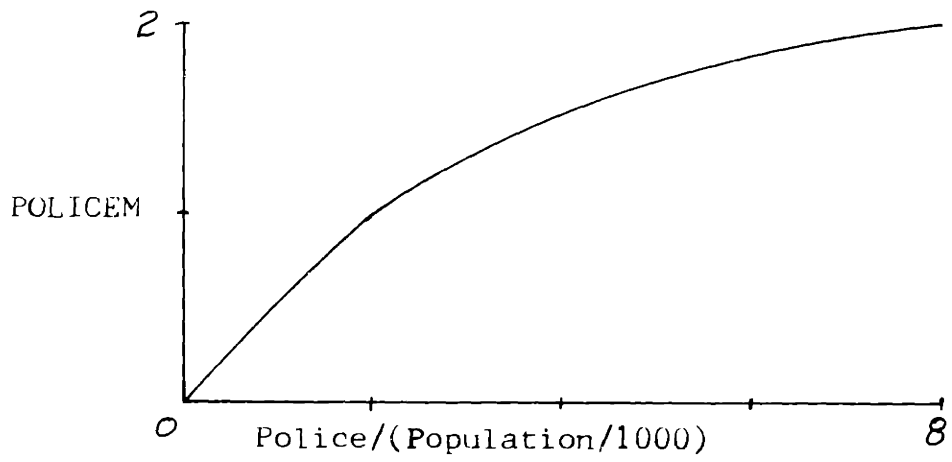
Police Ratio Multiplier

FIGURE 28

that (1) the police effectiveness (and arrest rate) should be approximately one under initial conditions, (2) the effectiveness should decrease to zero when there are no police, and (3) the effectiveness should peak at twice the initial level with a fourfold increase in the police to population ratio.

Summary of Model Considerations

The entire structure and operation of the actual criminal justice system is based on a set of assumptions about how the system is interrelated and what factors influence the attractiveness of crime and the police effectiveness. However, these are not explicitly defined and are not confirmed either by general informed opinion or research.

Since these factors are essential for the development of a model of the entire CJS operation (and understanding without an explicit model), they have been estimated by the author. The general trends of the relationships are in agreement with active participants in the criminal system and with the literature.

With regard to the actual numerical values of the relationships, there are two factors to consider:

   a. Are they relatively consistent with respect to each other? For example, is it reasonable (or correct) to state that a one year effective average sentence has a

greater (or lesser) deterrent effect than releasing

20% of those arrested back to the community?

b.   Are the magnitudes of the relationships correct?

Since there are no data, it is left to the reader to judge the

validity of the magnitude of the factors used.   Alternatives can be

easily evaluated for their influence on system behavior.   The values

chosen do appear to give results which are consistent with actual

observations.

CHAPTER V

RECOMMENDATIONS FOR ADDITIONAL STUDY

The model described in previous chapters is an initial attempt to provide a quantative description of the gross behavior of the entire system of crime and punishment. In developing the model, several areas appeared that could be studied that would improve its representation of the world. These are outlined in the following paragraphs.

Critical areas are the representations of the attractiveness of crime and police effectiveness. Without adequate understanding in these areas, there is little to be gained by increasing the complexity of the system description.

The actual crime rates of various populations and their rate of return to the non-criminal population can have significant influences on the choice of the best policies.

An approach to improving knowledge on the above factors in a reasonable time frame could be to:

    a. Develop a consensus of the experts in the field and initiate planning and action based on that opinion.

    b. In parallel with the development of the consensus, extract as much information as possible from the

statistics available.

    c. Develop controlled experiments that will provide

       the required data.

Many arguments can be made against the experimental

approach. Typically they are that:

    1. It is not ethical, moral or fair,

    2. It will take too long and be too expensive.

The counterpoint is that, rather than experimenting with

relatively small controlled groups, every policy or law change is

imposing an uncontrolled experiment on the entire population. In

addition, these experiments are not usually designed or implemented

in a manner that will provide the maximum amount of useful informa-

tion at the lowest possible cost.

Overall model changes that might improve the understanding

of the complete criminal justice system would be:

    a. Separate the various types of crime. A useful

       first step might be to specifically identify "white

       collar" crime due to differences in the people,

       probability of arrest, etc.

    b. Classify offenders by age.

    c. Incorporate economic factors into the determination of

of attractiveness of crime. (This was not done for this model due to the conflicting nature of the data regarding how economic conditions influence the attractiveness of crime.[1,2]

d. Incorporate feedback into the recidivism rates for all classes of people in addition to the existing feedback for ex-convicts and parolees. This could be based on probation officer case load if meaningful relationships could be found.

e. Extend the model to include the potential effects of early (high school or younger) counseling and training programs.

f. Extend the model to incorporate the influence and costs of the welfare system as it relates to crime.

Before an effort is made to separate the types of crime and to classify by age, the question should be addressed of whether or not System Dynamics and the resulting deterministic model is the

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[1]Cressey and Ward, Delinquency, Crime and Social Process pp. 388-403, 520

[2]Marshall B. Chinard, Sociology of the Deviant Behavior (New York: Rinehart & Company, Inc., 1957), pp. 113-14.

best approach for the results desired. In the author's opinion, the inherent ease of understanding of a System Dynamics model and the present lack of detailed knowledge about the criminal justice system characteristics make the deterministic approach very useful.

The present lack of data availability regarding the operational parameters of the criminal justice system is a serious handicap. The author strongly recommends additional study to define requirements and the development of an effective data bank.

CHAPTER VI

SUMMARY AND CONCLUSIONS

Summary

A great deal has been said and written regarding morality and justice in the criminal justice system. The author makes no attempt to enter these areas. The approach is to reduce the CJS performance measurement to a dollar cost to the public. If other criteria are considered to be more appropriate, they could also be included in future work.

In evaluating the results and selecting "good" approaches to inprovements to the criminal justice system, many considerations other than dollar costs must be included. However, in making selections, an explicit model -- such as the one described in this thesis -- can provide a better assesment of the probable consequences of any actions than present approaches.

A valid criticism of the approach taken is that it does not consider the special circumstances of each individual. But, laws and codes are legislated to apply to the population as a whole and are based on assumptions about the behavior of "the average citizen." Therefore, it should also be reasonable to model the system behavior based on assumptions and models of aggregate behavior.

To not model is to infer that we know enough to legislate attempts

to control people but that we do not understand the forces affecting

them well enough to attempt a description.

Conclusions

System Dynamics applied to the criminal justice system

forces additional insight into the interrelated factors that influence

the behavior of the entire system. In addition, the System Dynamics

model developed provides the capacity to evaluate the consistency

of presently held beliefs and the probable long term effects of

policy changes.

If the descriptive model of Appendix A correctly represents

the dynamics of the real world, there are system changes that

could significantly lower the dollar and social costs of crime with-

out resorting to more police and/or more repression.

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APPENDICES

APPENDIX A

CRIMINAL JUSTICE SYSTEM DYNAMIC MODEL

ATTRACTIVENESS OF CRIME MULTIPLIER

$$AOC.K=SCMAOC*(CBM.K+SLM.K*PPROBM.K+RCRM.K+FCRM.K+ \quad \text{1, A}$$
$$PCM.K+ARPROBM.K)+STEP(ACHG,1)$$

    AOC   - ATTRACTIVENESS OF CRIME (MULTIPLIER FOR
                  CRIME RATES)
    SCMAOC - SCALING MULTIPLIER FOR ATTRACTIVENESS OF
                  CRIME
    CBM   - COURT BACKLOG MULTIPLIER
    SLM   - SENTENCE LENGTH MULTIPLIER
    PPROBM - PRISON PROBABILITY MULTIPLIER
    RCRM   - RELEASED CRIMINAL RATIO MULTIPLIER
    FCRM   - FREED CRIMINAL RATIO MULTIPLIER USED IN AOC
    PCM   - PRISON CONDITION MULTIPLIER USED IN AOC
    ARPROBM - ARREST PROBABILITY MULTIPLIER FOR AOC
    ACHG   - ATTRACTIVENESS OF CRIME CHANGE

$$CBM.K=TABHL(CBT,CTBLYRS.K,0,.8,.2) \quad \text{2, A}$$
$$CBT=.9/1/1.15/1.35/1.4 \quad \text{2.1, T}$$
    CBM   - COURT BACKLOG MULTIPLIER
    CBT   - COURT BACKLOG MULTIPLIER TABLE
    CTBLYRS - COURT BACKLOG IN YEARS

$$SLM.K=TABHL(SLT,EAVESEN.K,0,5,.5) \quad \text{3, A}$$
$$SLT=2/.44/.4/.36/.32/.3/.28/.26/.24/.22/.2 \quad \text{3.1, T}$$
    SLM   - SENTENCE LENGTH MULTIPLIER
    SLT   - SENTENCE   LENGTH MULTIPLIER TABLE
    EAVESEN - EFFECTIVE AVERAGE SENTENCE (YRS)

$$PPROBM.K=TABHL(PPROBMT,PROBPSN.K,0,5,.5) \quad \text{4, A}$$
$$PPROBMT=10/6.5/3.6/2.5/1.7/1.1/.8/.6/.5/.4/.3 \quad \text{4.1, T}$$
    PPROBM - PRISON PROBABILITY MULTIPLIER
    PPROBMT - PRISON PROBABILITY MULTIPLIER TABLE
    PROBPSN - PROBABILITY OF GOING TO PRISON FOR EACH
                  CRIME

$$PROBPSN.K=100*SPSNIN.K/SMTCR.K \quad \text{5, A}$$
    PROBPSN - PROBABILITY OF GOING TO PRISON FOR EACH
                  CRIME
    SPSNIN - SMOOTHED PRISON INPUT (PEOPLE/YR)
    SMTCR   - SMOOTHED TOTAL CRIME RATE (CRIMES/YR)

```
SPSNIN.K=(1-CONPBR-CONRCR)*SMCON_J.K+(1-GPJPBR-          6, A
  GPJRCR)*SMGPJR.K+(1-CWOBPBR-CWOBRCR)*SMCWOBR.K+
  (1-GPBPBR-GPBRCR)*SMGPBR.K
     SPSNIN - SMOOTHED PRISON INPUT (PEOPLE/YR)
     CONPBR - CONVICTED FROM JAIL TO PROBATION RATIO
     CONRCR - CONVICTED FROM JAIL TO RELEASED CRIMINAL
                RATIO (FINES, ETC.)
     SMCON_J- SMOOTHED CONVICTION FROM JAIL RATE (PEOPLE/
                YR)
     GPJPBR - GUILTY PLEA FROM JAIL TO PROBATION RATIO
     GPJRCR - GUILTY PLEA FROM JAIL TO RELEASED CRIM
                RATIO (FINES, ETC.)
     SMGPJR - SMOOTHED GUILTY PLEA FROM JAIL RATE
     CWOBPBR- CONVICTED WHILE ON BAIL TO PROBATION RATIO
     CWOBRCR- CONVICTED WHILE ON BAIL TO REL CRIM RATIO
                (FINES, ETC.)
     SMCWOBR- SMOOTHED CONVICTED WHILE ON BAIL RATE
     GPBPBR - GUILTY PLEA FROM BAIL TO PROBATION RATIO
     GPBRCR - GUILTY PLEA WHILE ON BAIL TO REL CRIM RATIO
                (FINES, ETC.)
     SMGPBR - SMOOTHED GUILTY PLEA WHILE ON BAIL RATE

SMCWOBR.K=SMOOTH(CWOBR.JK,CRSMT)                         7, A
     SMCWOBR- SMOOTHED CONVICTED WHILE ON BAIL RATE
     CWOBR  - CONVICTED WHILE ON BAIL RATE
     CRSMT  - CRIME RATE SMOOTHING TIME (YRS)

SMGPBR.K=SMOOTH(GPBR.JK,CRSMT)                           8, A
     SMGPBR - SMOOTHED GUILTY PLEA WHILE ON BAIL RATE
     GPBR   - GUILTY PLEA WHILE ON BAIL RATE
     CRSMT  - CRIME RATE SMOOTHING TIME (YRS)

AVESEN.K=ASEN+STEP(ASENC,.01)                            9, A
     AVESEN - AVERAGE SENTENCE GIVEN BY THE COURT (YRS)
     ASEN   - AVERAGE PRISON SENTENCE GIVEN BY THE COURTS
                (YRS)

RCRM.K=TABLE(RCRT,RCR.K,0,1,.1)                          10, A
RCRT=.1/.2/.4/.7/1/2/4/7/9/10/10                         10.1, T
     RCRM   - RELEASED CRIMINAL RATIO MULTIPLIER
     RCR    - RELEASED CRIMINAL TO ARRESTED CRIMINAL
                RATIO
```

```
RCR.K=(SMCCRR.K+(SMPTPR.K+SARTOBR.K)*SMAR.K+          11, A
   (CONPBR+CONRCR)*SMCON_J.K+(GPJRCR+GPJPBR)*
   SMGPJR.K)/SMAR.K
      RCR      - RELEASED CRIMINAL TO ARRESTED CRIMINAL
                 RATIO
      SMCCRR - SMOOTHED COURT CRIMINAL RELEASE RATE
      SMPTRR - SMOOTHED PRETRIAL RELEASE RATIO
      SARTOBR- SMOOTHED ARREST TO BAIL RATIO
      SMAR   - SMOOTHED ARREST RATE
      CONPBR - CONVICTED FROM JAIL TO PROBATION RATIO
      CONRCR - CONVICTED FROM JAIL TO RELEASED CRIMINAL
                 RATIO (FINES, ETC.)
      SMCON_J- SMOOTHED CONVICTION FROM JAIL RATE (PEOPLE/
                 YR)
      GPJRCR - GUILTY PLEA FROM JAIL TO RELEASED CRIM
                 RATIO (FINES, ETC.)
      GPJPBR - GUILTY PLEA FROM JAIL TO PROBATION RATIO
      SMGPJR - SMOOTHED GUILTY PLEA FROM JAIL RATE
```

```
ARPROBM.K=TABLE(ARPMT,ARPROB.K,0,100,10)             12, A
      ARPROBM- ARREST PROBABILITY MULTIPLIER FOR AOC
      ARPMT  - ARREST PROBABILITY MULTIPLIER TABLE
      ARPROB - ARREST PROBABILITY FOR THE AVERAGE
                 POPULATION
```

```
ARPROB.K=100*SMAR.K/SMTCR.K                          13, A
ARPMT=10/1.5/.75/.45/.35/.3/.2/.15/.1/.05/0          13.1, T
      ARPROB - ARREST PROBABILITY FOR THE AVERAGE
                 POPULATION
      SMAR   - SMOOTHED ARREST RATE
      SMTCR  - SMOOTHED TOTAL CRIME RATE (CRIMES/YR)
      ARPMT  - ARREST PROBABILITY MULTIPLIER TABLE
```

```
SMPTRR.K=SMOOTH(PTRRR.JK,PDELAY)                     14, A
      SMPTRR - SMOOTHED PRETRIAL RELEASE RATIO
      PTRRR  - PTRR RATE USED TO AVERAGE PTRR
      PDELAY - TIME DELAY TO CHANGE PERCEIVED
                 ATTRACTIVENESS OF CRIME (YRS)
```

```
SMCON_J.K=SMOOTH(CON_JR.JK,PDELAY)                   15, A
      SMCON_J- SMOOTHED CONVICTION FROM JAIL RATE (PEOPLE/
                 YR)
      CON_JR - CONVICTED FROM JAIL RATE
      PDELAY - TIME DELAY TO CHANGE PERCEIVED
                 ATTRACTIVENESS OF CRIME (YRS)
```

```
PTRRR.KL=PTRR.K                                      16, R
      PTRRR  - PTRR RATE USED TO AVERAGE PTRR
      PTRR   - PRETRIAL RELEASE RATIO
```

```
SARTOBR.K=SMOOTH(ARTBRR.JK,PDELAY)                   17, A
      SARTOBR- SMOOTHED ARREST TO BAIL RATIO
      ARTBRR - RATE USED TO AVERAGE ARTOBR
      PDELAY - TIME DELAY TO CHANGE PERCEIVED
                 ATTRACTIVENESS OF CRIME (YRS)
```

```
ARTBRR.KL=ARTOBR.K                                      18, R
    ARTBRR  - RATE USED TO AVERAGE APTOBP
    ARTOBR  - ARREST TO BAIL RATIO


SMCCRR.K=SMOOTH(CCPR.JK,PDELAY)                         19, A
    SMCCRR  - SMOOTHED COURT CRIMINAL RELEASE RATE
    CCRR    - COURT CRIMINAL RELEASE RATE (NOT GUILTY
              DECISIONS)
    PDELAY  - TIME DELAY TO CHANGE PERCEIVED
              ATTRACTIVENESS OF CRIME (YRS)


SMAR.K=SMOOTH(AR.JK,PDELAY)                             20, A
    SMAR    - SMOOTHED ARREST RATE
    AR      - ARREST RATE
    PDELAY  - TIME DELAY TO CHANGE PERCEIVED
              ATTRACTIVENESS OF CRIME (YRS)


SMGPJR.K=SMOOTH(GPJR.JK,PDELAY)                         21, A
    SMGPJR  - SMOOTHED GUILTY PLEA FROM JAIL RATE
    GPJR    - GUILTY PLEA FROM JAIL RATE
    PDELAY  - TIME DELAY TO CHANGE PERCEIVED
              ATTRACTIVENESS OF CRIME (YRS)


FCRM.K=TABHL(FCRT,FCR.K,0,.25,.05)                      22, A
FCRT=0/1/2.5/3.5/4.5/5                                  22.1, T
    FCRM    - FREED CRIMINAL RATIO MULTIPLIER USED IN AOC
    FCRT    - FREED CRIMINAL RATIO TABLE
    FCR     - FREED CRIMINAL RATIO


FCR.K=(TFCRIM.K+RC.K+ROB.K+PROB.K)/(NCP.K+UNEX.K+       23, A
  EMEXC.K+CPROB.K+PAROLE.K+CPAR.K)
    FCR     - FREED CRIMINAL RATIO
    TFCRIM  - TOTAL FREE CRIMINALS
    RC      - RELEASED CRIMINAL
    ROB     - RELEASED ON BAIL (PEOPLE) AND NOT BECOME
              FCRIM
    PROB    - NUMBER ON PROBATION NOT RETURNED TO FCRIM
    NCP     - NON CRIMINAL POPULATION
    UNEX    - UNEMPLOYED EXCONVICTS
    EMEXC   - EMPLOYED EXCONVICTS THAT HAVE NOT BECOME
              FREE CRIMINALS
    CPROB   - NUMBER COMPLETED PROBATION AND NOT RETURNED
              TO FCRIM OR NCP
    PAROLE  - NUMBER OF PEOPLE ON PAROLE THAT HAVE NOT
              BECOME FCRIMINALS
    CPAR    - COMPLETED PAROLE BUT NOT RETURNED TO BE
              FCRIM OR NON CRIMINALS


PCM.K=TABHL(PCMT,PRISCON.K,0,10000,2000)                24, A
PCMT=.5/1/1.25/1.5/1.75/2                               24.1, T
    PCM     - PRISON CONDITION MULTIPLIER USED IN AOC
    PCMT    - PRISON CONDITION MULTIPLIER TABLE
    PRISCON - PRISON CONDITION MEASURED BY DOLLARS SPENT
```

```
PRISCON.K=((RHPCOST*PRISCAP)/PRISON.K)+MPCOST          25, A
    PRISCON- PRISON CONDITION MEASURED BY DOLLARS SPENT
    RHPCOST- REHABILITATION COST PER PRISONER IN PRISON
             ($/PRISONER)
    PRISCAP- PRISON NOMINAL CAPACITY (PEOPLE)
    PRISON - PRISON POPULATION (LIMITED TO BE NON ZERO)
    MPCOST - MARGINAL PRISON COST ($/ACTUAL PRISONER) -
             FOOD, ETC.
```

EFFECTIVENESS OF NEWS MEDIA MULTIPLIER

```
NEWSM.K=NRRA_M.K*COVERM.K                              26, A
    NEWSM  - EFFECTIVENESS OF NEWS MEDIA MULTIPLIER
    NRRA_M - NEWS REPORTING RATIO MULTIPLIER
    COVERM - NEWS COVERAGE MULTIPLIER
```

```
NRRA_M.K=TABHL(NRRAT,NRRATIO.K,0,3,.5)                 27, A
    NRRA_M - NEWS REPORTING RATIO MULTIPLIER
    NRRAT  - NEWS REPORTING RATIO TABLE
    NRRATIO- NEWS REPORTING RATIO
```

```
NRRATIO.K=NRCONST                                      28, A
NRRAT=.8/.81/.82/.83/.84/.85/.855                      28.1, T
    NRRATIO- NEWS REPORTING RATIO
    NRCONST- NEWS REPORTING RATIO CONSTANT
    NRRAT  - NEWS REPORTING RATIO TABLE
```

```
COVERM.K=TABHL(COVERMT,NCOVER.K,0,2,.4)                29, A
COVERMT=1.19/1.2/1.21/1.23/1.24/1.25                   29.1, T
    COVERM - NEWS COVERAGE MULTIPLIER
    COVERMT- COVERAGE MULT TABLE
    NCOVER - NEWS COVERAGE PERCENT
```

```
NCOVER.K=TABHL(NCOVERT,RCRRATE.K,0,6000,2000)          30, A
NCOVERT=0/.5/.9/1                                      30.2, T
    NCOVER - NEWS COVERAGE PERCENT
    NCOVERT- NEWS COVERAGE TABLE
```

TOTAL CRIME RATE CALCULATION

SMTCR.K=SMUXCCR.K+SMEXCCR.K+SMFOCR.K+SMRCCR.K+   31, A
  SMRUBCR.K+SPARCR.K+SPROBCR.K+SCPBCR.K+SMFCMCR.K+
  SMFNOCR.K+SCPARCR.K
        SMTCR   - SMOOTHED TOTAL CRIME RATE (CRIMES/YR)
        SMUXCCR- SMOOTHED UNEMPLOYED EXCONVICT CRIME RATE
                    (CRIMES/YR)
        SMEXCCR- SMOOTHED EMPLOYED EXCONVICT CRIME RATE
                    (CRIMES/YR)
        SMFOCR - SMOOTHED FIRST OFFENSE CRIME RATE (PEOPLE/
                    YR)
        SMRCCR - SMOOTHED RELEASED CRIMINAL CRIME RATE
                    (PEOPLE/YR)
        SMRUBCR- SMOOTHED RELEASED ON BAIL CRIME RATE (CR/
                    YR)
        SPARCR - SMOOTHED PAROLED CRIMINALS CRIME RATE
                    (CRIMES/YR)
        SPRUBCR- SMOOTHED CRIMINAL ON PROBATION CRIME RATE
                    (PEOPLE/YR)
        SCPBCR - SMOOTHED CRIM WHO HAVE COMPLETED PROBATION
                    CR RATE (PEOPLE/YR)
        SMFCMCR- SMOOTHED FREE CRIMINAL CRIME RATE (CR/YR)
        SMFNOCR- SMOOTHED FREE NEW OFFENDER CRIME RATE (CR/
                    YR)
        SCPARCR- SMOOTHED COMPLETED PROBATION CRIME RATE
                    (CRIMES/YR)

SCPARCR.K=SMOOTH(CPARCR.JK,CRSMT)   32, A
        SCPARCR- SMOOTHED COMPLETED PROBATION CRIME RATE
                    (CRIMES/YR)
        CPARCR - COMPLETED PAROLE CRIME RATE
        CRSMT   - CRIME RATE SMOOTHING TIME (YRS)

SMFNOCR.K=SMOOTH(FNOCR.JK,CRSMT)   33, A
        SMFNOCR- SMOOTHED FREE NEW OFFENDER CRIME RATE (CR/
                    YR)
        FNOCR   - FREE NEW OFFNEDER CRIME RATE (CR/YR)
        CRSMT   - CRIME RATE SMOOTHING TIME (YRS)

FNOCR.KL=(SCR/100000)*FNOCRM*AOCD.K*FNO.K*ARPNOM.K   34, R
ARPNOT=1.2/1.15/1.05/1/.9/.75/.65/.55/.5/.5   34.1, T
        FNOCR   - FREE NEW OFFNEDER CRIME RATE (CR/YR)
        SCR   - STANDARD CRIME RATE (CRIMES PER YR/100,000
                    POPULATION)
        FNOCRM - FREE NEW OFFENDER CRIME RATE MULTIPLIER
        AOCD   - ATTRACTIVENESS OF CRIME DELAYED
        FNO   - FREE NEW OFFENDERS (HAVE ESSENTIALLY NEVER
                    BEEN ARRESTED)
        ARPNOM - ARREST PROBABILITY FOR NEW OFFENDERS
                    MULTIPLIER
        ARPNOT - ARREST PROBABILITY FREE NEW OFFENDERS TABLE

ARPNO.K=100*SMFNOAR.K/(SMFOCR.K+SMFNOCR.K)   35, A
      ARPNO - APREST PROBABILITY FREE NEW OFFENDERS (%)
      SMFNOAR- SMOOTHED FREE NEW OFFENDERS ARREST RATE
                 (PEOPLE/YR)
      SMFOCR - SMOOTHED FIRST OFFENSE CRIME RATE (PEOPLE/
                 YR)
      SMFNOCR- SMOOTHED FREE NEW OFFENDER CRIME RATE (CR/
                 YR)

SMFNOAR.K=SMOOTH(FNOAR.JK,CRSMT)   36, A
      SMFNOAR- SMOOTHED FREE NEW OFFENDERS ARREST RATE
                 (PEOPLE/YR)
      FNOAR - FREE NEW OFFENDER ARREST RATE (PEOPLE/YR)
      CRSMT - CRIME RATE SMOOTHING TIME (YRS)

FNOAR.KL=POLEFF.K*FNOPEM*FNO.K   37, R
      FNOAR - FREE NEW OFFENDER ARREST RATE (PEOPLE/YR)
      POLEFF - POLICE EFFECTIVENESS MULTIPLIER
      FNOPEM - FREE NEW OFFENDERS POLICE EFFECTIVENESS
                 MULTIPLIER
      FNO   - FREE NEW OFFENDERS (HAVE ESSENTIALLY NEVER
                 BEEN ARRESTED)

SMUXCCR.K=SMOOTH(UXCCR.JK,CRSMT)   38, A
      SMUXCCR- SMOOTHED UNEMPLOYED EXCONVICT CRIME RATE
                 (CRIMES/YR)
      UXCCR - UNEMPLOYED EXCONVICT CRIME RATE
      CRSMT - CRIME RATE SMOOTHING TIME (YRS)

SMEXCCR.K=SMOOTH(EXCCR.JK,CRSMT)   39, A
      SMEXCCR- SMOOTHED EMPLOYED EXCONVICT CRIME RATE
                 (CRIMES/YR)
      EXCCR - EMPLOYED EXCONVICT CRIME RATE
      CRSMT - CRIME RATE SMOOTHING TIME (YRS)

SPARCR.K=SMOOTH(PARCR.JK,CRSMT)   40, A
      SPARCR - SMOOTHED PAROLED CRIMINALS CRIME RATE
                 (CRIMES/YR)
      PARCR - PEOPLE ON PAROLE CRIME RATE
      CRSMT - CRIME RATE SMOOTHING TIME (YRS)

SMFOCR.K=SMOOTH(FOCR.JK,CRSMT)   41, A
      SMFOCR - SMOOTHED FIRST OFFENSE CRIME RATE (PEOPLE/
                 YR)
      FOCR   - FIRST OFFENSE CRIME RATE
      CRSMT - CRIME RATE SMOOTHING TIME (YRS)

ARPNOM.K=TABHL(ARPNOT,ARPNO.K,2.5,25,2.5)   42, A
      ARPNOM - ARREST PROBABILITY FOR NEW OFFENDERS
                 MULTIPLIER
      ARPNOT - ARREST PROBABILITY FREE NEW OFFENDERS TABLE
      ARPNO - APREST PROBABILITY FREE NEW OFFENDERS (%)

```
SMRCCR.K=SMOOTH(RCCR.JK,CRSMT)                           43,  A
     SMRCCR - SMOOTHED RELEASED CRIMINAL CRIME RATE
                (PEOPLE/YR)
     RCCR   - RELEASED CRIMINAL CRIME RATE (CR/YR)
     CRSMT  - CRIME RATE SMOOTHING TIME (YRS)

SPROBCR.K=SMOOTH(PROBCR.JK,CRSMT)                        44,  A
     SPROBCR- SMOOTHED CRIMINAL ON PROBATION CRIME RATE
                (PEOPLE/YR)
     PROBCR - CRIME RATE OF THOSE ON PROBATION THAT HAVE
                NOT BECOME FCRIM
     CRSMT  - CRIME RATE SMOOTHING TIME (YRS)

SCPBCR.K=SMOOTH(CPBCR.JK,CRSMT)                          45,  A
     SCPBCR - SMOOTHED CRIM WHO HAVE COMPLETED PROBATION
                CR RATE (PEOPLE/YR)
     CPBCR  - COMPLETED PROBATION CRIME RATE
     CRSMT  - CRIME RATE SMOOTHING TIME (YRS)

FCMCR.KL=(FCRIM.K-DOPEAD.K)*AOCD.K*SCR*1E-5*             46,  R
   FCRIMMX+SDADCR*DOPEAD.K
     FCMCR  - FREE CRIMINAL CRIME RATE (CR/YR)
     FCRIM  - FREE CRIMINALS (INCLUDING DOPE ADDICTS)
     DOPEAD - NUMBER OF DOPE ADDICTS (PEOPLE)
     AOCD   - ATTRACTIVENESS OF CRIME DELAYED
     SCR    - STANDARD CRIME RATE (CRIMES PER YR/100,000
                POPULATION)
     FCRIMMX- FREE CRIMINAL CRIME RATE MULTIPLIER
     SDADCR - STANDARD DOPE ADDICT CRIME RATE (CRIMES/YR)

DOPEAD.K=DOPEA                                           47,  A
     DOPEAD - NUMBER OF DOPE ADDICTS (PEOPLE)
     DOPEA  - TOTAL NUMBER OF DOPE ADDICTS IN THE SYSTEM
                THAT ARE FREE

SMFCMCR.K=SMOOTH(FCMCR.JK,CRSMT)                         48,  A
     SMFCMCR- SMOOTHED FREE CRIMINAL CRIME RATE (CR/YR)
     FCMCR  - FREE CRIMINAL CRIME RATE (CR/YR)
     CRSMT  - CRIME RATE SMOOTHING TIME (YRS)

SMROBCR.K=SMOOTH(ROBCR.JK,CRSMT)                         49,  A
     SMROBCR- SMOOTHED RELEASED ON BAIL CRIME RATE (CR/
                YR)
     ROBCR  - RELEASED ON BAIL CRIME RATE
     CRSMT  - CRIME RATE SMOOTHING TIME (YRS)

SMCRRAT.K=SMTCR.K/(OUTPOP.K/100000)                      50,  A
     SMCRRAT- SMOOTHED CRIME RATIO (CRIMES PER YEAR PER
                100,000 POPULATION)
     SMTCR  - SMOOTHED TOTAL CRIME RATE (CRIMES/YR)
     OUTPOP - POPULATION OUTSIDE JAIL OR PRISON

RCRRATE.K=REPRA.K*SMCRRAT.K                              51,  S
     REPRA  - CRIME REPORTING RATIO (PERCENT OF TOTAL
                CRIMES THAT ARE REPTD)
     SMCRRAT- SMOOTHED CRIME RATIO (CRIMES PER YEAR PER
                100,000 POPULATION)
```

CRIME-P   CRIM JUSTICE SYSTEM DYNAMIC MODEL   4/18/72

POLICE EFFECTIVENESS MULTIPLIER

PULEFF.K=FCRIMM.K*POLICEM.K*(PCOOPM.K+PCOOPM1.K+   52, A
    PCOOPM2.K)*TRIALRM.K*SCMPEFF
        PULEFF - POLICE EFFECTIVENESS MULTIPLIER
        FCRIMM - FREE CRIMINAL MULTIPLIER
        POLICEM- POLICE MULTIPLIER TO ACCOUNT FOR POLICE/
                 POPULATION RATIO
        PCOOPM - PUBLIC COOPERATION MULTIPLIER AS EFFECTED
                 BY RELEASED CRIMINALS
        PCOOPM1- PUBLIC COOPERATION MULTIPLIER FOR
                 EFFECTIVENESS OF THE POLICE
        PCOOPM2- EFFECT OF THE ACTUAL CR RATE ON PUBLIC
                 COOPERATION
        TRIALRM- TRIAL RATE MULTIPLIER (ACCOUNTS FOR POLICE
                 TIME IN TRIALS)
        SCMPEFF- SCALING MULTIPLIER FOR POLICE EFFECTIVENESS

FCRIMM.K=TABHL(FCRIMT,FCRIMR.K,0,60,10)   53, A
        FCRIMM - FREE CRIMINAL MULTIPLIER
        FCRIMR - FREE CRIMINAL TO POLICE RATIO

FCRIMR.K=TFCRIM.K/POLICE   54, A
FCRIMT=1.3/1.16/1.04/.95/.89/.87/.86   54.1, T
        FCRIMR - FREE CRIMINAL TO POLICE RATIO
        TFCRIM - TOTAL FREE CRIMINALS
        POLICE - NUMBER OF POLICE WITHIN THE SYSTEM BOUNDRY

POLICEM.K=TABHL(POLICET,POLR.K,0,8,1)   55, A
        POLICEM- POLICE MULTIPLIER TO ACCOUNT FOR POLICE/
                 POPULATION RATIO
        POLICET- POLICE MULTIPLIER TABLE
        POLR   - POLICE RATIO TO TOTAL POPULATIO
                 (POLICE/1000 POPULATION)

POLR.K=POLICE/(OUTPOP.K/1000)   56, A
POLICET=0/.5/1/1.3/1.5/1.7/1.85/1.94/2   56.1, T
        POLR   - POLICE RATIO TO TOTAL POPULATIO
                 (POLICE/1000 POPULATION)
        POLICE - NUMBER OF POLICE WITHIN THE SYSTEM BOUNDRY
        OUTPOP - POPULATION OUTSIDE JAIL OR PRISON
        POLICET- POLICE MULTIPLIER TABLE

PCOOPM.K=TABLE(PCOOPMT,RCRD.K,0,1.2,.2)   57, A
        PCOOPM - PUBLIC COOPERATION MULTIPLIER AS EFFECTED
                 BY RELEASED CRIMINALS
        PCOOPMT- PUBLIC COOPERATION MULTIPLIER TABLE

RCRD.K=DLINF3(RCR.K,PDELAY)   58, A
PCOOPMT=1.5/1.35/1.25/.5/.45/.3/.3   58.1, T
        RCR   - RELEASED CRIMINAL TO APRESTED CRIMINAL
                 RATIO
        PDELAY - TIME DELAY TO CHANGE PERCEIVED
                 ATTRACTIVENESS OF CRIME (YRS)
        PCOOPMT- PUBLIC COOPERATION MULTIPLIER TABLE

```
PCOUPM1.K=TABLE(PCOOPT1,ARPROB.K,0,60,10)              59, A
PCOOPT1=.52/.64/1.03/2.06/3.09/3.87/4.13              59.1, T
     PCOOPM1- PUBLIC COOPERATION MULTIPLIER FOR
              EFFECTIVENESS OF THE POLICE
     PCOUPT1- TABLE RELATING PCOOPM1 TO PROBABILITY OF
              ARREST
     ARPROB - ARREST PROBABILITY FOR THE AVERAGE
              POPULATION


REPRA.K=REPR                                          60, A
     REPRA   - CRIME REPORTING RATIO (PERCENT OF TOTAL
               CRIMES THAT ARE REPTD)
     REPR    - CRIME REPORTING RATIO (REPORTED/ACTUAL)


PCOOPM2.K=TABHL(PCOOPT2,CRRATIO.K,0,40000,4000)       61, A
     PCOUPM2- EFFECT OF THE ACTUAL CR RATE ON PUBLICE
              COOPERATION
     CRRATIO- CRIME TO POPULATION RATIO (CR/100,
              000POPULATION)


CRRATIO.K=SMTCR.K/(OUTPOP.K/100000)                   62, A
PCOUPT2=.5/.55/.65/.75/1.4/1.5/1.5/1.5/1.4/1.2/.8     62.1, T
     CRRATIO- CRIME TO POPULATION RATIO (CR/100,
              000POPULATION)
     SMTCR   - SMOOTHED TOTAL CRIME RATE (CRIMES/YR)
     OUTPOP  - POPULATION OUTSIDE JAIL OR PRISON


TRIALRM.K=FIFGE(PERTCC.K,PERTTR.K,SMTRR.K,CTCAP)      63, A
     TRIALRM- TRIAL RATE MULTIPLIER (ACCOUNTS FOR POLICE
              TIME IN TRIALS)
     PERTCC - POLICE EFFECTIVENESS LIMITED BY COURT
              CAPACITY
     PERTTR - POLICE EFFECTIVENESS RELATED TO ACTUAL
              TRIAL RATE
     SMTRR   - SMOOTHED TRIAL RATE
     CTCAP   - COURT CAPACITY (TRIALS/YR)


PERTCC.K=((365*POLICE)-CTCAP)/(365*POLICE)            64, A
     PERTCC - POLICE EFFECTIVENESS LIMITED BY COURT
              CAPACITY
     POLICE - NUMBER OF POLICE WITHIN THE SYSTEM BOUNDRY
     CTCAP   - COURT CAPACITY (TRIALS/YR)


PERTTR.K=((365*POLICE)-SMTRR.K)/(365*POLICE)          65, A
     PERTTR - POLICE EFFECTIVENESS RELATED TO ACTUAL
              TRIAL RATE
     POLICE - NUMBER OF POLICE WITHIN THE SYSTEM BOUNDRY
     SMTRR   - SMOOTHED TRIAL RATE


SMTRR.K=SMOOTH(TRIALR.JK,TRSMT)                       66, A
     SMTRR   - SMOOTHED TRIAL RATE
     TRIALR - COURT TRIAL RATE (TRIALS PER YEAR)
     TRSMT   - TRIAL RATE SMOOTHING TIME
```

GUILTY PLEA INCENTIVESS

GPLEAI.K=CONVRM.K*CRTBLM.K*DEALM.K*GPISM   67, A
     GPLEAI - GUILITY PLEA INCENTIVES
     CONVRM - CONVICTION RATIO MULTIPLIER
     CRTBLM - COURTBACKLOG MULT
     DEALM   - DEAL MULTIPLIER (HOW MUCH OF A SENTENCE
                  REDUCTION IS OFFERED)
     GPISM   - GUILTY PLEA INCENTIVES SCALING MULTIPLIER

CONVRM.K=TABLE(CONVRMT,CONR.K,0,1,.2)   68, A
     CONVRM - CONVICTION RATIO MULTIPLIER
     CONVRMT- CONVICTION RATIO MULT TABLE

CONR.K=CONVR   69, A
CONVRMT=.2/.5/.75/.85/.93/1   69.1, T
     CONVR   - CONVICTION RATIO OF THOSE TRIED FROM JAIL
     CONVRMT- CONVICTION RATIO MULT TABLE

   BASED IN PART ON DATA FROM P126,"THE CHALLENGE
   OF CRIME IN
   A FREE SOCIETY

CRTBLM.K=TABHL(CRTBLMT,ASCTBLR.K,0,5,.5)   70, A
     CRTBLM - COURTBACKLOG MULT
     CRTBLMT- COURT BACKLOG MULT TABLE
     ASCTBLR- AVERAGE SENTENCE TO COURT BACKLOG RATIO

ASCTBLR.K=EAVESEN.K/AVCTBL.K   71, A
CRTBLMT=4/2/1/.8/.7/.6/.5/.4/.3/.2/.1   71.1, T
     ASCTBLR- AVERAGE SENTENCE TO COURT BACKLOG RATIO
     EAVESEN- EFFECTIVE AVERAGE SENTENCE (YRS)
     AVCTBL - AVERAGE COUURT BACKLOG (YRS)
     CRTBLMT- COURT BACKLOG MULT TABLE

DEALM.K=TABLE(DEALMT,PSENV.K,0,100,20)   72, A
DEALMT=10/.93/.8/.7/.5/.3   72.1, T
     DEALM   - DEAL MULTIPLIER (HOW MUCH OF A SENTENCE
                  REDUCTION IS OFFERED)
     DEALMT - DEAL MULT TABLE
     PSENV   - PERCENTAGE SENTENCE REDUCTION OFFERED (%)

PSENV.K=PSEN   73, A
     PSENV   - PERCENTAGE SENTENCE REDUCTION OFFERED (%)
     PSEN   - PERCENTAGE OF NOMINAL SENTENCE OFFERED FOR
                  A GUILTY PLEA (%)

NON CRIMINAL POPULATION LEVEL

NCP.K=NCP.J+DT*(BR.JK-DR1.JK-FOCR.JK+RETP.JK+   74, L
  RRPROB.JK+RRRC.JK+RRPAR.JK+RREXC.JK+RRFNO.JK)
        NCP   - NON CRIMINAL POPULATION
        BR   - BIRTH RATE FOR ALL THE POPULATION OUTSIDE
                    PRISON OR JAIL
        DR1   - DEATH RATE FOR FREE NEW OFFENDERS
        FOCR   - FIRST OFFENSE CRIME RATE
        RETR   - RATE FREE CRIMINALS RETURN TO THE NON
                    CRIMINAL POPULATION
        RRPROB - RETURN RATE TO NCP OF THOSE WHO HAVE
                    COMPLETED PROB
        RRRC   - RETURN TO THE NON CRIM POP RATE OF RELEASED
                    CRIM
        RRPAR   - RETURN RATE TO NCP FOP THOSE WHO HAVE
                    COMPLETED PAROLE
        RREXC   - RATE EMPLOYED EX CONVICT RETURN TO THE NON
                    CRIM POPULATION
        RRFNO   - REHABILITAION RATE FOP FREE NEW OFFENDERS

RRFNO.KL=AFNO.K/(RHABTNO*AOCERHT.K)   75, R
        RRFNO   - REHABILITAION RATE FOR FREE NEW OFFENDERS
        AFNO   - AVERAGE NUMBER OF FREE NEW OFFENDERS
        RHABTNO - FREE NEW OFFENDERS REHABILITAION TIME (YRS)
        AOCERHT - AOC EFFECT ON REHABILITATION TIMES

AOCERHT.K=EXP(ARHTE*LOGN(AOCD.K))   76, A
        AOCERHT - AOC EFFECT ON REHABILITATION TIMES
        ARHTE   - AOC - REHABILITATION TIME EXPONENT
        AOCD   - ATTRACTIVENESS OF CRIME DELAYED

AFNO.K=SMOOTH(FNOR.JK,RHABTNO)   77, A
        AFNO   - AVERAGE NUMBER OF FREE NEW OFFENDERS
        FNOR   - RATE USED IN AVERAGING FREE NEW OFFENDERS
        RHABTNO - FREE NEW OFFENDERS REHABILITAION TIME (YRS)

FNOR.KL=FNO.K   78, R
        FNOR   - RATE USED IN AVERAGING FREE NEW OFFENDERS
        FNO   - FREE NEW OFFENDERS (HAVE ESSENTIALLY NEVER
                    BEEN ARRESTED)

DR1.KL=(DRN/1000)(NCP.K)   79, R
        DR1   - DEATH RATE FOR FREE NEW OFFENDERS
        DRN   - DEATH RATE NORMAL (DEATHS/1000 POPULATION)
        NCP   - NON CRIMINAL POPULATION

FREE NEW OFFENDER LEVEL

FNO.K=FNO.J+DT*(FOCR.JK-FNOARR.J*AR.JK-DR12.JK-   80, L
   RRFNU.JK)
      FNO   - FREE NEW OFFENDERS (HAVE ESSENTIALLY NEVER
                  BEEN ARRESTED)
      FOCR   - FIRST OFFENSE CRIME RATE
      FNOARR - FREE NEW OFFENDER ARREST RATIO
      AR   - ARREST RATE
      DR12   - FREE NEW OFFENDER DEATH RATE
      RRFNO   - REHABILITAION RATE FOR FREE NEW OFFENDERS

FNOARR.K=(FNOPEM*FNO.K)/(FNOPEM*FNO.K+ROFPEM*   81, A
   FCRIM.K)
      FNUARR - FREE NEW OFFENDER ARREST RATIO
      FNOPEM - FREE NEW OFFENDERS POLICE EFFECTIVENESS
                  MULTIPLIER
      FNO   - FREE NEW OFFENDERS (HAVE ESSENTIALLY NEVER
                  BEEN ARRESTED)
      ROFPEM - REPEAT OFFENDERS POLICE EFFECTIVENESS
                  MULTIPLIER
      FCRIM   - FREE CRIMINALS (INCLUDING DOPE ADDICTS)

DR12.KL=(DRN/1000)*FNO.K   82, R
      DR12   - FREE NEW OFFENDER DEATH RATE
      DRN   - DEATH RATE NORMAL (DEATHS/1000 POPULATION)
      FNO   - FREE NEW OFFENDERS (HAVE ESSENTIALLY NEVER
                  BEEN ARRESTED)

BR.KL=(BRN/1000)*OUTPOP.K   83, R
      BR   - BIRTH RATE FOR ALL THE POPULATION OUTSIDE
                  PRISON OR JAIL
      BRN   - BIRTH RATE NORMAL (PEOPLE/1000 POPULATION)
      OUTPOP - POPULATION OUTSIDE JAIL OR PRISON

OUTPOP.K=NCP.K+FCRIM.K+RC.K+ROB.K+UNEX.K+EMEXC.K+   84, A
   CPROB.K+PROB.K+PAROLE.K+CPAR.K+FNO.K
      OUTPOP - POPULATION OUTSIDE JAIL OR PRISON
      NCP   - NON CRIMINAL POPULATION
      FCRIM   - FREE CRIMINALS (INCLUDING DOPE ADDICTS)
      RC   - RELEASED CRIMINAL
      ROB   - RELEASED ON BAIL (PEOPLE) AND NOT BECOME
                  FCRIM
      UNEX   - UNEMPLOYED EXCONVICTS
      EMEXC   - EMPLOYED EXCONVICTS THAT HAVE NOT BECOME
                  FREE CRIMINALS
      CPRUB   - NUMBER COMPLETED PROBATION AND NOT RETURNED
                  TO FCRIM OR NCP
      PROB   - NUMBER ON PROBATION NOT RETURNED TO FCRIM
      PAROLE - NUMBER OF PEOPLE ON PAROLE THAT HAVE NOT
                  BECOME FCRIMINALS
      CPAR   - COMPLETED PAROLE BUT NOT RETURNED TO BE
                  FCRIM OR NON CRIMINALS
      FNO   - FREE NEW OFFENDERS (HAVE ESSENTIALLY NEVER
                  BEEN ARRESTED)

FOCR.KL=(SCR/100000)*AOCD.K*NCP.K*NEWSM.K*FOCRM*   85, R
  ARPNOM.K
    FOCR   - FIRST OFFENSE CRIME RATE
    SCR   - STANDARD CRIME RATE (CRIMES PER YR/100,000
                POPULATION)
    AOCD   - ATTRACTIVENESS OF CRIME DELAYED
    NCP   - NON CRIMINAL POPULATION
    NEWSM   - EFFECTIVENESS OF NEWS MEDIA MULTIPLIER
    FOCRM   - FIRST OFFENDERS CRIME RATE MULTIPLIER
    ARPNOM - ARREST PROBABILITY FOR NEW OFFENDERS
                MULTIPLIER

AOCD.K=DLINF3(AOC.K,PDELAY)   86, A
    AOCD   - ATTRACTIVENESS OF CRIME DELAYED
    AOC   - ATTRACTIVENESS OF CRIME (MULTIPLIER FOR
                CRIME RATES)
    PDELAY - TIME DELAY TO CHANGE PERCEIVED
                ATTRACTIVENESS OF CRIME (YRS)

    FREE CRIMINAL LEVEL

FCRIM.K=FCRIN.K+DOPEAD.K   87, A
    FCRIM   - FREE CRIMINALS (INCLUDING DOPE ADDICTS)
    FCRIN   - FREE CRIMINALS (WITHOUT DOPE ADDICTS)
    DOPEAD - NUMBER OF DOPE ADDICTS (PEOPLE)

FCRIN.K=FCRIN.J+(DT)(ROBCR.JK-(1-FNOARR.J)*AR.JK+   88, L
  RCCR.JK-DR.JK-RETR.JK+UXCCR.JK+EXCCR.JK+
  CPARCR.JK+PARCR.JK+PROBCR.JK+CPBCR.JK-(1-ROBR.J)
  (CWOBR.JK+GPBR.JK+FCBR.JK))
    FCRIN   - FREE CRIMINALS (WITHOUT DOPE ADDICTS)
    ROBCR   - RELEASED ON BAIL CRIME RATE
    FNOARR - FREE NEW OFFENDER ARREST RATIO
    AR   - ARREST RATE
    RCCR   - RELEASED CRIMINAL CRIME RATE (CR/YR)
    DR   - FREE CRIMINAL DEATH RATE
    RETR   - RATE FREE CRIMINALS RETURN TO THE NON
                CRIMINAL POPULATION
    UXCCR   - UNEMPLOYED EXCONVICT CRIME RATE
    EXCCR   - EMPLOYED EXCONVICT CRIME RATE
    CPARCR - COMPLETED PAROLE CRIME RATE
    PARCR   - PEOPLE ON PAROLE CRIME RATE
    PROBCR - CRIME RATE OF THOSE ON PROBATION THAT HAVE
                NOT BECOME FCRIM
    CPBCR   - COMPLETED PROBATION CRIME RATE
    ROBR   - RELEASED ON BAIL RATIO TO THOSE THOUGHT TO
                BE ON BAIL
    CWOBR   - CONVICTED WHILE ON BAIL RATE
    GPBR   - GUILTY PLEA WHILE ON BAIL RATE

ROBCR.KL=(SCR/100000)*AOCD.K*ROB.K*ROBCRM   89, R
    ROBCR   - RELEASED ON BAIL CRIME RATE
    SCR   - STANDARD CRIME RATE (CRIMES PER YR/100,000
                POPULATION)
    AOCD   - ATTRACTIVENESS OF CRIME DELAYED
    ROB   - RELEASED ON BAIL (PEOPLE) AND NOT BECOME
                FCRIM
    ROBCRM - RELEASED ON BAIL CRIME RATE MULTIPLIER

TFCRIM.K=FCRIM.K+FNO.K   90, A
    TFCRIM - TOTAL FREE CRIMINALS
    FCRIM   - FREE CRIMINALS (INCLUDING DOPE ADDICTS)
    FNO   - FREE NEW OFFENDERS (HAVE ESSENTIALLY NEVER
                BEEN ARRESTED)

AR.KL=FIFGE(POLCAP.K,POLARR.K,POLARR.K,POLCAP.K)   91, R
    AR   - ARREST RATE
    POLCAP - POLICE CAPACITY TO MAKE ARRESTS (MEN AND
                EFFECTIVENESS)
    POLARR - POLICE ARREST RATE (USED AS LONG AS IT IS
                LESS THAN POLCAP)

POLCAP.K=ARTOPR*POLICE*POLEFF.K*POLCAPM.K/POLICEM.K 92, A
    POLCAP - POLICE CAPACITY TO MAKE ARRESTS (MEN AND
                EFFECTIVENESS)
    ARTOPR - ARRESTS TO POLICE RATIO (MAXIMUM ARRESTS
                PER YR PER OFFICER)
    POLICE - NUMBER OF POLICE WITHIN THE SYSTEM BOUNDRY
    POLEFF - POLICE EFFECTIVENESS MULTIPLIER
    POLCAPM- POLICE CAPACITY MULTIPLIER(ADJUSTS FOR
                DECIMAL CHAR OF POLEFF)
    POLICEM- POLICE MULTIPLIER TO ACCOUNT FOR POLICE/
                POPULATION RATIO

POLCAPM.K=SCMPOLC   93, A
    POLCAPM- POLICE CAPACITY MULTIPLIER(ADJUSTS FOR
                DECIMAL CHAR OF POLEFF)
    SCMPOLC- SCALING MULTIPLIER FOR POLICE CAPACITY
                (ADJUST WITH SCMPEFF)

POLARR.K=POLEFF.K*(FNOPEM*FNO.K+ROFPEM*FCRIM.K)   94, A
    POLARR - POLICE ARREST RATE (USED AS LONG AS IT IS
                LESS THAN POLCAP)
    POLEFF - POLICE EFFECTIVENESS MULTIPLIER
    FNOPEM - FREE NEW OFFENDERS POLICE EFFECTIVENESS
                MULTIPLIER
    FNO   - FREE NEW OFFENDERS (HAVE ESSENTIALLY NEVER
                BEEN ARRESTED)
    ROFPEM - REPEAT OFFENDERS POLICE EFFECTIVENESS
                MULTIPLIER
    FCRIM   - FREE CRIMINALS (INCLUDING DOPE ADDICTS)

RCCR.KL=(SCR/100000)*RCCRM*RC.K*AOCD.K   95, R
     RCCR   - RELEASED CRIMINAL CRIME RATE (CR/YR)
     SCR   - STANDARD CRIME RATE (CP IMES PER YR/100,000
               POPULATION)
     RCCRM   - RELEASED CRIMINALS CRIME RATE MULTIPLIER
     RC   - RELEASED CRIMINAL
     AOCD   - ATTRACTIVENESS OF CRIME DELAYED

DR.KL=(DRN/1000)*FCRIM.K   96, R
     DR   - FREE CRIMINAL DEATH RATE
     DRN   - DEATH RATE NORMAL (DEATHS/1000 POPULATION)
     FCRIM   - FREE CRIMINALS (INCLUDING DOPE ADDICTS)

PROBCR.KL=(SCR/100000)*PROBCRM*PROB.K*AOCD.K   97, R
     PROBCR - CRIME RATE OF THOSE ON PROBATION THAT HAVE
               NOT BECOME FCRIM
     SCR   - STANDARD CRIME RATE (CP IMES PER YR/100,000
               POPULATION)
     PROBCRM- PEOPLE ON PROBATION CRIME RATE MULTIPLIER
     PROB   - NUMBER ON PROBATION NOT RETURNED TO FCRIM
     AOCD   - ATTRACTIVENESS OF CRIME DELAYED

PARREST.K=100*SCMPEFF*POLEFF.K   98, S
     PARREST- PERCENT OF THE FREE CRIMINALS ARRESTED EACH
               YEAR
     SCMPEFF- SCALING MULTIPLIER FOR POLICE EFFECTIVENESS
     POLEFF - POLICE EFFECTIVENESS MULTIPLIER

AFCRIM.K=SMOOTH(FCRIR.JK,STLIM)   99, A
     AFCRIM - AVERAGE NUMBER OF FREE CRIMINALS
     FCRIR   - RATE USED IN AVERAGING FCRIM
     STLIM   - FREE CRIMINAL REHABILITATION TIME

FCRIR.KL=FCRIM.K   100, R
     FCRIR   - RATE USED IN AVERAGING FCRIM
     FCRIM   - FREE CRIMINALS (INCLUDING DOPE ADDICTS)

RETR.KL=FIFGE(RETR1.K,RETR2.K,FCRIM.K,AFCRIM.K) 101, R
     RETR   - RATE FREE CRIMINALS RETURN TO THE NON
               CRIMINAL POPULATION
     RETR1   - RETR ADJUSTED FOR THE LAG IN THE RETURN
     RETR2   - RETR WITHOUT A LAG IN THE RETURN TIME
     FCRIM   - FREE CRIMINALS (INCLUDING DOPE ADDICTS)
     AFCRIM - AVERAGE NUMBER OF FREE CRIMINALS

RETR1.K=AFCRIM.K/(STLIM*AOCERHT.K)   102, A
     RETR1   - RETR ADJUSTED FOR THE LAG IN THE RETURN
     AFCRIM - AVERAGE NUMBER OF FREE CRIMINALS
     STLIM   - FREE CRIMINAL REHABILITATION TIME
     AOCERHT- AOC EFFECT ON REHABILITATION TIMES

RETR2.K=FCRIM.K/(STLIM*AOCERHT.K)   103, A
     RETR2   - RETR WITHOUT A LAG IN THE RETURN TIME
     FCRIM   - FREE CRIMINALS (INCLUDING DOPE ADDICTS)
     STLIM   - FREE CRIMINAL REHABILITATION TIME
     AOCERHT- AOC EFFECT ON REHABILITATION TIMES

JAIL POPULATION LEVEL

JAIL.K=FIFGE(JAILL.K,0,JAILL.K,0)   104, A
    JAIL   - JAIL POPULATION
    JAILL - JAIL POPULATION BEFORE NON ZERO LIMITATION

JAILL.K=JAILL.J+DT*(ARTOJR.J*AR.JK-GPJR.JK-   105, L
    CON_JR.JK-CCRR.JK-DR2.JK)
    JAILL - JAIL POPULATION BEFORE NON ZERO LIMITATION
    ARTOJR - ARREST TO JAIL RATIO
    AR   - ARREST RATE
    GPJR   - GUILTY PLEA FROM JAIL RATE
    CON_JR - CONVICTED FROM JAIL RATE
    CCRR   - COURT CRIMINAL RELEASE RATE (NOT GUILTY
             DECISIONS)
    DR2   - DEATH RATE OF THOSE IN JAIL

JCR.K=JAIL.K/JCAP   106, A
    JCR   - JAIL CROWDING RATIO
    JAIL   - JAIL POPULATION
    JCAP   - NOMINAL JAIL CAPACITY (PEOPLE)

ARTOJR.K=1-ARTOBR.K-PTRR.K   107, A
    ARTOJR - ARREST TO JAIL RATIO
    ARTOBR - ARREST TO BAIL RATIO
    PTRR   - PRETRIAL RELEASE RATIO

TRRATE.K=TRIALDM.K*CTCAP   108, A
    TRIALDM- TRIAL DELAY MULTIPLIER TO ADJUST COURT
             CAPACITY TO NEED
    CTCAP - COURT CAPACITY (TRIALS/YR)

CON_JR.KL=TRJAIL.K*CONVR*TRPATE.K   109, R
    CON_JR - CONVICTED FROM JAIL RATE
    TRJAIL - TRIAL RATIO FROM JAIL
    CONVR - CONVICTION RATIO OF THOSE TRIED FROM JAIL

TRJAIL.K=(JAIL.K/(JAIL.K+DROB.K))*JAILTM.K   110, A
    TRJAIL - TRIAL RATIO FROM JAIL
    JAIL   - JAIL POPULATION
    DROB   - THE NUMBER BELIEVED TO BE CURRENTLY
             RELEASED ON BAIL
    JAILTM - PEOPLE FROM JAIL TO TRIAL MULTIPLIER

JAILTM.K=TABHL(JTMT,JCRD.K,1,3,1)   111, A
JTMT=1/1.2/1.4   111.1, T
    JAILTM - PEOPLE FROM JAIL TO TRIAL MULTIPLIER
    JTMT   - JAIL TRIAL MULTIPLIER TABLE
    JCRD   - JAIL CROWDING RATIO DELAYED

JCRD.K=DLINF3(JCR.K,TTCCC)   112, A
    JCRD   - JAIL CROWDING RATIO DELAYED
    JCR   - JAIL CROWDING RATIO
    TTCCC - TIME TO CHANGE COURT CAPACITY BY ADJUSTING
             OVERTIME, ETC. (YRS)

GPJR.KL=STDGPR*GPLEAI.K*JCRM.K*JAIL.K   113, R
    GPJR   - GUILTY PLEA FROM JAIL RATE
    STDGPR - STANDARD GUILTY PLEA RATE FROM JAIL(MULT
                FOR GPJR)
    GPLEAI - GUILITY PLEA INCENTIVES
    JCRM   - JAIL CROWDING RATIO MULTIPLIER
    JAIL   - JAIL POPULATION

JCRM.K=TABHL(JAILCMT,JCR.K,0,3,.5)   114, A
JAILCMT=.4/.5/.9/1.3/1.7/1.9/2   114.1, T
    JCRM   - JAIL CROWDING RATIO MULTIPLIER
    JAILCMT- JAIL CROWDING MULT TABLE
    JCR   - JAIL CROWDING RATIO

DR2.KL=(DRN/1000)*JAIL.K   115, R
    DR2   - DEATH RATE OF THOSE IN JAIL
    DRN   - DEATH RATE NORMAL (DEATHS/1000 POPULATION)
    JAIL   - JAIL POPULATION

CCRR.KL=TRJAIL.K*(1-CONVR)*TRRATE.K   116, R
    CCRR   - COURT CRIMINAL RELEASE RATE (NOT GUILTY
                DECISIONS)
    TRJAIL - TRIAL RATIO FROM JAIL
    CONVR   - CONVICTION RATIO OF THOSE TRIED FROM JAIL

ATGPLEA.K=(365/STDGPR)*GPLEAI.K*JCRM.K   117, S
    ATGPLEA- AVERAGE TIME TO A GUILTY PLEA
    STDGPR - STANDARD GUILTY PLEA RATE FROM JAIL(MULT
                FOR GPJR)
    GPLEAI - GUILITY PLEA INCENTIVES
    JCRM   - JAIL CROWDING RATIO MULTIPLIER

        RELEASED CRIMINAL LEVEL

RC.K=FIFGE(RLC.K,0,RLC.K,0)   118, A
    RC   - RELEASED CRIMINAL
    RLC   - RELEASED CRIMINALS BEFORE NON ZERO
                LIMITATION

120

RLC.K=RLC.J+DT*(PTRR.J*AR.JK+CCRR.JK-DR3.JK-   119, L
    RCCR.JK+FCBR.JK-RRRC.JK+CONRCR*CON_JR.JK+GPJRCR*
    GPJR.JK+CWOBRCR*CWOBR.JK+GPBRCR*GPBR.JK)
        RLC   - RELEASED CRIMINALS BEFORE NON ZERO
                    LIMITATION
        PTRR   - PRETRIAL RELEASE RATIO
        AR   - ARREST RATE
        CCRR   - COURT CRIMINAL RELEASE RATE (NOT GUILTY
                    DECISIONS)
        DR3   - DEATH RATE OF RELEASED CRIMINALS
        RCCR   - RELEASED CRIMINAL CRIME RATE (CR/YR)
        RRRC   - RETURN TO THE NON CRIM POP RATE OF RELEASED
                    CRIM
        CONRCR - CONVICTED FROM JAIL TO RELEASED CRIMINAL
                    RATIO (FINES, ETC.)
        CON_JR - CONVICTED FROM JAIL RATE
        GPJRCR - GUILTY PLEA FROM JAIL TO RELEASED CRIM
                    RATIO (FINES, ETC.)
        GPJR   - GUILTY PLEA FROM JAIL RATE
        CWOBRCR- CONVICTED WHILE ON BAIL TO REL CRIM RATIO
                    (FINES, ETC.)
        CWOBR   - CONVICTED WHILE ON BAIL RATE
        GPBRCR - GUILTY PLEA WHILE ON BAIL TO REL CRIM RATIO
                    (FINES, ETC.)
        GPBR   - GUILTY PLEA WHILE ON BAIL RATE

RRRC.KL=FIFGE(RRRC1.K,RRRC2.K,RC.K,ARC.K)   120, R
        RRRC   - RETURN TO THE NON CRIM POP RATE OF RELEASED
                    CRIM
        RRRC1   - RRRC ADJUSTED FOR THE DELAY IN FLOWING
                    THROUGH
        RRRC2   - RRRC WITHOUT FLOW DELAY
        RC   - RELEASED CRIMINAL
        ARC   - AVERAGE NUMBER OF RELEASED CRIMINALS

RRRC1.K=ARC.K/(REHABT*ADCEPHT.K)   121, A
        RRRC1   - RRRC ADJUSTED FOR THE DELAY IN FLOWING
                    THROUGH
        ARC   - AVERAGE NUMBER OF RELEASED CRIMINALS
        REHABT - RELEASED CRIMINAL REHABILITATION TIME (YRS)
        ADCERHT- ADC EFFECT ON REHABILITATION TIMES

RRRC2.K=RC.K/(REHABT*ADCEPHT.K)   122, A
        RRRC2   - RRRC WITHOUT FLOW DELAY
        RC   - RELEASED CRIMINAL
        REHABT - RELEASED CRIMINAL REHABILITATION TIME (YRS)
        ADCERHT- ADC EFFECT ON REHABILITATION TIMES

PTRR.K=NUPRSR   123, A
        PTRR   - PRETRIAL RELEASE RATIO
        NUPRSR - NO PROSECUTE RATIO

ARC.K=SMOOTH(RELCR.JK,REHABT)   124, A
        ARC   - AVERAGE NUMBER OF RELEASED CRIMINALS
        RELCR   - RATE USED IN AVERAGING RELEASED CRIMINALS
        REHABT - RELEASED CRIMINAL REHABILITATION TIME (YRS)

RELCR.KL=RC.K   125, R
    RELCR   - RATE USED IN AVERAGING RELEASED CRIMINALS
    RC   - RELEASED CRIMINAL

DR3.KL=(DRN/1000)*RC.K   126, R
    DR3   - DEATH   RATE OF RELEASED CRIMINALS
    DRN   - DEATH RATE NORMAL (DEATHS/1000 POPULATION)
    RC   - RELEASED CRIMINAL

    PRISON LEVEL

PRISON.K=FIFGE(PRISN.K,0,PRISN.K,0)   127, A
    PRISON - PRISON POPULATION (LIMITED TO BE NON ZERO)
    PRISN   - PRISON BEFORE THE NON ZERO LIMITAION

PRISN.K=PRISN.J+DT*((1-CONPBR-CONRCR)*CON_JR.JK+(1- 128, L
   GPJPBR-GPJRCR)*GPJR.JK+(1-CWOBPBR-CWOBPCR)*
   CWOBR.JK+(1-GPBPBR-GPBRCR)*GPBR.JK-PARR.JK-
   PRRR.JK-DR4.JK)
    PRISN   - PRISON BEFORE THE NON ZERO LIMITAION
    CONPBR - CONVICTED FROM JAIL TO PROBATION RATIO
    CONRCR - CONVICTED FROM JAIL TO RELEASED CRIMINAL
              RATIO (FINES, ETC.)
    CON_JR - CONVICTED FROM JAIL RATE
    GPJPBR - GUILTY PLEA FROM JAIL TO PROBATION RATIO
    GPJRCR - GUILTY PLEA FROM JAIL TO RELEASED CRIM
              RATIO (FINES, ETC.)
    GPJR   - GUILTY PLEA FROM JAIL RATE
    CWOBPBR- CONVICTED WHILE ON BAIL TO PROBATION RATIO
    CWOBRCR- CONVICTED WHILE ON BAIL TO REL CRIM RATIO
              (FINES, ETC.)
    CWOBR   - CONVICTED WHILE ON BAIL RATE
    GPBPBR - GUILTY PLEA FROM BAIL TO PROBATION RATIO
    GPBRCR - GUILTY PLEA WHILE ON BAIL TO REL CRIM RATIO
              (FINES, ETC.)
    GPBR   - GUILTY PLEA WHILE ON BAIL RATE
    PARR   - PAROLE RATE
    PRRR   - PRISON RELEASE RATE (END OF SENTENCE OR
              OTHER UNSUPERVISED)
    DR4   - DEATH RATE OF THOSE IN PRISON

CWOBR.KL=(1-TRJAIL.K)*COVRB*TRIALDM.K*CTCAP   129, R
    CWOBR   - CONVICTED WHILE ON BAIL RATE
    TRJAIL - TRIAL RATIO FROM JAIL
    COVRB   - CONVICTION RATIO OF THOSE TRIED FROM BAIL
    TRIALDM- TRIAL DELAY MULTIPLIER TO ADJUST COURT
              CAPACITY TO NEED
    CTCAP   - COURT CAPACITY (TRIALS/YR)

GPBR.KL=(1/ATGPB)*CONVRM.K*DEALM.K*DROB.K   130, R
    GPBR   - GUILTY PLEA WHILE ON BAIL RATE
    ATGPB - AVERAGE TIME TO A GUILTY PLEA FOR THOSE ON
               BAIL (YRS)
    CONVRM - CONVICTION RATIO MULTIPLIER
    DEALM - DEAL MULTIPLIER (HOW MUCH OF A SENTENCE
               REDUCTION IS OFFERED)
    DROB   - THE NUMBER BELIEVED TO BE CURRENTLY
               RELEASED ON BAIL

PRRR.KL=(APRIS.K/AVESEN.K)+CCOMRR.K*PRISON.K   131, R
    PRRR   - PRISON RELEASE RATE (END OF SENTENCE OR
               OTHER UNSUPERVISED)
    APRIS - AVERAGE PRISON POPULATION
    AVESEN - AVERAGE SENTENCE GIVEN BY THE COURT (YRS)
    CCOMRR - COUNTY COMMISSIONER RELEASE RATE
    PRISON - PRISON POPULATION (LIMITED TO BE NON ZERO)

CCOMRR.K=TABHL(PCRDT,PCRDR.K,.8,1.4,.1)   132, A
    CCOMRR - COUNTY COMMISSIONER RELEASE RATE
    PCRDT - PRISON CROWDING RATIO TABLE
    PCRDR - PRISON CROWDING RATIO

PCRDR.K=PRISON.K/PRISCAP   133, A
PCRDT=0/0/.4/.8/1.6/3.2/10   133.1, T
    PCRDR - PRISON CROWDING RATIO
    PRISON - PRISON POPULATION (LIMITED TO BE NON ZERO)
    PRISCAP- PRISON NOMINAL CAPACITY (PEOPLE)
    PCRDT - PRISON CROWDING RATIO TABLE

APRIS.K=SMOOTH(PRISR.JK,AVESEN.K)   134, A
    APRIS - AVERAGE PRISON POPULATION
    PRISR - RATE USED IN AVERAGING PRISON POPULATION
    AVESEN - AVERAGE SENTENCE GIVEN BY THE COURT (YRS)

PRISR.KL=PRISON.K   135, R
    PRISR - RATE USED IN AVERAGING PRISON POPULATION
    PRISON - PRISON POPULATION (LIMITED TO BE NON ZERO)

PARR.KL=PARBCAP*PRISPM.K   136, R
    PARR   - PAROLE RATE
    PARBCAP- PAROLE BOARD NOMINAL PROCESSING CAPACITY
               (PEOPLE/YR)
    PRISPM - PRISON POPULATION MULTIPLIER FOR PAROLE
               BOARD RELEASES

PRISPM.K=TABHL(PRISPMT,PCRDR.K,0,1.6,.2)   137, A
PRISPMT=0/.4/.65/.8/.9/1/1.1/1.15/1.2   137.1, T
    PRISPM - PRISON POPULATION MULTIPLIER FOR PAROLE
               BOARD RELEASES
    PCRDR - PRISON CROWDING RATIO

DR4.KL=(DRN/1000)*PRISON.K   138, R
    DR4   - DEATH RATE OF THOSE IN PRISON
    DRN   - DEATH RATE NORMAL (DEATHS/1000 POPULATION)
    PRISON - PRISON POPULATION (LIMITED TO BE NON ZERO)

EAVESEN.K=PRISON.K/SMPRISO.K   139, A
     EAVESEN- EFFECTIVE AVERAGE SENTENCE (YRS)
     PRISUN - PRISON POPULATION (LIMITED TO BE NON ZERO)
     SMPRISO- SMOOTHED PRISON OUTPUT (PEOPLE/YR)

SMPRISO.K=SMPRRR.K+SMPARR.K   140, A
     SMPRISO- SMOOTHED PRISON OUTPUT (PEOPLE/YR)
     SMPRRR - SMOOTHED PRISON RELEASE RATE (UNSUPERVISED
                - PEOPLE/YR)
     SMPARR - SMOOTHED PAROLE RATE (PEOPLE/YR)

SMPARR.K=SMOOTH(PARR.JK,1)   141, A
     SMPARR - SMOOTHED PAROLE RATE (PEOPLE/YR)
     PARR   - PAROLE RATE

SMPRRR.K=SMOOTH(PPRR.JK,1)   142, A
     SMPRRR - SMOOTHED PRISON RELEASE RATE (UNSUPERVISED
                - PEOPLE/YR)
     PRKR   - PRISON RELEASE RATE (END OF SENTENCE OR
                OTHER UNSUPERVISED)

     RELEASED ON BAIL LEVEL

ROB.K=ROB.J+DT*(ARTOBR.J*AR.JK-ROBP.J*FCBR.JK-   143, L
  ROBCR.JK-ROBR.J*GPBR.JK-ROBP.J*CWOBR.JK-DR5.JK)
     ROB   - RELEASED ON BAIL (PEOPLE) AND NOT BECOME
                FCRIM
     ARTOBR - ARREST TO BAIL RATIO
     AR   - ARREST RATE
     ROBR   - RELEASED ON BAIL RATIO TO THOSE THOUGHT TO
                BE ON BAIL
     ROBCR - RELEASED ON BAIL CRIME RATE
     GPBR   - GUILTY PLEA WHILE ON BAIL RATE
     CWOBR - CONVICTED WHILE ON BAIL RATE
     DR5   - DEATH RATE FOR RELEASED ON BAIL

ARTOBR.K=TABHL(ARTOBRT,JCR.K,0,2,.4)   144, A
ARTOBRT=.5/.6/.7/.7/.8/.85   144.1, T
     ARTOBR - ARREST TO BAIL RATIO
     ARTOBRT- ARREST TO BAIL RATIO TABLE
     JCR   - JAIL CROWDING RATIO

FCBR.KL=(1-TRJAIL.K)(1-CONVR)*TRRATE.K   145, R
     TRJAIL - TRIAL RATIO FROM JAIL
     CONVR - CONVICTION RATIO OF THOSE TRIED FROM JAIL

DR5.KL=(DRN/1000)*ROB.K   146, R
     DR5   - DEATH RATE FOR RELEASED ON BAIL
     DRN   - DEATH RATE NORMAL (DEATHS/1000 POPULATION)
     ROB   - RELEASED ON BAIL (PEOPLE) AND NOT BECOME
                FCRIM

124

RJBR.K=RUB.K/DROB.K   147, A
    RUBR   - RELEASED ON BAIL RATIO TO THOSE THOUGHT TO
                BE ON BAIL
    RUB   - RELEASED ON BAIL (PEOPLE) AND NOT BECOME
                FCRIM
    DROB   - THE NUMBER BELIEVED TO BE CURRENTLY
                RELEASED ON BAIL

        UNEMPLOYED EXCONVICT LEVEL

UNEX.K=UNEX.J+DT*((1-FXCER.J)*PPRR.JK-UXCER.JK-   148, L
    UXCCR.JK-DR6.JK)
    UNEX   - UNEMPLOYED EXCONVICTS
    FXCER   - FREED EX CONVICT EMPLOYMENT RATIO (% THAT
                ARE IMMED EMPLOYED)
    PRRR   - PRISON RELEASE RATE (END OF SENTENCE OR
                OTHER UNSUPERVISED)
    UXCER   - UNEMPLOYED EXCONVICT EMPLOYMENT RATE
    UXCCR   - UNEMPLOYED EXCONVICT CRIME RATE
    DR6   - UNEMPLOYED EX CONVICT DEATH RATE

FXCER.K=FXCERC   149, A
    FXCER   - FREED EX CONVICT EMPLOYMENT RATIO (% THAT
                APE IMMED EMPLOYED)
    FXCERC - FREED EXCONVICTS EMPLOYMENT RATIO CONSTANT
                (EMPLOYED/UNEMPLOYED)

UXCCR.KL=(SCR/100000)*UXCCM*ADCD.K*UNEX.K*PRISCRM.K 150, R
    UXCCR   - UNEMPLOYED EXCONVICT CRIME RATE
    SCR   - STANDARD CRIME RATE (CRIMES PER YR/100,000
                POPULATION)
    UXCCM   - UNEMPLOYED EXCONVICT CRIME RATE MULTIPLIER
    AUCD   - ATTRACTIVENESS OF CRIME DELAYED
    UNEX   - UNEMPLOYED EXCONVICTS
    PRISCRM- PRISON CROWDING AND REHABILITAION PROGRAM
                MULTIPLIER

PRISCRM.K=PRISCM.K+PRISRM.K   151, A
    PRISCRM- PRISON CROWDING AND PEHABILITAION PROGRAM
                MULTIPLIER
    PRISCM - PRISON CROWDING MULTIPLIER
    PRISRM - PRISON REHABILTATION PROGRAM MULT (MEASURED
                BY $ SPENT)

PRISCM.K=TABHL(PRISCT,PRISCR.K,.5,2,.25)   152, A
PRISCT=.45/.48/.5/.65/.93/1/1.1   152.1, T
    PRISCM - PRISON CROWDING MULTIPLIER
    PRISCT - PRISON CROWDING MULT TABLE
    PRISCR - PRISON CROWDING RATIO

PRISCR.K=PRISON.K/PRISCAP   153, A
    PRISCR - PRISON CROWDING RATIO
    PRISON - PRISON POPULATION (LIMITED TO BE NON ZERO)
    PRISCAP- PRISON NOMINAL CAPACITY (PEOPLE)

PRISRM.K=TABHL(PRISRT,RHPCR.K,0,4000,1000)   154, A
    PRISRM - PRISON REHABILTATION PROGRAM MULT (MEASURED
          BY $ SPENT)
    PRISRT - PRISON REHAB PROG MULT TABLE
    RHPCR - REHABILITATION PROGRAM COST PER PRISONER
          RATIO ($/PRISONER)

RHPCR.K=RHPCOST*PRISCAP/PRISON.K   155, A
PRISRT=.5/.25/.15/.14/.13   155.1, T
    RHPCR - REHABILITATION PROGRAM COST PER PRISONER
          RATIO ($/PRISONER)
    RHPCOST- REHABILITATION COST PER PRISONER IN PRISON
          ($/PRISONER)
    PRISCAP- PRISON NOMINAL CAPACITY (PEOPLE)
    PRISON - PRISON POPULATION (LIMITED TO BE NON ZERO)
    PRISRT - PRISON REHAB PROG MULT TABLE

UXCER.KL=(1/UXCTTE)*UNEX.K   156, R
    UXCER - UNEMPLOYED EXCONVICT EMPLOYMENT RATE
    UXCTTE - UNEMPLOYED EXCONVICT TIME TO EMPLOYMENT
          (YRS)
    UNEX   - UNEMPLOYED EXCONVICTS

DR6.KL=(DRN/1000)*UNEX.K   157, R
    DR6   - UNEMPLOYED EX CONVICT DEATH RATE
    DRN   - DEATH RATE NORMAL (DEATHS/1000 POPULATION)
    UNEX   - UNEMPLOYED EXCONVICTS

      EMPLOYED EXCONVICT LEVEL

EMEXC.K=EMEXC.J+DT*(FXCER.J*PRRR.JK+UXCER.JK-   158, L
 EXCCR.JK-RREXC.JK-DR7.JK)
    EMEXC - EMPLOYED EXCONVICTS THAT HAVE NOT BECOME
          FREE CRIMINALS
    FXCER - FREED EX CONVICT EMPLOYMENT RATIO (% THAT
          ARE IMMED EMPLOYED)
    PRRR   - PRISON RELEASE RATE (END OF SENTENCE OR
          OTHER UNSUPERVISED)
    UXCER - UNEMPLOYED EXCONVICT EMPLOYMENT RATE
    EXCCR - EMPLOYED EXCONVICT CRIME RATE
    RREXC - RATE EMPLOYED EX CONVICT RETURN TO THE NON
          CRIM POPULATION
    DR7   - EMPLOYED EXCONVICT DEATH RATE

EXCCR.KL=EXCCM*AOCD.K*(SCR/100000)*EMEXC.K*   159, R
 PRISCRM.K
    EXCCR - EMPLOYED EXCONVICT CRIME RATE
    EXCCM - EMPLOYED EXCONVICT CRIME RATE MULTIPLIER
    AOCD   - ATTRACTIVENESS OF CRIME DELAYED
    SCR   - STANDARD CRIME RATE (CRIMES PER YR/100,000
          POPULATION)
    EMEXC - EMPLOYED EXCONVICTS THAT HAVE NOT BECOME
          FREE CRIMINALS
    PRISCRM- PRISON CROWDING AND REHABILITAION PROGRAM
          MULTIPLIER

RREXC.KL=FIFGE(RREXC1.K,RREXC2.K,EMEXC.K,AEMEXC.K)   160, R
    RREXC - RATE EMPLOYED EX CONVICT RETURN TO THE NON
                CRIM POPULATION
    RREXC1 - RREXC ADJUSTED FOR THE FLOW TIME
    RREXC2 - RREXC WITHOUT FOW TIME   FLOW TIME
                ADJUSTMENT
    EMEXC - EMPLOYED EXCONVICTS THAT HAVE NOT BECOME
                FREE CRIMINALS
    AEMEXC - AVERAGE EMPLOYED EX CONVICT LEVEL

RREXC1.K=AEMEXC.K/(REHABTX*AOCERHT.K*PRISCRM.K)   161, A
    RREXC1 - RREXC ADJUSTED FOR THE FLOW TIME
    AEMEXC - AVERAGE EMPLOYED EX CONVICT LEVEL
    REHABTX- EMPLOYED EXCONVICT REHABILITAION TIME (YRS)
    AOCERHT- AOC EFFECT ON REHABILITATION TIMES
    PRISCRM- PRISON CROWDING AND REHABILITAION PROGRAM
                MULTIPLIER

RREXC2.K=EMEXC.K/(REHABTX*AOCERHT.K*PRISCRM.K)   162, A
    RREXC2 - RREXC WITHOUT FOW TIME   FLOW TIME
                ADJUSTMENT
    EMEXC - EMPLOYED EXCONVICTS THAT HAVE NOT BECOME
                FREE CRIMINALS
    REHABTX- EMPLOYED EXCONVICT REHABILITAION TIME (YRS)
    AOCERHT- AOC EFFECT ON REHABILITATION TIMES
    PRISCRM- PRISON CROWDING AND REHABILITAION PROGRAM
                MULTIPLIER

AEMEXC.K=SMOOTH(AEXCR.JK,REHABTX)   163, A
    AEMEXC - AVERAGE EMPLOYED EX CONVICT LEVEL
    AEXCR - RATE USE TO AVERAGE EMEXC
    REHABTX- EMPLOYED EXCONVICT REHABILITAION TIME (YRS)

AEXCR.KL=EMEXC.K   164, R
    AEXCR - RATE USE TO AVERAGE EMEXC
    EMEXC - EMPLOYED EXCONVICTS THAT HAVE NOT BECOME
                FREE CRIMINALS

DR7.KL=(DRN/1000)*EMEXC.K   165, R
    DR7   - EMPLOYED EXCONVICT DEATH RATE
    DRN   - DEATH RATE NORMAL (DEATHS/1000 POPULATION)
    EMEXC - EMPLOYED EXCONVICTS THAT HAVE NOT BECOME
                FREE CRIMINALS

    PAROLE LEVEL

PAROLE.K=PAROLE.J+DT*(PAPR.JK-PARCP.JK-CPARR.JK-   166, L
    DR8.JK)
    PAROLE - NUMBER OF PEOPLE ON PAROLE THAT HAVE NOT
                BECOME FCRIMINALS
    PARR   - PAROLE RATE
    PARCR - PEOPLE ON PAROLE CRIME RATE
    CPARR - RATE AT WHICH PEOPLE COMPLETE PAROLE
    DR8   - PEOPLE ON PAROLE DEATH RATE

DR8.KL=(DRN/1000)*PAROLE.K   167, R
    DR8   - PEOPLE ON PAROLE DEATH RATE
    DRN   - DEATH RATE NORMAL (DEATHS/1000 POPULATION)
    PAROLE - NUMBER OF PEOPLE ON PAROLE THAT HAVE NOT
            BECOME FCRIMINALS

PARCR.KL=(SCR/100000)*PARCRM*PAROLE.K*ADCD.K*   168, R
  PRISCRM.K
    PARCR - PEOPLE ON PAROLE CRIME RATE
    SCR   - STANDARD CRIME RATE (CRIMES PER YR/100,000
            POPULATION)
    PARCRM - PEOPLE ON PAROLE CRIME RATE MULTIPLIER
    PAROLE - NUMBER OF PEOPLE ON PAROLE THAT HAVE NOT
            BECOME FCRIMINALS
    ADCD   - ATTRACTIVENESS OF CRIME DELAYED
    PRISCRM- PRISON CROWDING AND REHABILITAION PROGRAM
            MULTIPLIER

CPARR.KL=APAROLE.K/AVEPART   169, R
    CPARR - RATE AT WHICH PEOPLE COMPLETE PAROLE
    APAROLE- AVERAGE NUMBER OF PEOPLE ON PAROLE
    AVEPART- AVERAGE PAROLE TIME (YRS)

APAROLE.K=SMOOTH(PAROLER.JK,AVEPART)   170, A
    APAROLE- AVERAGE NUMBER OF PEOPLE ON PAROLE
    PAROLER- RATE USED IN AVERAGING PAROLE
    AVEPART- AVERAGE PAROLE TIME (YRS)

PAROLER.KL=PAROLE.K   171, R
    PAROLER- RATE USED IN AVERAGING PAROLE
    PAROLE - NUMBER OF PEOPLE ON PAROLE THAT HAVE NOT
            BECOME FCRIMINALS

   COMPLETED PAROLE LEVEL

CPAR.K=CPAR.J+DT*(CPARR.JK-CPARCR.JK-RRPAR.JK-   172, L
  DR9.JK)
    CPAR   - COMPLETED PAROLE BUT NOT RETURNED TO BE
            FCRIM OR NON CRIMINALS
    CPARR - RATE AT WHICH PEOPLE COMPLETE PAROLE
    CPARCR - COMPLETED PAROLE CRIME RATE
    RRPAR - RETURN RATE TO NCP FOR THOSE WHO HAVE
            COMPLETED PAROLE
    DR9   - DEATH RATE FOR COMPLETED PAROLE

DR9.KL=(DRN/1000)*CPAR.K   173, R
    DR9   - DEATH RATE FOR COMPLETED PAROLE
    DRN   - DEATH RATE NORMAL (DEATHS/1000 POPULATION)
    CPAR   - COMPLETED PAROLE BUT NOT RETURNED TO BE
            FCRIM OR NON CRIMINALS

CPARCR.KL=(SCP/100000)*CPARCRM*AOCD.K*CPAR.K*   174, R
   PRISCRM.K
      CPARCR - COMPLETED PAROLE CRIME RATE
      SCR   - STANDARD CRIME RATE (CRIMES PER YR/100,000
               POPULATION)
      CPARCRM- PEOPLE WHO HAVE COMPLETED PAROLE CRIME RATE
               MULTIPLIER
      AOCD   - ATTRACTIVENESS OF CRIME DELAYED
      CPAR   - COMPLETED PAROLE BUT NOT RETURNED TO BE
               FCRIM OR NON CRIMINALS
      PRISCRM- PRISON CROWDING AND REHABILITAION PROGRAM
               MULTIPLIER

RRPAR.KL=FIFGE(RRPAR1.K,RRPAR2.K,CPAR.K,ACPAR.K)   175, R
      RRPAR - RETURN RATE TO NCP FOR THOSE WHO HAVE
               COMPLETED PAROLE
      RRPAR1 - RRPAR NOT ADJUSTED FOR FLOW DELAY
      RRPAR2 - RRPAR NOT ADJUSTED FOR FLOW DELAY
      CPAR   - COMPLETED PAROLE BUT NOT RETURNED TO BE
               FCRIM OR NON CRIMINALS
      ACPAR - AVERAGE NUMBER COMPLETED PAROLE

RRPAR1.K=ACPAR.K/(REHABTP*AOCERHT.K*PRISCRM.K)   176, A
      RRPAR1 - RRPAR NOT ADJUSTED FOR FLOW DELAY
      ACPAR - AVERAGE NUMBER COMPLETED PAROLE
      REHABTP- PEOPLE ON PAROLE REHABILITATION TIME (YRS)
      AOCERHT- AOC EFFECT ON REHABILITATION TIMES
      PRISCRM- PRISON CROWDING AND REHABILITAION PROGRAM
               MULTIPLIER

RRPAR2.K=CPAR.K/(REHABTP*AOCERHT.K*PRISCRM.K)   177, A
      RRPAR2 - RRPAR NOT ADJUSTED FOR FLOW DELAY
      CPAR   - COMPLETED PAROLE BUT NOT RETURNED TO BE
               FCRIM OR NON CRIMINALS
      REHABTP- PEOPLE ON PAROLE REHABILITATION TIME (YRS)
      AOCERHT- AOC EFFECT ON REHABILITATION TIMES
      PRISCRM- PRISON CROWDING AND REHABILITAION PROGRAM
               MULTIPLIER

ACPAR.K=SMOOTH(CPAROLR.JK,REHABTP)   178, A
      ACPAR - AVERAGE NUMBER COMPLETED PAROLE
      CPAROLR- RATE USED TO AVERAGE CPAR
      REHABTP- PEOPLE ON PAROLE REHABILITATION TIME (YRS)

CPAROLR.KL=CPAR.K   179, R
      CPAROLR- RATE USED TO AVERAGE CPAR
      CPAR   - COMPLETED PAROLE BUT NOT RETURNED TO BE
               FCRIM OR NON CRIMINALS

PROBATION LEVEL

PROB.K=PROB.J+DT*(GPJPBR*GPJR.JK+CONPBR*CON_JR.JK+   180, L
   CWOBPBR*CWOBR.JK+GPBPBR*GPBR.JK-PROBCR.JK-
   CPROBR.JK-DR10.JK)
     PROB   - NUMBER ON PROBATION NOT RETURNED TO FCRIM
     GPJPBR - GUILTY PLEA FROM JAIL TO PROBATION RATIO
     GPJR   - GUILTY PLEA FROM JAIL RATE
     CONPBR - CONVICTED FROM JAIL TO PROBATION RATIO
     CON_JR - CONVICTED FROM JAIL RATE
     CWOBPBR - CONVICTED WHILE ON BAIL TO PROBATION RATIO
     CWOBR   - CONVICTED WHILE ON BAIL RATE
     GPBPBR - GUILTY PLEA FROM BAIL TO PROBATION RATIO
     GPBR   - GUILTY PLEA WHILE ON BAIL RATE
     PROBCR - CRIME RATE OF THOSE ON PROBATION THAT HAVE
                  NOT BECOME FCRIM
     CPROBR - RATE AT WHICH PROBATION IS COMPLETED
     DR10   - DEATH RATE OF THOS IN PROB

DR10.KL=(DRN/1000)*PPROB.K   181, R
     DR10   - DEATH RATE OF THOS IN PROB
     DRN   - DEATH RATE NORMAL (DEATHS/1000 POPULATION)
     PROB   - NUMBER ON PROBATION NOT RETURNED TO FCRIM

CPROBR.KL=APROB.K/APROBT   182, R
     CPROBR - RATE AT WHICH PROBATION IS COMPLETED
     APROB   - AVERAGE NUMBER IN PROBATION
     APROBT - AVERAGE PROBATION TIME (YRS)

APROB.K=SMOOTH(PROBR.JK,APPOBT)   183, A
     APROB   - AVERAGE NUMBER IN PROBATION
     PROBR   - RATE USED FOR APROB CALC
     APROBT - AVERAGE PROBATION TIME (YRS)

PROBR.KL=PROB.K   184, R
     PROBR   - RATE USED FOR APROB CALC
     PROB   - NUMBER ON PROBATION NOT RETURNED TO FCRIM

      COMPLETED PROBATION LEVEL

CPROB.K=CPROB.J+DT*(CPROBR.JK-RRPROB.JK-CPBCR.JK-   185, L
   DR11.JK)
     CPROB   - NUMBER COMPLETED PROBATION AND NOT RETURNED
                  TO FCRIM OR NCP
     CPROBR - RATE AT WHICH PROBATION IS COMPLETED
     RRPROB - RETURN RATE TO NCP OF THOSE WHO HAVE
                  COMPLETED PROB
     CPBCR   - COMPLETED PROBATION CRIME RATE
     DR11   - DEATH RATE OF THOSE IN CPROB

DR11.KL=(DRN/1000)*CPROB.K   186, R
     DR11   - DEATH RATE OF THOSE IN CPROB
     DRN   - DEATH RATE NORMAL (DEATHS/1000 POPULATION)
     CPROB   - NUMBER COMPLETED PROBATION AND NOT RETURNED
                  TO FCRIM OR NCP

RRPROB.KL=FIFGE(RRPROB1.K,RRPROB2.K,CPROB.K,   187, R
    ACPROB.K)
        RRPROB - RETURN RATE TO NCP OF THOSE WHO HAVE
                 COMPLETED PROB
        RRPROB1- RRPROB ADJUSTED FOR FLOW DELAY
        RRPROB2- RRPROB NOT ADJUSTED FOR FLOW DELAY
        CPROB - NUMBER COMPLETED PROBATION AND NOT RETURNED
                 TO FCRIM OR NCP
        ACPROB - AVERAGE NUMBER IN COMPLETED PROBATION

RRPROB1.K=ACPROB.K/(RHTPROB*AOCERHT.K)   188, A
        RRPROB1- RRPROB ADJUSTED FOR FLOW DELAY
        ACPROB - AVERAGE NUMBER IN COMPLETED PROBATION
        RHTPROB- PEOPLE ON PROBATION REHABILITAION TIME
                 (YRS)
        AOCERHT- AOC EFFECT ON REHABILITATION TIMES

RRPROB2.K=CPROB.K/(RHTPROB*AOCERHT.K)   189, A
        RRPROB2- RRPROB NOT ADJUSTED FOR FLOW DELAY
        CPROB - NUMBER COMPLETED PROBATION AND NOT RETURNED
                 TO FCRIM OR NCP
        RHTPROB- PEOPLE ON PROBATION REHABILITAION TIME
                 (YRS)
        AOCERHT- AOC EFFECT ON REHABILITATION TIMES

ACPROB.K=SMOOTH(CPROBRT.JK,RHTPROB)   190, A
        ACPROB - AVERAGE NUMBER IN COMPLETED PROBATION
        CPROBRT- RATE USED IN AVE CPROB CALCULATION
        RHTPROB- PEOPLE ON PROBATION REHABILITAION TIME
                 (YRS)

CPROBRT.KL=CPROB.K   191, R
        CPROBRT- RATE USED IN AVE CPROB CALCULATION
        CPROB - NUMBER COMPLETED PROBATION AND NOT RETURNED
                 TO FCRIM OR NCP

CPBCR.KL=(SCR/100000)*AOCD.K*CPBCRM*CPROB.K   192, R
        CPBCR - COMPLETED PROBATION CRIME RATE
        SCR   - STANDARD CRIME RATE (CRIMES PER YR/100,000
                 POPULATION)
        AOCD   - ATTRACTIVENESS OF CRIME DELAYED
        CPBCRM - COMPLETED PROBATION CRIME RATE MULTIPLIER
        CPROB - NUMBER COMPLETED PROBATION AND NOT RETURNED
                 TO FCRIM OR NCP

            COURTBACKLOG LEVEL

COURTBL.K=JAIL.K+DROB.K   193, A
        COURTBL- COURT BACKLOG (NUMBER OF PEOPLE)
        JAIL   - JAIL POPULATION
        DROB   - THE NUMBER BELIEVED TO BE CURRENTLY
                 RELEASED ON BAIL

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TRIALR.KL=TRIALDM.K*CTCAP                                    194, R
     TRIALR - COURT TRIAL RATE (TRIALS PER YEAR)
     TRIALDM- TRIAL DELAY MULTIPLIER TO ADJUST COURT
                CAPACITY TO NEED
     CTCAP  - COURT CAPACITY (TRIALS/YR)


TRIALDM.K=TABLE(TRDMT,AVCTBL.K,0,2,.2)                        195, A
TRDMT=0/.75/1/1.15/1.25/1.3/1.35/1.4/1.45/1.5/1.55  195.1, T
     TRIALDM- TRIAL DELAY MULTIPLIER TO ADJUST COURT
                CAPACITY TO NEED
     TRDMT  - TRIAL DELAY MULTIPLIER TABLE
     AVCTBL - AVERAGE COUURT BACKLOG  (YRS)


AVCTBL.K=SMOOTH(CTBLR.JK,TTCCC)                               196, A
     AVCTBL - AVERAGE COUURT BACKLOG  (YRS)
     CTBLR  - RATE USED IN AVERAGING COURT BACKLOG
     TTCCC  - TIME TO CHANGE COURT CAPACITY BY ADJUSTING
                OVERTIME, ETC. (YRS)


CTBLR.KL=COURTBL.K/CTCAP                                      197, R
     CTBLR  - RATE USED IN AVERAGING COURT BACKLOG
     COURTBL- COURT BACKLOG (NUMBER OF PEOPLE)
     CTCAP  - COURT CAPACITY (TRIALS/YR)


CTBLYRS.K=COURTBL.K/CTCAP                                     198, A
     CTBLYRS- COURT BACKLOG IN YEARS
     COURTBL- COURT BACKLOG (NUMBER OF PEOPLE)
     CTCAP  - COURT CAPACITY (TRIALS/YR)


BAILBL.K=(DROB.K/CTCAP)(1/(1-TRJAIL.K))                       199, A
     BAILBL - BAIL BACKLOG (YRS)
     DROB   - THE NUMBER BELIEVED TO BE CURRENTLY
                RELEASED ON BAIL
     CTCAP  - COURT CAPACITY (TRIALS/YR)
     TRJAIL - TRIAL RATIO FROM JAIL


JAILBL.K=(JAIL.K/CTCAP)*(1/TRJAIL.K)                          200, A
     JAILBL - JAIL BACKLOG (YRS)
     JAIL   - JAIL POPULATION
     CTCAP  - COURT CAPACITY (TRIALS/YR)
     TRJAIL - TRIAL RATIO FROM JAIL


     COST CALCULATIONS


ACOST.K=PRISC.K+JAILC.K+PROBC.K+PARC.K+POLICEC.K+     201, A
  CRIMEC.K+COURTC.K
     ACOST  - ANNUAL COST OF CRIME ($/YR)
     PRISC  - ANNUAL PRISON COST ($/YR)
     JAILC  - ANNUAL JAIL COST ($/YR)
     PROBC  - ANNUAL PROBCATION COST ($/YR)
     PARC   - PAROLE COST ($/YR)
     POLICEC- ANNUAL POLICE COST ($/YR)
     CRIMEC - ANNUAL DIRECT LOSS DUE TO INDIVIDUAL CRIMES
                ($/YR)
     COURTC - COURT COST ($/YR)
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COURTC.K=TRRATE.K*CPERTR   202, A
     COURTC - COURT COST ($/YR)
     CPERTR - AVERAGE COST PER TRIAL - NOT INCLUDING
               DEFENSE COSTS ($/TRIAL)

PRISC.K=(FPCOST+RHPCOST)*PRISCAP+MPCOST*PRISON.K   203, A
     PRISC   - ANNUAL PRISON COST ($/YR)
     FPCOST - FIXED PRISON COST PER NOMINAL PRISONER
               CAPACITY ($/CELL CAP)
     RHPCOST- REHABILITATION COST PER PRISONER IN PRISON
               ($/PRISONER)
     PRISCAP- PRISON NOMINAL CAPACITY (PEOPLE)
     MPCOST - MARGINAL PRISON COST ($/ACTUAL PRISONER) -
               FOOD, ETC.
     PRISON - PRISON POPULATION (LIMITED TO BE NON ZERO)

JAILC.K=FJCOST*JCAP+MJCOST*JAIL.K   204, A
     JAILC   - ANNUAL JAIL COST ($/YR)
     FJCOST - FIXED JAIL COST PER NOMINAL CAPICITY ($/
               PRISONER CAPACITY)
     JCAP   - NOMINAL JAIL CAPACITY (PEOPLE)
     MJCOST - MARGINAL JAIL COST PER ACTUAL PRISONER PER
               YR
     JAIL   - JAIL POPULATION

PROBC.K=(DPROB.K/PROBWL)*PROBOC   205, A
     PROBC   - ANNUAL PROBCATION COST ($/YR)
     DPROB   - NUMBER OF PEOPLE BELIEVE TO BE CURRENTLY ON
               PROBATION (PEOPLE)
     PROBWL - PROBATION OFFICER WORKLOAD (PEOPLE/
               PROBATION OFFICER)
     PROBOC - ANNUAL PROBATION OFFICER COST INCLUDING
               OVERHEAD ($/YR)

PARC.K=(DPAR.K/PARWL)*PAROC   206, A
     PARC   - PAROLE COST ($/YR)
     DPAR   - NUMBER BELIEVED TO BE CURRENTLY ON PAROLE
               (PEOPLE)
     PARWL   - PAROLE OFFICER WORKLOAD (PEOPLE/PAROLE
               OFFICER)
     PAROC   - ANNUAL PAROLE OFFICER COST INCLUDING
               OVERHEAD ($/YR)

POLICEC.K=POLICE*POLOFC   207, A
     POLICEC- ANNUAL POLICE COST ($/YR)
     POLICE - NUMBER OF POLICE WITHIN THE SYSTEM BOUNDRY
     POLOFC - ANNUAL POLICE OFFICER COST INCLUDING ALL
               EQUIP ($/YR)

CRIMEC.K=SMTCR.K*AVECPC   208, A
     CRIMEC - ANNUAL DIRECT LOSS DUE TO INDIVIDUAL CRIMES
               ($/YR)
     SMTCR   - SMOOTHED TOTAL CRIME RATE (CRIMES/YR)
     AVECPC - AVERAGE COST PER CRIME ($/CRIME)

COST ACCUMULATIONS

TCOST.K=TCOST.J+DT*ACOSTR.JK   209, L
    TCOST - TOTAL ACCUMULATED COST OF CRIME ($)
    ACOSTR - COST RATE USED TO CALC TOTAL COST

ACOSTR.KL=ACOST.K   210, R
    ACOSTR - COST RATE USED TO CALC TOTAL COST
    ACOST - ANNUAL COST OF CRIME ($/YR)

NPVCOST.K=NPVCOST.J+DT*DACOSTR.JK   211, L
    NPVCOST- NET PRESENT VALUE OF THE TOTAL COST OF
              CRIME FOR THE RUN LENGTH
    DACOSTR- DISCOUNTED ANNUAL COST RATE (USED IN
              NPVCOST CALC)

DACOSTR.KL=ACOST.K/DISF.K   212, R
    DACOSTR- DISCOUNTED ANNUAL COST RATE (USED IN
              NPVCOST CALC)
    ACOST - ANNUAL COST OF CRIME ($/YR)
    DISF   - DISCOUNT FACTOR (USED TO DISCOUNT ANNUAL
              COST)

    DISCOUNT FACTOR

DISF.K=DISF.J+DT*DISFR.JK   213, L
    DISF   - DISCOUNT FACTOR (USED TO DISCOUNT ANNUAL
              COST)
    DISFR - DISCOUNT FACTOR RATE USED IN DISCOUNT
              FACTOR CALC

DISFR.KL=(DISR)*DISF.K   214, R
    DISFR - DISCOUNT FACTOR RATE USED IN DISCOUNT
              FACTOR CALC
    DISR   - DISCOUNT RATE (INTEREST RATE USED FOR COST
              OF CAPITAL)
    DISF   - DISCOUNT FACTOR (USED TO DISCOUNT ANNUAL
              COST)

    MISCELLANEOUS EQUATIONS

TOTPOP.K=OUTPOP.K+JAIL.K+PRISON.K   215, A
    TOTPOP - TOTAL POPULATION (PEOPLE)
    OUTPOP - POPULATION OUTSIDE JAIL OR PRISON
    JAIL   - JAIL POPULATION
    PRISON - PRISON POPULATION (LIMITED TO BE NON ZERO)

DROB.K=DROB.J+DT*(ARTOBR.J*AR.JK-GPBR.JK-FCBR.JK-   216, L
   CWOBR.JK-BJR.JK-DR5.JK-DROBAR.JK)
      DROB   - THE NUMBER BELIEVED TO BE CURRENTLY
                 RELEASED ON BAIL
      ARTOBR - APPEST TO BAIL RATIO
      AR   - ARREST RATE
      GPBR   - GUILTY PLEA WHILE ON BAIL RATE
      CWOBR - CONVICTED WHILE ON BAIL RATE
      BJR   - BAIL JUMP RATE (PEOPLE/YR)
      DR5   - DEATH RATE FOR RELEASED ON BAIL
      DROBAR - DROB ARREST RATE (PEOPLE/YR)

BJR.KL=DROB.K*BAILJP   217, R
      BJR   - BAIL JUMP RATE (PEOPLE/YR)
      DROB   - THE NUMBER BELIEVED TO BE CURRENTLY
                 RELEASED ON BAIL
      BAILJP - BAIL JUMP PROBABILITY (THOSE JUMPING BAIL/
                 TOTAL ON BAIL)

DROBAR.KL=ARPBFC.K*SCR*1E-5*AOCD.K*((DROB.K-ROB.K)*   218, P
   FCRIMMX+ROB.K*ROBCRM)
      DROBAR - DROB ARREST RATE (PEOPLE/YR)
      ARPBFC - ARPEST PROBABILITY - FREE CRIMINALS
      SCR   - STANDARD CRIME RATE (CRIMES PER YR/100,000
                 POPULATION)
      AOCD   - ATTRACTIVENESS OF CRIME DELAYED
      DROB   - THE NUMBER BELIEVED TO BE CURRENTLY
                 RELEASED ON BAIL
      ROB   - RELEASED ON BAIL (PEOPLE) AND NOT BECOME
                 FCRIM
      FCRIMMX- FREE CRIMINAL CRIME RATE MULTIPLIER
      ROBCRM - RELEASED ON BAIL CRIME RATE MULTIPLIER

ARPBFC.K=((1-FNOARR.K)*FIFGE(POLCAP.K,POLARR.K,   219, A
   POLARR.K,POLCAP.K))/((FCRIM.K-DOPEAD.K)*AOCD.K*
   SCR*1E-5*FCRIMMX+SDADCR*DOPEAD.K)
      ARPBFC - ARREST PROBABILITY - FREE CRIMINALS
      FNOARR - FREE NEW OFFENDER ARREST RATIO
      POLCAP - POLICE CAPACITY TO MAKE ARRESTS (MEN AND
                 EFFECTIVENESS)
      POLARR - POLICE ARREST RATE (USED AS LONG AS IT IS
                 LESS THAN POLCAP)
      FCRIM - FREE CRIMINALS (INCLUDING DOPE ADDICTS)
      DOPEAD - NUMBER OF DOPE ADDICTS (PEOPLE)
      AOCD   - ATTRACTIVENESS OF CRIME DELAYED
      SCR   - STANDARD CRIME RATE (CRIMES PER YR/100,000
                 POPULATION)
      FCRIMMX- FREE CRIMINAL CRIME RATE MULTIPLIER
      SDADCR - STANDARD DOPE ADDICT CRIME RATE (CRIMES/YR)

DPAR.K=DPAR.J+DT*(PARR.JK-CPARR.JK-PARVR.JK-DR8.JK-   220, L
  DPARAR.JK)
     DPAR   - NUMBER BELIEVED TO BE CURRENTLY ON PAROLE
               (PEOPLE)
     PARR   - PAROLE RATE
     CPARR   - RATE AT WHICH PEOPLE COMPLETE PAROLE
     PARVR   - PAROLE VIOLATION RATE (PEOPLE/YR)
     DR8   - PEOPLE ON PAROLE DEATH RATE
     DPARAR - DPAR ARREST RATE (PEOPLE/YR)

PARVR.KL=PARVP*DPAR.K   221, R
     PARVR   - PAROLE VIOLATION RATE (PEOPLE/YR)
     PARVP   - PAROLE VIOLATION PROBABILITY (VIOLATORS/
               TOTAL ON PAROLE)
     DPAR   - NUMBER BELIEVED TO BE CURRENTLY ON PAROLE
               (PEOPLE)

DPARAR.KL=ARPBFC.K*SCR*1E-5*ADCD.K*((DPAR.K-   222, R
  PAROLE.K)*FCRIMMX+PAROLE.K*PARCRM)
     DPARAR - DPAR ARREST RATE (PEOPLE/YR)
     ARPBFC - ARREST PROBABILITY - FREE CRIMINALS
     SCR   - STANDARD CRIME RATE (CRIMES PER YR/100,000
               POPULATION)
     ADCD   - ATTRACTIVENESS OF CRIME DELAYED
     DPAR   - NUMBER BELIEVED TO BE CURRENTLY ON PAROLE
               (PEOPLE)
     PAROLE - NUMBER OF PEOPLE ON PAROLE THAT HAVE NOT
               BECOME FCRIMINALS
     FCRIMMX - FREE CRIMINAL CRIME RATE MULTIPLIER
     PARCRM - PEOPLE ON PAROLE CRIME RATE MULTIPLIER

DPROB.K=DPROB.J+DT*(GPJPBR*GPJR.JK+CONPBR*   223, L
  CON_JR.JK+CWOBPBR*CWOBR.JK+GPBPBR*GPBR.JK-
  CPROBR.JK-DR10.JK-PROBVP.JK-DPROBAR.JK)
     DPROB   - NUMBER OF PEOPLE BELIEVE TO BE CURRENTLY ON
               PROBATION (PEOPLE)
     GPJPBR - GUILTY PLEA FROM JAIL TO PROBATION RATIO
     GPJR   - GUILTY PLEA FROM JAIL RATE
     CONPBR - CONVICTED FROM JAIL TO PROBATION RATIO
     CON_JR - CONVICTED FROM JAIL RATE
     CWOBPBR - CONVICTED WHILE ON BAIL TO PROBATION RATIO
     CWOBR   - CONVICTED WHILE ON BAIL RATE
     GPBPBR - GUILTY PLEA FROM BAIL TO PROBATION RATIO
     GPBR   - GUILTY PLEA WHILE ON BAIL RATE
     CPROBR - RATE AT WHICH PROBATION IS COMPLETED
     DR10   - DEATH RATE OF THOS IN PROB
     PROBVP - PROBATION VIOLATION RATE (P/YR)
     DPROBAR - DPROB ARREST RATE (P/YR)

DPROBAR.KL=ARPBFC.K*((DPROB.K-PROB.K)*FCRIMMX+   224, P
  PROB.K*PROBCRM)*AOCD.K*SCR*1E-5
    DPROBAR- DPROB ARREST RATE (P/YR)
    ARPBFC - ARREST PROBABILITY - FREE CRIMINALS
    DPRUB - NUMBER OF PEOPLE BELIEVE TO BE CURRENTLY ON
             PROBATION (PEOPLE)
    PROB   - NUMBER ON PROBATION NOT RETURNED TO FCRIM
    FCRIMMX- FREE CRIMINAL CRIME RATE MULTIPLIER
    PROBCRM- PEOPLE ON PROBATION CRIME RATE MULTIPLIER
    AOCD   - ATTRACTIVENESS OF CRIME DELAYED
    SCR   - STANDARD CRIME RATE (CRIMES PER YR/100,000
             POPULATION)

PROBVP.KL=PROBVR*DPROB.K   225, P
    PROBVP - PROBATION VIOLATION RATE (P/YR)
    PROBVR - PROBATION VIOLATION PROBABILITY (VIOLATORS/
             TOTAL ON PROBATION)
    DPROB - NUMBER OF PEOPLE BELIEVE TO BE CURRENTLY ON
             PROBATION (PEOPLE)

  CONSTANTS   FOLLOW

GPBPBR=.16   225.5, C
CWOBPBR=.08   225.6, C
GPJPBR=.14   225.7, C
CONPBR=.06   225.8, C
CONRCR=.64   225.9, C
    GPBPBR - GUILTY PLEA FROM BAIL TO PROBATION RATIO
    CWOBPBR- CONVICTED WHILE ON BAIL TO PROBATION RATIO
    GPJPBR - GUILTY PLEA FROM JAIL TO PROBATION RATIO
    CONPBR - CONVICTED FROM JAIL TO PROBATION RATIO
    CONRCR - CONVICTED FROM JAIL TO RELEASED CRIMINAL
             RATIO (FINES, ETC.)

GPJRCR=.73   226, C
CWOBRCR=.7   226.1, C
GPBRCR=.75   226.2, C
PRISCAP=2500   226.3, C
POLICE=10500   226.4, C
BRN=14   226.5, C
CTCAP=43700   226.6, C
TTCCC=.2   226.7, C
    GPJRCR - GUILTY PLEA FROM JAIL TO RELEASED CRIM
             RATIO (FINES, ETC.)
    CWOBRCR- CONVICTED WHILE ON BAIL TO REL CRIM RATIO
             (FINES, ETC.)
    GPBRCR - GUILTY PLEA WHILE ON BAIL TO REL CRIM RATIO
             (FINES, ETC.)
    PRISCAP- PRISON NOMINAL CAPACITY (PEOPLE)
    POLICE - NUMBER OF POLICE WITHIN THE SYSTEM BOUNDRY
    BRN   - BIRTH RATE NORMAL (PEOPLE/1000 POPULATION)
    CTCAP - COURT CAPACITY (TRIALS/YR)
    TTCCC - TIME TO CHANGE COURT CAPACITY BY ADJUSTING
             OVERTIME, ETC. (YRS)

CONVR=.52   226.9, C
    CONVR   - CONVICTION RATIO OF THOSE TRIED FROM JAIL

CJVRB=.44   227, C
PSEN=20   227.1, C
DRN=14   227.2, C
JCAP=1460   227.3, C
    COVRB   - CONVICTION RATIO OF THOSE TRIED FROM BAIL
    PSEN   - PERCENTAGE OF NOMINAL SENTENCE OFFERED FOR
              A GUILTY PLEA (%)
    DRN   - DEATH RATE NORMAL (DEATHS/1000 POPULATION)
    JCAP   - NOMINAL JAIL CAPACITY (PEOPLE)

CRSMT=1   227.5, C
NRCONST=1   227.6, C
TRSMT=.3   227.7, C
REPR=.4   227.8, C
FXCERC=.7   227.9, C
    CRSMT   - CRIME RATE SMOOTHING TIME (YRS)
    NRCONST- NEWS REPORTING RATIO CONSTANT
    TRSMT   - TRIAL RATE SMOOTHING TIME
    REPR   - CRIME REPORTING RATIO (REPORTED/ACTUAL)
    FXCERC - FREED EXCONVICTS EMPLOYMENT RATIO CONSTANT
              (EMPLOYED/UNEMPLOYED)

GPISM=1.34   228, C
ARTOPR=8   228.1, C
PROBOC=15000   228.2, C
PROBWL=137   228.3, C
PARWL=60   228.4, C
PAROC=22000   228.5, C
POLOFC=18000   228.6, C
AVECPC=250   228.7, C
CPERTR=520   228.8, C
BAILJP=.05   228.9, C
    GPISM   - GUILTY PLEA INCENTIVES SCALING MULTIPLIER
    ARTOPR - ARRESTS TO POLICE RATIO (MAXIMUM ARRESTS
              PER YR PER OFFICER)
    PROBOC - ANNUAL PROBATION OFFICER COST INCLUDING
              OVERHEAD ($/YR)
    PROBWL - PROBATION OFFICER WORKLOAD (PEOPLE/
              PROBATION OFFICER)
    PARWL   - PAROLE OFFICER WORKLOAD (PEOPLE/PAROLE
              OFFICER)
    PAROC   - ANNUAL PAROLE OFFICER COST INCLUDING
              OVERHEAD ($/YR)
    POLOFC - ANNUAL POLICE OFFICER COST INCLUDING ALL
              EQUIP ($/YR)
    AVECPC - AVERAGE COST PER CRIME ($/CRIME)
    CPERTR - AVERAGE COST PER TRIAL - NOT INCLUDING
              DEFENSE COSTS ($/TRIAL)
    BAILJP - BAIL JUMP PROBABILITY (THOSE JUMPING BAIL/
              TOTAL ON BAIL)

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PARVP=.1                                           229, C
PROBVR=.1                                          229.1, C
ASENC=0                                            229.2, C
     PARVP   - PAROLE VIOLATION PROBABILITY (VIOLATORS/
                  TOTAL ON PAROLE)
     PROBVR  - PROBATION VIOLATION PROBABILITY (VIOLATORS/
                  TOTAL ON PROBATION)


DISR=.06                                           229.4, C
NOPRSR=.05                                          229.5, C
SCMPOLC=20                                          229.6, C
ROFPEM=10                                           229.7, C
DOPEA=4000                                          229.8, C
ASEN=.75                                            229.9, C
     DISR    - DISCOUNT RATE (INTEREST RATE USED FOR COST
                  OF CAPITAL)
     NOPRSR  - NO PROSECUTE RATIO
     SCMPOLC - SCALING MULTIPLIER FOR POLICE CAPACITY
                  (ADJUST WITH SCMPEFF)
     ROFPEM  - REPEAT OFFENDERS POLICE EFFECTIVENESS
                  MULTIPLIER
     DOPEA   - TOTAL NUMBER OF DOPE ADDICTS IN THE SYSTEM
                  THAT ARE FREE
     ASEN    - AVERAGE PRISON SENTENCE GIVEN BY THE COURTS
                  (YRS)

APROBT=2                                            230, C
AVEPART=2                                           230.1, C
STDGPR=8.57                                         230.2, C
PDELAY=2                                            230.3, C
SCR=1300                                            230.4, C
FOCRM=1                                             230.5, C
RCCRM=290                                           230.6, C
ROBCRM=200                                          230.7, C
SDADCR=50                                           230.8, C
CPBCRM=75                                           230.9, C
     APROBT  - AVERAGE PROBATION TIME (YRS)
     AVEPART - AVERAGE PAROLE TIME (YRS)
     STDGPR  - STANDARD GUILTY PLEA RATE FROM JAIL(MULT
                  FOR GPJR)
     PDELAY  - TIME DELAY TO CHANGE PERCEIVED
                  ATTRACTIVENESS OF CRIME (YRS)
     SCR     - STANDARD CRIME RATE (CRIMES PER YR/100,000
                  POPULATION)
     FOCRM   - FIRST OFFENDERS CRIME RATE MULTIPLIER
     RCCRM   - RELEASED CRIMINALS CRIME RATE MULTIPLIER
     ROBCRM  - RELEASED ON BAIL CRIME RATE MULTIPLIER
     SDADCR  - STANDARD DOPE ADDICT CRIME RATE (CRIMES/YR)
     CPBCRM  - COMPLETED PROBATION CRIME RATE MULTIPLIER
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PROBCRM=150                                         231, C
PARCRM=200                                          231.1, C
CPARCRM=100                                         231.2, C
EXCCM=220                                           231.3, C
UXCTTE=.5                                            231.4, C
ATGPB=1                                              231.5, C
FNOCRM=50                                            231.6, C
UXCCM=420                                            231.7, C
FCRIMMX=420                                          231.8, C
STLIM=15                                             231.9, C
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    PROBCRM- PEOPLE ON PROBATION CRIME RATE MULTIPLIER
    PARCRM - PEOPLE ON PAROLE CRIME RATE MULTIPLIER
    CPARCRM- PEOPLE WHO HAVE COMPLETED PAROLE CRIME RATE
             MULTIPLIER
    EXCCM - EMPLOYED EXCONVICT CRIME RATE MULTIPLIER
    UXCTTE - UNEMPLOYED EXCONVICT TIME TO EMPLOYMENT
             (YRS)
    ATGPB - AVERAGE TIME TO A GUILTY PLEA FOR THOSE ON
             BAIL (YRS)
    FNOCRM - FREE NEW OFFENDER CRIME RATE MULTIPLIER
    UXCCM - UNEMPLOYED EXCONVICT CRIME RATE MULTIPLIER
    FCRIMMX- FREE CRIMINAL CRIME RATE MULTIPLIER
    STLIM - FREE CRIMINAL REHABILITATION TIME

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REHABTX=14                                          232, C
REHABTP=12                                          232.1, C
REHABT=16                                           232.2, C
RHTPROB=11                                          232.3, C
RHABTNU=9.3                                          232.4, C
FPCOST=4000                                         232.5, C
MPCOST=1000                                         232.6, C
RHPCOST=20                                          232.7, C
FJCOST=1000                                         232.8, C
MJCOST=800                                          232.9, C
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    REHABTX- EMPLOYED EXCONVICT REHABILITAION TIME (YRS)
    REHABTP- PEOPLE ON PAROLE REHABILITATION TIME (YRS)
    REHABT - RELEASED CRIMINAL REHABILITATION TIME (YRS)
    RHTPROB- PEOPLE ON PROBATION REHABILITAION TIME
             (YRS)
    RHABTNU- FREE NEW OFFENDERS REHABILITAION TIME (YRS)
    FPCOST - FIXED PRISON COST PER NOMINAL PRISONER
             CAPACITY ($/CELL CAP)
    MPCOST - MARGINAL PRISON COST ($/ACTUAL PRISONER) -
             FOOD, ETC.
    RHPCOST- REHABILITATION COST PER PRISONER IN PRISON
             ($/PRISONER)
    FJCOST - FIXED JAIL COST PER NOMINAL CAPICITY ($/
             PRISONER CAPACITY)
    MJCOST - MARGINAL JAIL COST PER ACTUAL PRISONER PER
             YR

PARBCAP=1260   233, C
FNOPEM=1   233.1, C
ARHTE=.5   233.2, C
SCMAOC=.0485   233.3, C
SCMPEFF=.0345   233.4, C
ACHG=0   233.5, C

     PARBCAP- PAROLE BOARD NOMINAL PROCESSING CAPACITY
              (PEOPLE/YR)
     FNOPEM - FREE NEW OFFENDERS POLICE EFFECTIVENESS
              MULTIPLIER
     ARHTE - AOC - REHABILITATION TIME EXPONENT
     SCMAOC - SCALING MULTIPLIER FOR ATTRACTIVENESS OF
              CRIME
     SCMPEFF- SCALING MULTIPLIER FOR POLICE EFFECTIVENESS
     ACHG   - ATTRACTIVENESS OF CRIME CHANGE

     INITIAL CONDITIONS FOLLOW

DISF=1   234, N
NPVCOST=0   234.1, N
TCOST=0   234.2, N
SMTCR=1010000   234.3, N
TOTPOP=5500000   234.5, N
PRISN=2440   234.6, N
JAILL=1460   234.7, N
AR=81000   234.8, N
DPAR=2530   234.9, N

     DISF   - DISCOUNT FACTOR (USED TO DISCOUNT ANNUAL
              COST)
     NPVCOST- NET PRESENT VALUE OF THE TOTAL COST OF
              CRIME FOR THE RUN LENGTH
     TCOST - TOTAL ACCUMULATED COST OF CRIME ($)
     SMTCR - SMOOTHED TOTAL CRIME RATE (CRIMES/YR)
     TOTPOP - TOTAL POPULATION (PEOPLE)
     PRISN - PRISON BEFORE THE NON ZERO LIMITAION
     JAILL - JAIL POPULATION BEFORE NON ZERO LIMITATION
     AR   - ARREST RATE
     DPAR   - NUMBER BELIEVED TO BE CURRENTLY ON PAROLE
              (PEOPLE)

```
DPRUB=52000                                           235. N
ARPNOM=1.031                                          235.1, N
PROBPSN=.56                                           235.2, N
NCP=TOTPOP-FCRIM-RC-CPRCB-PROB-ROB-UNEX-EMEXC-        235.3, N
  PAROLE-CPAR-FNO-JAIL-PRISON
        DPRUB   - NUMBER OF PEOPLE BELIEVE TO BE CURRENTLY ON
                    PROBATION (PEOPLE)
        ARPNOM  - ARREST PROBABILITY FOR NEW OFFENDERS
                    MULTIPLIER
        PROBPSN- PROBABILITY OF GOING TO PRISON FOR EACH
                    CRIME
        NCP     - NON CRIMINAL POPULATION
        TOTPOP  - TOTAL POPULATION (PEOPLE)
        FCRIM   - FREE CRIMINALS (INCLUDING DOPE ADDICTS)
        RC      - RELEASED CRIMINAL
        CPRUB   - NUMBER COMPLETED PROBATION AND NOT RETURNED
                    TO FCRIM OR NCP
        PRUB    - NUMBER ON PROBATION NOT RETURNED TO FCRIM
        RUB     - RELEASED ON BAIL (PEOPLE) AND NOT BECOME
                    FCRIM
        UNEX    - UNEMPLOYED EXCONVICTS
        EMEXC   - EMPLOYED EXCONVICTS THAT HAVE NOT BECOME
                    FREE CRIMINALS
        PAROLE  - NUMBER OF PEOPLE ON PAROLE THAT HAVE NOT
                    BECOME FCRIMINALS
        CPAR    - COMPLETED PAROLE BUT NOT RETURNED TO BE
                    FCRIM OR NON CRIMINALS
        FNO     - FREE NEW OFFENDERS (HAVE ESSENTIALLY NEVER
                    BEEN ARRESTED)
        JAIL    - JAIL POPULATION
        PRISON  - PRISON POPULATION (LIMITED TO BE NON ZERO)
```

INITIAL CONDITIONS FOLLOW THAT CAN BE AUTOMATICALLY
          CALCULATED FOR A NEW SET OF MODEL BOUNDRIES
          USING THE APPROPRIATE EQUATIONS

FNO=357500	236.1, N
EMEXC=900	236.2, N
RLC=11000	236.3, N
PROB=3000	236.4, N
CPROB=1360	236.5, N
UNEX=170	236.6, N
PAROLE=402	236.7, N
CPAR=143	236.8, N
FCRIN=74770	236.9, N

    FNO   - FREE NEW OFFENDERS (HAVE ESSENTIALLY NEVER
                BEEN ARRESTED)

    EMEXC - EMPLOYED EXCONVICTS THAT HAVE NOT BECOME
                FREE CRIMINALS

    RLC   - RELEASED CRIMINALS BEFORE NON ZERO
                LIMITATION

    PROB   - NUMBER ON PROBATION NOT RETURNED TO FCRIM

    CPROB - NUMBER COMPLETED PROBATION AND NOT RETURNED
                TO FCRIM OR NCP

    UNEX   - UNEMPLOYED EXCONVICTS

    PAROLE - NUMBER OF PEOPLE ON PAROLE THAT HAVE NOT
                BECOME FCRIMINALS

    CPAR   - COMPLETED PAROLE BUT NOT RETURNED TO BE
                FCRIM OR NON CRIMINALS

    FCRIN - FREE CRIMINALS (WITHOUT DOPE ADDICTS)

DROB=10410	237, N
ROB=9300	237.1, N

    DROB   - THE NUMBER BELIEVED TO BE CURRENTLY
                RELEASED ON BAIL

    ROB   - RELEASED ON BAIL (PEOPLE) AND NOT BECOME
                FCRIM

PAGE 1   CRIME-P CRIM JUSTICE SYSTEM DYNAMIC MODEL   4/18/72

NAME	NO	T	DEFINITION	WHERE USED
ACHG	233.5	C	ATTRACTIVENESS OF CRIME CHANGE	AOC,A,1
ACOST	201	A	ANNUAL COST OF CRIME ($/YR)	ACOSTR,R,210/DACOSTP,P,212
ACOSTR	210	P	COST RATE USED TO CALC TOTAL COST	TCOST,L,209
ACPAR	178	A	AVERAGE NUMBER COMPLETED PAROLE	PRPAP,P,175/RRPAR1,A,176
ACPROB	190	A	AVERAGE NUMBER IN COMPLETED PROBATION	PRPROB,R,187/RRPROB1,A,188
AEMEXC	163	A	AVERAGE EMPLOYED EX CONVICT LEVEL	PPEXC,P,160/RREXC1,A,161
AEXCR	164	F	RATE USE TO AVERAGE EMEXC	AEMEXC,A,163
AFCRIM	99	A	AVERAGE NUMBER OF FREE CRIMINALS	PETR,R,101/RETR1,A,102
AFNO	77	A	AVERAGE NUMBER OF FREE NEW OFFENDERS	PPFNO,P,75
AOC	1	A	ATTRACTIVENESS OF CRIME (MULTIPLIER FOR CRIME RATES)	AOCD,A,86
AOCD	86	A	ATTRACTIVENESS OF CRIME DELAYED	FNOCP,P,34/FCMCR,R,46/AOCERHT,A,76/FOCP,R,85/PCBCR,P,89 RCCP,R,95/PPROBCR,R,97/UXCCR,R,150/EXCCR,R,159/PARCP,R, 168/CPAPCR,R,174/CPBCR,R,192/DPROBAR,P,218/ARPBFC,A,219 DPARAP,P,222/DPRORAP,R,224
AOCERHT	76	A	AOC EFFECT ON REHABILITATION TIMES	PRFNO,P,75/RETR1,A,102/RETR2,A,103/RRRC1,A,121/RRPC2,A,122 RREXC1,A,161/RREXC2,A,162/RRPAP1,A,176/RRPAR2,A,177 RRPPOB1,A,188/RRPPOB2,A,190
APAROLE	170	A	AVERAGE NUMBER OF PEOPLE ON PAROLE	CPAPP,P,169
APRIS	134	A	AVERAGE PRISON POPULATION	PPRP,P,131
APROB	183	A	AVERAGE NUMBER IN PROBATION	CPROBR,R,182
APRUBT	230	C	AVERAGE PROBATION TIME (YRS)	CPPJRP,R,182/APROR,A,183
AR	91 235.8	R N	ARREST RATE	SMAP,A,20/FNO,L,80/FCRIN,L,88/JAILL,L,105/RLC,L,119/POB,L, 143/DROP,L,216
ARC	124	A	AVERAGE NUMBER OF RELEASED CRIMINALS	PRRC,P,120/RRRC1,A,121
ARHTE	233.2	C	AOC - REHABILITATION TIME EXPONENT	AOCERHT,A,76
ARPBFC	219	A	ARREST PROBABILITY - FREE CRIMINALS	DPDRAP,P,218/DPARAP,P,222/DPROBAR,R,224
ARPMT	13.1	T	ARREST PROBABILITY MULTIPLIER TABLE	ARPPOBM,A,12
ARPNO	35	A	ARREST PROBABILITY FREE NEW OFFENDERS (%)	ARPNOM,A,42
ARPNUM	42 235.1	A N	ARREST PROBABILITY FOR NEW OFFENDERS MULTIPLIER	FNOCP,R,34/FOCR,R,85
ARPNOT	34.1	T	ARREST PROBABILITY FREE NEW OFFENDERS TABLE	ARPNOM,A,42
ARPHUB	13	A	ARREST PROBABILITY FOR THE AVERAGE POPULATION	ARPROBM,A,12/PCOOPML,A,59
ARPROBM	12	A	ARREST PROBABILITY MULTIPLIER FOR AOC	AOC,A,1
ARTBRA	18	R	RATE USED TO AVERAGE ARTOBR	SARTOBR,A,17
ARTOBR	144	A	ARREST TO BAIL RATIO	APTOBR,R,18/ARTOJR,A,107/POB,L,143/DPOB,L,216
ARTOBRT	144.1	T	ARREST TO BAIL RATIO TABLE	APTOBR,A,144
ARTOJR	107	A	ARREST TO JAIL RATIO	JAILL,L,105
ARTOPR	228.1	C	ARRESTS TO POLICE RATIO (MAXIMUM ARRESTS PER YR PER OFFICER)	POLCAP,A,92
ASCTBLR	71	A	AVERAGE SENTENCE TO COURT BACKLOG RATIO	CRTBLM,A,70
ASEN	229.9	C	AVERAGE PRISON SENTENCE GIVEN BY THE COURTS (YRS)	AVESEN,A,9
ASENC	229.2	C	*AVERAGE PRISON SENTENCE CHANGE*	AVESEN,A,9
ATGPB	231.5	C	AVERAGE TIME TO A GUILTY PLEA FOR THOSE ON BAIL (YRS)	GPBR,P,130
ATGPLEA	117	S	AVERAGE TIME TO A GUILTY PLEA	
AVCTBL	195	A	AVERAGE COURT BACKLOG (YRS)	ASCTRLR,A,71/TRIALDM,A,195
AVECPC	228.7	C	AVERAGE COST PER CRIME ($/CRIME)	CRIMEC,A,208
AVEPART	230.1	C	AVERAGE PAROLE TIME (YRS)	CPAPP,P,169/APAROLE,A,170
AVESEN	9	A	AVERAGE SENTENCE GIVEN BY THE COURT (YRS)	PRRP,P,131/APRIS,A,134
AVSENC			AVERAGE SENTENCE CHANGE (YRS)	
BAILBKL			INITIAL COURT BACKLOG FROM BAIL (USED FOR INITIALIZATION ONLY)	
BAILBL	199	A	BAIL BACKLOG (YRS)	

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BAILJP	228.9 C	BAIL JUMP PROBABILITY (THOSE JUMPING BAIL/ TOTAL ON BAIL)	BJP,P,217
BJR	217	R BAIL JUMP RATE (PEOPLE/YR)	DROB,L,216
BR	83	R BIRTH RATE FOR ALL THE POPULATION OUTSIDE PRISON OR JAIL	NCP,L,74
BRN	226.5 C	BIRTH RATE NORMAL (PEOPLE/1000 POPULATION)	BP,P,83
CBM	2	A COURT BACKLOG MULTIPLIER	ADC,A,1
CBT	2.1 T	COURT BACKLOG MULTIPLIER TABLE	CBM,A,2
CCOMRR	132	A COUNTY COMMISSIONER RELEASE RATE	PPRR,P,131
CCRR	116	R COURT CRIMINAL RELEASE RATE (NOT GUILTY DECISIONS)	SMCCRP,A,19/JAILL,L,105/RLC,L,119
CJN_JR	109	R CONVICTED FROM JAIL RATE	SMCON_J,A,15/JAILL,L,105/RLC,L,119/PRISN,L,128/PROB,L,180 DPROB,L,223
CJVPBR	225.8 C	CONVICTED FROM JAIL TO PROBATION RATIO	SPSNIN,A,6/RCR,A,11/PRISN,L,128/PROB,L,180/DPPOB,L,223
CJVR	59	A *CONVICTION RATIO OF THOSE TRIED FROM JAIL*	CONVRM,A,68
CJNRCR	225.9 C	CONVICTED FROM JAIL TO RELEASED CRIMINAL RATIO (FINES, ETC.)	SPSNIN,A,6/RCR,A,11/RLC,L,119/PRISN,L,128
CJNVR	226.9 C	CONVICTION RATIO OF THOSE TRIED FROM JAIL	CONR,A,69/CCN_JR,R,109/CCRR,R,116/FCRR,R,145
CONVRM	68	A CONVICTION RATIO MULTIPLIER	GPLEAI,A,67/GPBR,R,130
CONVRMT	69.1 T	CONVICTION RATIO MULT TABLE	CONVRM,A,68
COURTBL	193	A COURT BACKLOG (NUMBER OF PEOPLE)	CTBLR,P,197/CTBLYRS,A,198
CJURTC	202	A COURT COST ($/YR)	ACOST,A,201
COVERM	29	A NEWS COVERAGE MULTIPLIER	NEWSM,A,26
COVERMT	29.1 T	COVERAGE MULT TABLE	COVERM,A,29
CJVKB	227	C CONVICTION RATIO OF THOSE TRIED FROM BAIL	CWOBR,R,129
CPAR	172	L COMPLETED PAROLE BUT NOT RETURNED TO BE	FCR,A,23/OUTPOP,A,84/DR9,R,173/CPARCR,R,174/RRPAR,R,175
	236.8 N	ECRIM OR NON CRIMINALS	RPPAP2,A,177/CPAPOLR,R,179/NCP,N,235.3
CPARCR	174	R COMPLETED PAROLE CRIME RATE	SCPARCR,A,32/FCRIN,L,88/CPAR,L,172
CPARCRM	231.2 C	PEOPLE WHO HAVE COMPLETED PAROLE CRIME RATE MULTIPLIER	CPARCR,P,174
CPAROLR	179	R RATE USED TO AVERAGE CPAR	ACPAP,A,178
CPARR	169	R RATE AT WHICH PEOPLE COMPLETE PAROLE	PAROLE,L,166/CPAR,L,172/DPAR,L,220
CPBCR	192	R COMPLETED PROBATION CRIME RATE	SCPBCP,A,45/FCRIN,L,88/CPROB,L,185
CPBCRM	230.9 C	COMPLETED PROBATION CRIME RATE MULTIPLIER	CPBCR,P,192
CPERTR	228.8 C	AVERAGE COST PER TRIAL - NOT INCLUDING DEFENSE COSTS ($/TRIAL)	CCOUPTC,A,202
CPROB	185	L NUMBER COMPLETED PROBATION AND NOT RETURNED	FCR,A,23/OUTPOP,A,84/DR11,R,186/RRPROB,R,187/RRPROB2,A,189
	236.9 N	TO ECRIM OR NCP	CPPOBRT,P,191/CPBCR,R,192/NCP,N,235.3
CPRUBR	162	R RATE AT WHICH PROBATION IS COMPLETED	PPOB,L,180/CPROB,L,185/DPROB,L,223
CPROBRT	191	R RATE USED IN AVE CPPOB CALCULATION	ACPROB,A,190
CRIMEC	208	A ANNUAL DIRECT LOSS DUE TO INDIVIDUAL CRIMES ($/YR)	ACOST,A,201
CRRATIO	62	A CRIME TO POPULATION RATIO (CR/100, 000POPULATION)	PCOOPM2,A,61
CRSMT	227.5 C	CRIME RATE SMOOTHING TIME (YRS)	SMCWOPR,A,7/SMGPBR,A,8/SCPARCR,A,32/SMFNOCR,A,33/SMFNOAR,A ,36/SMUXCCR,A,38/SMEXCCR,A,39/SPAPCR,A,40/SMFOCR,A,41 SMPCCR,A,43/SPROBCR,A,44/SCPBCR,A,45/SMFCMCR,A,48 SMPOBCR,A,49
CRTBLM	70	A COURTBACKLOG MULT	GPLEAI,A,67
CRTBLMT	71.1 T	COURT BACKLOG MULT TABLE	CRTBLM,A,70
CTBLR	197	R RATE USED IN AVERAGING COURT BACKLOG	AVCTRL,A,196
CTBLYRS	198	A COURT BACKLOG IN YEARS	CRM,A,2
CTCAP	226.6 C	COURT CAPACITY (TRIALS/YR)	TRIALRM,A,63/PERTCC,A,64/TRRATE,A,108/CWOBR,R,129/TRIALR,R ,194/CTRLR,R,197/CTBLYRS,A,198/BAILRL,A,199/JAILRL,A,200
CTPB		INITIAL NUMBER RELEASED TO PROBATION IN ONE YR (INIT. ONLY)	
CWOBPBR	225.6 C	CONVICTED WHILE ON BAIL TO PROBATION RATIO	SPSMIN,A,6/PRISN,L,128/PROB,L,180/DPPOB,L,223

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CWJBK    129   R CONVICTED WHILE ON BAIL RATE                     SMCWOBP,A,7/FCRIM,L,88/RLC,L,119/PRISN,L,128/ROR,L,143
                                                                  PROR,L,180/DROB,L,216/DPROR,L,223
CWJBRCR  226.1 C CONVICTED WHILE ON BAIL TO REL CRIM RATIO        SPSNIM,A,6/RLC,L,119/PRISN,L,128
                 (FINES, ETC.)
DACOSTR  212   R DISCOUNTED ANNUAL COST RATE (USED IN NPVCOST     NPVCOST,L,211
                 CALC)
DEALM    72    A DEAL MULTIPLIER (HOW MUCH OF A SENTENCE          GPLEAI,A,67/GPRR,R,130
                 REDUCTION IS OFFERED)
DEALMT   72.1  T DEAL MULT TABLE                                  DEALM,A,72
DISF     213   L DISCOUNT FACTOR  (USED TO DISCOUNT ANNUAL        DACOSTR,P,212/DISFR,R,214
         234   N  COST)
DISFR    214   R DISCOUNT FACTOR RATE USED IN DISCOUNT FACTOR     DISF,L,213
                 CALC
DISR     224.4 C DISCOUNT RATE (INTEREST RATE USED FOR COST       DISFR,P,214
                 OF CAPITAL)
DJPEA    229.8 C TOTAL NUMBER OF DOPE ADDICTS IN THE SYSTEM       DOPEAD,A,47
                 THAT ARE FREE
DOPEAD   47    A NUMBER OF DOPE ADDICTS (PEOPLE)                  FCMCP,P,46/FCRIM,A,87/ARPBFC,A,219
DPAR     220   L NUMBER RELIEVED TO BE CURRENTLY ON PAROLE        PAPC,A,206/PARVR,P,221/DPARAR,P,222
         234.9 N  (PEOPLE)
DPARAR   222   R DPAR ARREST RATE (PEOPLE/YR)                     DPAR,L,220
DPROB    223   L NUMBER OF PEOPLE BELIEVE TO BE CURRENTLY ON      PPOBC,A,205/DPROBAR,R,224/PROBVP,P,225
         235   N  PROBATION (PEOPLE)
DPROBAR  224   R DPROB ARREST RATE (P/YR)                         DPROB,L,223
DR       96    R FREE CRIMINAL DEATH RATE                         FCRIM,L,88
DRN      227.2 C DEATH RATE NORMAL (DEATHS/1000 POPULATION)       DR1,P,79/DR12,R,82/DR,R,96/DR2,R,115/DR3,R,126/DR4,R,138
                                                                  DR5,P,146/DR6,P,157/DR7,R,165/DR8,P,167/DR9,R,173/DR10,P
                                                                  ,181/DR11,R,186
DROB     216   L THE NUMBER BELIEVED TO BE CURRENTLY RELEASED     TPJAIL,A,110/GPRR,R,130/RORR,A,147/COURTBL,A,193/BAILRL,A,
         237   N  ON BAIL                                         109/RJP,P,217/DROBAR,R,218
DROBAR   218   R DROB ARREST RATE (PEOPLE/YR)                     DROB,L,216
DR1      79    P DEATH RATE FOR FREE NEW OFFENDERS                NCP,L,74
DR10     181   R DEATH RATE OF THOS IN PROB                       PPCR,L,180/DPROB,L,223
DR11     186   P DEATH RATE OF THOSE IN CPROB                     CPROR,L,185
DR12     82    R FREE NEW OFFENDER DEATH RATE                     FNO,L,80
DR2      115   R DEATH RATE OF THOSE IN JAIL                      JAILL,L,105
DR3      126   P DEATH  RATE OF RELEASED CRIMINALS                PLC,L,119
DR4      138   P DEATH RATE OF THOSE IN PRISON                    PRISN,L,128
DR5      146   P DEATH RATE FOR RELEASED ON BAIL                  PDR,L,143/DROB,L,216
DR6      157   R UNEMPLOYED EX CONVICT DEATH RATE                 UNEX,L,148
DR7      165   R EMPLOYED EXCONVICT DEATH RATE                    EMEXC,L,158
DR8      167   R PEOPLE ON PAROLE DEATH RATE                      PAROLE,L,166/DPAR,L,220
DR9      173   R DEATH RATE FOR COMPLETED PAROLE                  CPAR,L,172
EAVESEN  139   A EFFECTIVE AVERAGE SENTENCE (YRS)                 SLM,A,3/ASCTBLR,A,71
EMEXC    158   L EMPLOYED EXCONVICTS THAT HAVE NOT BECOME         FCR,A,23/OUTPOP,A,84/EXCCR,R,155/RREXC,P,160/RPEXC2,A,162
         236.2 N  FREE CRIMINALS                                  AEXCP,P,164/DR7,P,165/NCP,N,235.3
EXCCM    231.3 C EMPLOYED EXCONVICT CRIME RATE MULTIPLIER         EXCCR,P,159
EXLCR    159   P EMPLOYED EXCONVICT CRIME RATE                    SMEXCCR,A,39/FCRIM,L,88/EMEXC,L,158
FCBK     145   P                                                  FCRIM,L,88/RLC,L,119/POB,L,143/DROB,L,216
FCMCR    46    P FREE CRIMINAL CRIME RATE (CR/YR)                 SMFCMCR,A,48
FCR      23    A FREED CRIMINAL RATIO                             FCPM,A,22
FCRIM    87    A FREE CRIMINALS (INCLUDING DOPE ADDICTS)          FCMCP,R,46/FNOARR,A,81/OUTPOP,A,84/TFCRIM,A,90/POLAPP,A,94
                                                                  DR,P,96/FCRIR,R,100/RETR,P,101/RETR2,A,103/ARPBFC,A,219
                                                                  NCP,N,235.3
FCRIMM   53    A FREE CRIMINAL MULTIPLIER                         POLCFF,A,52
FCRIMMX  231.P C FREE CRIMINAL CRIME RATE MULTIPLIER              FCMCR,P,46/DROBAR,R,218/ARPBFC,A,219/DPARAR,R,222/DPPORAR,
                                                                  P,224
FCRIMR   54    A FREE CRIMINAL TO POLICE RATIO                    FCRIMM,A,53
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FCRIMT   54.1 T *FREE CRIMINAL MULTIPLIER TABLE*   FCRIMM,A,53
FCRIN   88   L FREE CRIMINALS (WITHOUT DOPE ADDICTS)   FCRIM,A,87
         236.9 N
FCRIK   100 R RATE USED IN AVERAGING FCRIM   AFCRIM,A,99
FCRM   22   A FREED CRIMINAL RATIO MULTIPLIER USED IN ADC ADC,A,1
FCRT   22.1 T FREED CRIMINAL RATIO TABLE   FCRM,A,22
FCVR   FREED CRIMINALS FROM BAIL RATE (RELEASED BY
                 THE COURTS)
FJCUST   232.8 C FIXED JAIL COST PER NOMINAL CAPICITY (S/   JAILC,A,204
                 PRISONER CAPACITY)
FNO   80   L FREE NEW OFFENDERS (HAVE ESSENTIALLY NEVER FNOCP,P,34/FNOAR,R,37/FNOR,R,78/FNOARR,A,81/DR12,R,82
         236.1 N BEEN ARRESTED)   OUTPOP,A,84/TFCRIM,A,90/POLARP,A,94/NCP,N,235.3
FNOAR   37   R FREE NEW OFFENDER ARREST RATE (PEOPLE/YR)   SMFNOAP,A,36
FNOARR   81   A FREE NEW OFFENDER ARREST RATIO   FNO,L,80/FCRIN,L,88/ARPBFC,A,210
FNOCK   34   R FREE NEW OFFENDER CRIME RATE (CR/YR)   SMFNOCP,A,33
FNOCRM   231.6 C FREE NEW OFFENDER CRIME RATE MULTIPLIER   FNOCP,R,34
FNOPEM   233.1 C FREE NEW OFFENDERS POLICE EFFECTIVENESS   FNOAP,R,37/FNOARR,A,81/POLARP,A,94
                 MULTIPLIER
FNOR   78   P RATE USED IN AVERAGING FREE NEW OFFENDERS   AFNO,A,77
FOCR   85   R FIRST OFFENSE CRIME RATE   SMFOCR,A,41/NCP,L,74/FNO,L,80
FOCRM   230.5 C FIRST OFFENDERS CRIME RATE MULTIPLIER   FOCR,P,85
FPCUST   232.5 C FIXED PRISON COST PER NOMINAL PRISONER   PPISC,A,203
                 CAPACITY (S/CELL CAP)
FXCEF   149 A FREED EX CONVICT EMPLOYMENT RATIO (% THAT   UNEX,L,148/EMEXC,L,158
                 ARE IMMED EMPLOYED)
FXCERC   227.9 C FREED EXCONVICTS EMPLOYMENT RATIO CONSTANT FXCEP,A,149
                 (EMPLOYED/UNEMPLOYED)
GPBPBR   225.5 C GUILTY PLEA FROM BAIL TO PROBATION RATIO   SPSMIN,A,6/PRISN,L,128/PROB,L,180/OPROB,L,223
GPBR   130 R GUILTY PLEA WHILE ON BAIL RATE   SMGPPR,A,8/FCRIN,L,88/RLC,L,119/PRISN,L,128/ROR,L,143/PROB
                                                          ,L,180/OROR,L,216/OPROB,L,223
GPBRCR   226.2 C GUILTY PLEA WHILE ON BAIL TO REL CRIM RATIO SPSMIN,A,6/RLC,L,119/PRISN,L,128
                 (FINES, ETC.)
GPISM   228 C GUILTY PLEA INCENTIVES SCALING MULTIPLIER GPLEAI,A,67
GPJPBR   225.7 C GUILTY PLEA FROM JAIL TO PROBATION RATIO   SPSMIN,A,6/RCR,A,11/PRISN,L,128/PROB,L,180/OPROB,L,223
GPJR   113 P GUILTY PLEA FROM JAIL RATE   SMGPJR,A,21/JAILL,L,105/RLC,L,119/PPISN,L,128/PROB,L,180
                                                          OPROP,L,223
GPJRCR   226 C GUILTY PLEA FROM JAIL TO RELEASED CRIM RATIO SPSMIN,A,6/RCR,A,11/PLC,L,119/PPISN,L,128
                 (FINES, ETC.)
GPLEAI   67   A GUILTY PLEA INCENTIVES   GPJR,R,113/ATGPLEA,S,117
JAIL   104 A JAIL POPULATION   JCP,A,106/TRJAIL,A,110/GPJR,P,113/DR2,R,115/COURTRL,A,193
                                                          JAILRL,A,200/JAILC,A,204/TOTPOP,A,215/NCP,N,235.3
JAILBL   200 A JAIL BACKLOG (YRS)
JAILC   204 A ANNUAL JAIL COST (S/YR)   ACOST,A,201
JAILCMT 114.1 T JAIL CROWDING MULT TABLE   JCPM,A,114
JAILL   105 L JAIL POPULATION BEFORE NON ZERO LIMITATION JAIL,A,104
         236.7 N
JAILTM   111 A PEOPLE FROM JAIL TO TRIAL MULTIPLIER   TPJAIL,A,110
JCAP   227.3 C NOMINAL JAIL CAPACITY (PEOPLE)   JCR,A,106/JAILC,A,204
JCR   106 A JAIL CROWDING RATIO   JCRD,A,112/JCPM,A,114/ARTOBR,A,144
JCRD   112 A JAIL CROWDING RATIO DELAYED   JAILTM,A,111
JCRM   114 A JAIL CROWDING RATIO MULTIPLIER   GPJR,R,113/ATGPLEA,S,117
JTMT   111.1 T JAIL TRIAL MULTIPLIER TABLE   JAILTM,A,111
MJCUST   232.9 C MARGINAL JAIL COST PER ACTUAL PRISONER PER JAILC,A,204
                 YR
MPCUST   232.6 C MARGINAL PRISON COST (S/ACTUAL PRISONER) - PRISCON,A,25/PRISC,A,203
                 FOOD, ETC.
NCOVER   30   A NEWS COVERAGE PERCENT   COVERM,A,29
NCOVERT 30.2 T NEWS COVERAGE TABLE   NCOVER,A,30

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NCP   74   L NON CRIMINAL POPULATION   FCR,A,23/DP1,R,79/OUTPOP,A,84/FOCR,R,85
          235.3 N
NEWSM   26   A EFFECTIVENESS OF NEWS MEDIA MULTIPLIER   FOCP,R,85
NOPKSK   229.5 C NO PROSECUTE RATIO   PTPP,A,123
NPVCOST   211 L NET PRESENT VALUE OF THE TOTAL COST OF CRIME
          234.1 N   FOR THE RUN LENGTH
NRCONST   227.6 C NEWS REPORTING RATIO CONSTANT   NRRATIO,A,28
NRRA_M   27   A NEWS REPORTING RATIO MULTIPLIER   NEWSM,A,26
NRRAT   28.1 T NEWS REPORTING RATIO TABLE   NRRA_M,A,27
NRRATIO   28   A NEWS REPORTING RATIO   NRRA_M,A,27
OUTPOP   84   A POPULATION OUTSIDE JAIL OR PRISON   SMCPPAT,A,50/POLR,A,56/CRRATIO,A,62/BR,R,83/TOTPOP,A,215
PARBCAP   233 C PAROLE BOARD NOMINAL PROCESSING CAPACITY   PARP,R,136
                    (PEOPLE/YR)
PARC   206 A PAROLE COST ($/YR)   ACOST,A,201
PARCR   168 R PEOPLE ON PAROLE CRIME RATE   SPAPCR,A,40/FCRIN,L,88/PAROLE,L,166
PARCRM   231.1 C PEOPLE ON PAROLE CRIME RATE MULTIPLIER   PARCR,P,168/DPARAR,P,222
PAROC   226.5 C ANNUAL PAROLE OFFICER COST INCLUDING   PARC,A, 206
                    OVERHEAD ($/YR)
PAROLE   166 L NUMBER OF PEOPLE ON PAROLE THAT HAVE NOT   FCR,A,23/OUTPOP,A,84/DRB,R,167/PARCR,R,168/PAROLEP,P,171
          236.7 N   BECOME FCRIMINALS   DPAPAP,P,222/NCP,N,235.3
PAROLEP   171 P RATE USED IN AVERAGING PAROLE   APAROLE,A,170
PARR   136 P PAROLE RATE   PRISN,L,128/SMPARR,A,141/PAROLE,L,166/DPAR,L,220
PARREST   98   S PERCENT OF THE FREE CRIMINALS ARRESTED EACH
                    YEAR
PARVP   229 C PAROLE VIOLATION PROBABILITY (VIOLATORS/   PARVP,P,221
                    TOTAL ON PAROLE)
PARVR   221 P PAROLE VIOLATION RATE (PEOPLE/YR)   DPAP,L,220
PARWL   228.4 C PAROLE OFFICER WORKLOAD (PEOPLE/PAROLE   PARC,A,206
                    OFFICER)
PCM   24   A PRISON CONDITION MULTIPLIER USED IN AOC   AOC,A,1
PCMT   24.1 T PRISON CONDITION MULTIPLIER TABLE   PCM,A,24
PCOOPM   57   A PUBLIC COOPERATION MULTIPLIER AS EFFECTED BY   POLEFF,A,52
                    RELEASED CRIMINALS
PCOOPMT   58.1 T PUBLIC COOPERATION MULTIPLIER TABLE   PCOOPM,A,57
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                    EFFECTIVENESS OF THE POLICE
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                    COOPERATION
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                    ARREST
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PCRUR   133 A PRISON CROWDING RATIO   CCOMPR,A,132/PRISPM,A,137
PCROT   133.1 T PRISON CROWDING RATIO TABLE   CCOMPR,A,132
PDELAY   230.3 C TIME DELAY TO CHANGE PERCEIVED   SMPTPR,A,14/SMCON_J,A,15/SARTORR,A,17/SMCCPR,A,19/SMAR,A,
                    ATTPACTIVENESS OF CRIME (YRS)   20/SMGPJR,A,21/RCRD,A,58/AOCD,A,96
PERTCC   64   A POLICE EFFECTIVENESS LIMITED BY COURT   TPIALPM,A,63
                    CAPACITY
PERTTR   65   A POLICE EFFECTIVENESS RELATED TO ACTUAL TRIAL   TRIALRM,A,63
                    RATE
POLARR   94   A POLICE ARREST RATE (USED AS LONG AS IT IS   AR,P,91/APPBFC,A,219
                    LESS THAN POLCAP)
POLCAP   92   A POLICE CAPACITY TO MAKE ARRESTS (MEN AND   AR,R,91/APPBFC,A,219
                    EFFECTIVENESS)
POLCAPM   93   A POLICE CAPACITY MULTIPLIER(ADJUSTS FOR   POLCAP,A,92
                    DECIMAL CHAR OF POLEFF)
POLEFF   52   A POLICE EFFECTIVENESS MULTIPLIER   FNOAR,P,37/POLCAP,A,92/POLARP,A,94/PARREST,S,98
POLICE   226.4 C NUMBER OF POLICE WITHIN THE SYSTEM BOUNDRY   FCRIMR,A,54/POLR,A,56/PERTCC,A,64/PERTTR,A,65/POLCAP,A,92
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POLICET  55.1   T  POLICE MULTIPLIER TABLE                            POLICEM,A,55
POLOFC   228.6  C  ANNUAL POLICE OFFICER COST INCLUDING ALL           POLICEC,A,207
                   EQUIP ($/YR)
POLR     56     A  POLICE RATIO TO TOTAL POPULATIO (POLICE/1000       POLICEM,A,55
                   POPULATION)
PPROBM   4      A  PRISON PROBABILITY MULTIPLIER                      ADC,A,1
PPROBMT  4.1    T  PRISON PROBABILITY MULTIPLIER TABLE                PPROBM,A,4
PRISC    203    A  ANNUAL PRISON COST ($/YR)                          ACOST,A,201
PRISCAP  226.3  C  PRISON NOMINAL CAPACITY (PEOPLE)                   PRISCOM,A,25/PCRDR,A,133/PRISCR,A,153/RHPCR,A,155/PPISC,A,
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PRISCM   152    A  PRISON CROWDING MULTIPLIER                         PRISCRM,A,151
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                   MULTIPLIER                                         168/CPARCR,R,174/PRPAR1,A,176/PRPAP2,A,177
PRISCT   152.1  T  PRISON CROWDING MULT TABLE                         PPISCM,A,152
PRISMT          PRISON POPULATION MULT TABLE
PRISN    128    L  PRISON BEFORE THE NON ZERO LIMITAION               PRISON,A,127
         234.6  N
PRISON   127    A  PRISON POPULATION (LIMITED TO BE NON ZERO)         PPISCON,A,25/PRRR,R,131/PCPOP,A,133/PPISP,P,135/DP4,R,138
                                                                      EAVESEN,A,139/PRISCR,A,153/RHPCR,A,155/PRISC,A,203
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PRISR    135    R  RATE USED IN AVERAGING PRISON POPULATION           APRIS,A,134
PRISRM   154    A  PRISON REHABILTATION PROGRAM MULT                  PPISCRM,A,151
                   (MEASUREDBY $ SPENT)
PRISRT   155.1  T  PRISON REHAB PROG MULT TABLE                       PPISPM,A,154
PROB     183    L  NUMBER ON PROBATION NOT RETURNED TO FCRIM          FCP,A,23/OUTPOP,A,84/PROBCP,P,97/DR10,R,181/PROBR,R,184
         236.4  N                                                    DPROBAP,P,224/NCP,N,235.3
PROBC    205    A  ANNUAL PROBCATION COST ($/YR)                      ACOST,A,201
PROBCR   97     R  CRIME RATE OF THOSE ON PRUBATION THAT HAVE         SPPRBCP,A,44/FCRIN,L,88/PROB,L,180
                   NOT BECOME FCRIM
PROBCRM  231    C  PEOPLE ON PROBATION CRIME RATE MULTIPLIER          PROBCP,P,97/DPROBAP,P,224
PROBOC   228.2  C  ANNUAL PROBATION OFFICER COST INCLUDING            PROBC,A,205
                   OVERHEAD ($/YR)
PROBPSN  5      A  PROBABILITY OF GOING TO PRISON FOR EACH            PPROB4,A,4
         235.2  N   CRIME
PROBR    184    R  RATE USED FOR APROB CALC                           APROB,A,183
PROBVP   225    R  PROBATION VIOLATION RATE (P/YR)                    DPPROB,L,223
PROBVR   229.1  C  PROBATION VIOLATION PROBABILITY (VIOLATORS/        PROBVP,P,225
                   TOTAL ON PROBATION)
PROBWL   228.3  C  PROBATION OFFICER WORKLOAD (PEOPLE/                PROBC,A,205
                   PROBATION OFFICER)
PRRR     131    R  PRISON RELEASE RATE (END OF SENTENCE OR            PPISN,L,128/SMPRRR,A,142/UNEX,L,148/EMEXC,L,158
                   OTHER UNSUPERVISED)
PSEN     227.1  C  PERCENTAGE OF NOMINAL SENTENCE OFFERED FOR A       PSENV,A,73
                   GUILTY PLEA (%)
PSENV    73     A  PERCENTAGE SENTENCE REDUCTION OFFERED (%)          DEALM,A,72
PTRR     123    A  PRETRIAL RELEASE RATIO                             PTRRP,P,16/ARTOJR,A,107/RLC,L,119
PTRRR    16     R  PTRR RATE USED TO AVERAGE PTRR                     SMPTRP,A,14
RC       118    A  RELEASED CRIMINAL                                  FCP,A,23/OUTPOP,A,84/RCCR,R,95/RRPC,R,120/PPRC2,A,122
                                                                      PELCP,R,125/DR3,P,126/NCP,N,235.3
RCCR     95     R  RELEASED CRIMINAL CRIME RATE (CR/YR)               SMPCCR,A,43/FCRIN,L,88/RLC,L,119
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RCCRM   230.6 C RELEASED CRIMINALS CRIME RATE MULTIPLIER   PCCR,P,95
RCR   11   A RELEASED CRIMINAL TO ARRESTED CRIMINAL RATIO PCPM,A,10/PCRD,A,58
RCRD   58   A *RELEASED CRIMINAL RATIO DELAYED*   PCRDPM,A,57
RCRM   10   A RELEASED CRIMINAL RATIO MULTIPLIER   ARC,A,1
RCRRATE 51   S *REPORTED CRIME RATE*   NCOVER,A,30
RCRT   10.1 T *TABLE RELATING RCRM TO RCR*   PCRM,A,10
REHABT   232.2 C RELEASED CRIMINAL REHABILITATION TIME (YRS)   POPC1,A,121/RRRC2,A,122/ARC,A,124
REHABTP 232.1 C PEOPLE ON PAROLE REHABILITATION TIME (YRS)   PRPAP1,A,176/RRPAR2,A,177/ACPAR,A,178
REHABTX 232   C EMPLOYED EXCONVICT REHABILITATION TIME (YRS)   PPEXC1,A,161/RREXC2,A,162/ACMEXC,A,163
RELCR   125   R RATE USED IN AVERAGING RELEASED CRIMINALS   ARC,A,124
REPR   227.8 C CRIME REPORTING RATIO (REPORTED/ACTUAL)   PEPRA,A,60
REPRA   60   A CRIME REPORTING RATIO (PERCENT OF TOTAL   RCPRATE,S,51
                 CRIMES THAT ARE REPTD)
RETR   101   R RATE FREE CRIMINALS RETURN TO THE NON   NCP,L,74/FCRIN,L,85
                 CRIMINAL POPULATION
RETR1   102   A RETR ADJUSTED FOR THE LAG IN THE RETURN   PETP,P,101
RETR2   103   A RETR WITHOUT A LAG IN THE RETURN TIME   PETP,P,101
RHABTNU 232.4 C FREE NEW OFFENDERS REHABILITAION TIME (YRS)   PRFNO,R,75/AFNO,A,77
RHPCUST 232.7 C REHABILITATION COST PER PRISONER IN PRISON   PRISCON,A,25/RHPCR,A,155/PRISC,A,203
                 ($/PRISONER)
RHPCR   155   A REHABILITATION PROGRAM COST PER PRISONER   PPISPM,A,154
                 RATIO ($/PRISONER)
RHTPRJB 232.3 C PEOPLE ON PROBATION REHABILITAION TIME (YRS)   RRPPOB1,A,188/RRPROR2,A,189/ACPROB,A,190
RLC   119   L RELEASED CRIMINALS BEFORE NON ZERO   RC,A,118
         236.3 N   LIMITATION
RJB   143   L RELEASED ON BAIL (PEOPLE) AND NOT BECOME   FCR,A,23/OUTPOP,A,84/PORCR,R,89/DR5,R,146/ROBR,A,147
         237.1 N   FCRIM   DROBAR,P,218/NCP,N,235.3
RJBCR   89   R RELEASED ON BAIL CRIME RATE   SMPORCP,A,49/FCRIN,L,88/ROB,L,143
ROBCRM   233.7 C RELEASED ON BAIL CRIME RATE MULTIPLIER   PORCR,P,89/DROBAR,R,218
RJBR   147   A RELEASED ON BAIL RATIO TO THOSE THOUGHT TO   FCRIN,L,88/ROR,L,143
                 BE ON BAIL
ROFPEM   229.7 C REPEAT OFFENDERS POLICE EFFECTIVENESS   FNOAPR,A,81/POLARR,A,94
                 MULTIPLIER
RREXC   160   R RATE EMPLOYED EX CONVICT RETURN TO THE NON   NCP,L,74/EMEXC,L,158
                 CRIM POPULATION
RREXC1   161   A RREXC ADJUSTED FOR THE FLOW TIME   PREXC,P,160
RREXC2   162   A RREXC WITHOUT FOW TIME FLOW TIME ADJUSTMENT   PREXC,P,160
RFNU   75   R REHABILITATION RATE FOR FREE NEW OFFENDERS   NCP,L,74/FNO,L,80
RRPAR   175   R RETURN RATE TO NCP FOR THOSE WHO HAVE   NCP,L,74/CPAR,L,172
                 COMPLETED PAROLE
RRPAR1   176   A RRPAR NOT ADJUSTED FOR FLOW DELAY   PRPAR,R,175
RRPAR2   177   A RRPAR NOT ADJUSTED FOR FLOW DELAY   PRPAR,R,175
RRPROB   187   R RETURN RATE TO NCP OF THOSE WHO HAVE   NCP,L,74/CPROB,L,185
                 COMPLETED PROB
RRPROB1 188   A RRPROB ADJUSTED FOR FLOW DELAY   PRPROB,P,187
RRPROB2 189   A RRPROB NOT ADJUSTED FOR FLOW DELAY   PRPROB,P,187
RRRC   120   R RETURN TO THE NON CRIM POP RATE OF RELEASED   NCP,L,74/RLC,L,119
                 CRIM
RRRC1   121   A RRRC ADJUSTED FOR THE DELAY IN FLOWING   PRRC,P,120
                 THROUGH
RRRC2   122   A RRRC WITHOUT FLOW DELAY   PPRC,P,120
SARTOBR 17   A SMOOTHED ARREST TO BAIL RATIO   PCR,A,11
SCMADC   233.3 C SCALING MULTIPLIER FOR ATTRACTIVENESS OF   ARC,A,1
                 CRIME
SCMPEFF 233.4 C SCALING MULTIPLIER FOR POLICE EFFECTIVENESS   POLEFF,A,52/PARREST,S,98
SCMPOLC 229.6 C SCALING MULTIPLIER FOR POLICE CAPACITY   POLCAPM,A,93
                 (ADJUST WITH SCMPEFF)
SCON_JR   SMOOTHED CONVICTION FROM JAIL RATE

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SCPARCR	32	A	SMOOTHED COMPLETED PROBATION CRIME RATE (CRIMES/YR)	SMTCR,A,31
SCPGCR	45	A	SMOOTHED CRIM WHO HAVE COMPLETED PROBATION CR RATE (PEOPLE/YR)	SMTCP,A,31
SCR	230.4	C	STANDARD CRIME RATE (CRIMES PER YR/100,000 POPULATION)	FNOCR,P,34/FCMCR,R,46/FCCR,R,85/ROBCR,R,89/RCCR,P,95 PPORCP,P,97/UXCCR,P,150/EXCCR,R,159/PAPCR,R,168/CPAPCR,R ,174/CPACR,R,192/DROBAR,R,218/ARPBFC,A,219/DPARAP,P,222 DPPORAR,P,224
SDADCR	230.8	C	STANDARD DOPE ADDICT CRIME RATE (CRIMES/YR)	FCMCR,P,46/ARPBFC,A,219
SLM	3	A	SENTENCE LENGTH MULTIPLIER	ADC,A,1
S.T	3.1	T	SENTENCE LENGTH MULTIPLIER TABLE	SLM,A,3
SMAR	20	A	SMOOTHED ARREST RATE	PCR,A,11/ARPROB,A,13
SMCCRR	19	A	SMOOTHED COURT CRIMINAL RELEASE RATE	PCR,A,11
SMCON_J	15	A	SMOOTHED CONVICTION FROM JAIL RATE (PEOPLE/ YR)	SPSNIN,A,6/PCR,A,11
SMCRRAT	50	A	SMOOTHED CRIME RATIO (CRIMES PER YEAR PER 100,000 POPULATION)	PCRPATE,S,51
SMCWOBR	7	A	SMOOTHED CONVICTED WHILE ON BAIL RATE	SPSNIN,A,6
SMEXCCR	39	A	SMOOTHED EMPLOYED EXCONVICT CRIME RATE (CRIMES/YR)	SMTCP,A,31
SMFCMCR	48	A	SMOOTHED FREE CRIMINAL CRIME RATE (CR/YR)	SMTCR,A,31
SMFNUAR	36	A	SMOOTHED FREE NEW OFFENDERS ARREST RATE (PEOPLE/YR)	APPNO,A,35
SMFNOCR	33	A	SMOOTHED FREE NEW OFFENDER CRIME RATE (CR/ YR)	SMTCP,A,31/ARPNO,A,35
SMFOCR	41	A	SMOOTHED FIRST OFFENSE CRIME RATE (PEOPLE/ YR)	SMTCR,A,31/ARPNO,A,35
SMGPBR	8	A	SMOOTHED GUILTY PLEA WHILE ON BAIL RATE	SPSNIN,A,6
SMGPJR	21	A	SMOOTHED GUILTY PLEA FROM JAIL RATE	SPSNIN,A,6/RCR,A,11
SMPARR	141	A	SMOOTHED PAROLE RATE (PEOPLE/YR)	SMPPISO,A,140
SMPRISO	140	A	SMOOTHED PRISON OUTPUT (PEOPLE/YR)	EAVESEN,A,139
SMPRRR	142	A	SMOOTHED PRISON RELEASE RATE (UNSUPERVISED - PEOPLE/YR)	SMPRISO,A,140
SMPTRR	14	A	SMOOTHED PRETRIAL RELEASE RATIO	PCP,A,11
SMRCCR	43	A	SMOOTHED RELEASED CRIMINAL CRIME RATE (PEOPLE/YR)	SMTCR,A,31
SMROBCR	49	A	SMOOTHED RELEASED ON BAIL CRIME RATE (CR/ YR)	SMTCP,A,31
SMTCR	31 234.3	A N	SMOOTHED TOTAL CRIME RATE (CRIMES/YR)	PPORPSN,A,5/ARPROB,A,13/SMCRRAT,A,50/CRRATIO,A,62/CRIMEC,A ,208
SMTRR	66	A	SMOOTHED TRIAL RATE	TPIALPM,A,63/PERTTR,A,65
SMUXCCR	38	A	SMOOTHED UNEMPLOYED EXCONVICT CRIME RATE (CRIMES/YR)	SMTCP,A,31
SPARCR	40	A	SMOOTHED PAROLED CRIMINALS CRIME RATE (CRIMES/YR)	SMTCP,A,31
SPRUBCR	44	A	SMOOTHED CRIMINAL ON PROBATION CRIME RATE (PEOPLE/YR)	SMTCP,A,31
SPSNIN	6	A	SMOOTHED PRISON INPUT (PEOPLE/YR)	PPORPSN,A,5
STJGPR	230.2	C	STANDARD GUILTY PLEA RATE FROM JAIL(MULT FOR GPJR)	GPJR,R,113/ATGPLEA,S,117
STLIM	231.9	C	FREE CRIMINAL REHABILITATION TIME	AFCRIM,A,99/RETR1,A,102/RETR2,A,103
TCOST	209 234.2	L N	TOTAL ACCUMULATED COST OF CRIME ($)	
TFCRIM	90	A	TOTAL FREE CRIMINALS	FCP,A,23/FCRIMR,A,54
TOTPOP	215 234.5	A N	TOTAL POPULATION (PEOPLE)	NCP,N,235.3
TOTREL			INITIAL TOTAL RELEASED FROM PRISON (INITIALIZATION ONLY)	

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TRDMT	195.1	T	TRIAL DELAY MULTIPLIER TABLE	TPIALPM,A,195
TRIALDM	195	A	TRIAL DELAY MULTIPLIER TO ADJUST COURT CAPACITY TO NEED	TPRATE,A,108/CWOBR,P,129/TRIALR,R,194
TRIALR	194	R	COURT TRIAL RATE (TRIALS PER YEAR)	SMTRR,A,66
TRIALRM	63	A	TRIAL RATE MULTIPLIER (ACCOUNTS FOR POLICE TIME IN TRIALS)	POLEFF,A,52
TRJAIL	110	A	TRIAL RATIO FROM JAIL	CON_JR,P,109/CCRR,R,116/CWOBR,P,129/FCRR,P,145/RAILRL,A,199/JAILBL,A,200
TRRATE	108	A	TRIAL RATE (TRIALS PER YEAR)	CON_JP,R,109/CCRR,R,116/FCRR,R,145/COURTC,A,202
TRSMT	227.7	C	TRIAL RATE SMOOTHING TIME	SMTPR,A,66
TICCC	226.7	C	TIME TO CHANGE COURT CAPACITY BY ADJUSTING OVERTIME, ETC. (YPS)	JCPD,A,112/AVCTRL,A,196
UNEX	148	L	UNEMPLOYED EXCONVICTS	FCR,A,23/OUTPOP,A,94/UXCCP,R,150/UXCEP,R,156/DR6,R,157/NCP,N,234.3
	236.6	N		
UXCCM	231.7	C	UNEMPLOYED EXCONVICT CRIME RATE MULTIPLIER	UXCCP,P,150
UXCCR	150	P	UNEMPLOYED EXCONVICT CRIME RATE	SMUXCCR,A,38/FCRIN,L,86/UNEX,L,148
UXCER	156	R	UNEMPLOYED EXCONVICT EMPLOYMENT RATE	UNEX,L,148/EMEXC,L,158
UXCTTE	231.4	C	UNEMPLOYED EXCONVICT TIME TO EMPLOYMENT (YRS)	UXCEP,P,156

APPENDIX B

CRIMINAL JUSTICE SYSTEM MODEL NOTES

Introduction

The criminal justice system model has a number of known characteristics that any potential user should consider. These are outlined in the following paragraphs.

DPROB

The level DPROB is intended to keep track of the number of individuals under probation supervision even though some may be active criminals. It is only used in the model in the cost calculations for probation cost. However, it is a useful variable to check on the validity and consistency of the assertions about the percentage of those arrested going to probation, the crime rate and the percentage violating probation. If all of these are correct, the magnitude of DPROB should reflect that observed (roughly constant for Massachusetts).

For the Appendix A model, DPROB declines rapidly (in five years) from 52,000 to approximately 12,000 and then remains stable. This indicates, to the author, that the values of CONPBR, GPJPRB, CWOBPBR and GPBPBR are not quite correct even though they were

the best available.

Since this primarily has a minor effect on the cost calculations, there was no attempt to adjust the above constants to maintain the DPROB level constant.

Another possible interpretation of the relatively constant DPROB level actually experienced is that decisions to grant probation or terminate it early are based on the probation officers case load. However, the author found no evidence of this in interviews or in the literature.

AOCERHT

The attractiveness of crime effect on rehabilitation times (AOCERHT) was included due to the author's belief that the percentage of criminals going "straight" in any year would be effected by the delayed attractiveness of crime (AOCD). However, it did not seem reasonable to change the rehabilitation times by the same percentage AOCD changed. Therefore, AOCERHT is calculated as the square root of AOCD. The model has also been tested for AOCD to the .75 and unity exponents. The only effect is to increase the rate of increase or decrease in the crime rate.

DROB & ROB

The way the model is designed, people actually move from

being arrested to being released on bail (ROB). From there, they either go to prison, are released or commit another crime and move into the free criminal category (where they can be arrested again).

To conserve people and compute the correct trial rates a knowledge of how many individuals the courts believe are on bail is required. This done with the calculations for DROB. Then, the released on bail ratio (ROBR) is used to determine the relative rates of flow from ROB and DROB as people are tried and released, etc.

NEWSM

The effectiveness of the news media multiplier was incorporated based on the author's belief that the actions of the news media in illustrating the profits and glory of successful crime, without the unsuccessful ones, would affect the attractiveness of crime for the non-criminal population. It was felt that once a person had actually committed a crime, his primary information sources would be informal communications rather than the news media. Therefore, the news multiplier was only applied to the first offense crime rate (FOCR).

No support for this belief has been found either in interviews or in the literature. Therefore, the equations have been left in the model but with an insignificant effect that only influences the crime

rate when it drops significantly below present levels.

RCRM

The released criminal ratio (RCRM) has been incorporated to relate the influence of immediate release to the street after arrest on the attractiveness of crime. This is a complementary effect to the probabilit , actually going to prison.

Time Delays

In general, the time delays have been chosen somewhat arbitrarily. However, moderate changes should not greatly affect the results.

DT

For this type of a social system, the author expected that the computation interval could be an appreciable part of a year. However, the jail capacity is such a small fraction of the jail inflow (arrest rate minus those to bail) that DT = .05 years results in unstable model operation for step changes in critical constants like the number of police. A computation interval of .02 years has given good results over the range of situations tried to date.

DOPEAD

The number of dope addicts was set to be a constant for this model. This was done because the author saw no reasonable approach to relate the number of dope addicts to crime. However,

crime -- in the model -- is related to the number of dope addicts.

In the real world, the number of dope addicts should change as some are arrested. However, the suppliers will attempt to develop new customers as some are taken out of circulation. Therefore, it seemed to be reasonable to set the number of free addicts to be constant and to test the influence of them by changing the constant (DOPEA).

TOTPOP

The calculation of total population (TOTPOP) is done to provide a convenient verification that there are no model errors that result in nonconservative flows of people. When the birth rate and death rate are equal, only .04% are lost in thirty years. This is due to the model assumption that individuals in jail or prison do not contribute to the birth rate.

<p align="center">Use of the Model</p>

Initialization

The special initialization equations should be used to calculate initial conditions for all appropriate values where there are no data.

The arrest rate, the total crime rate, the attractiveness of crime, police effectiveness and others are calculated after the completion of initialization. Since the following conditions should be met at the beginning of the run, some adjustments to scaling multi-

pliers and tables may be necessary if the model is to be applied to different geographical or political boundries. The conditions to be met at time zero are:

AOC = AOCD = 1

SMTCR = actual crime rate observed after adjustment
for reporting percentages.

AR = actual arrest rate observed.

ARPROB = actual observed arrest probability after
adjustment for reporting percentages.

In addition, the following levels should either remain relatively stable or match observed changes during the first one or two years. If they do not, some inconsistencies in constants and initial conditions are indicated.

The levels are:

DPROB, JAIL, PRISON, DROB, DPAR

Possible Changes

It might be useful to calculate a separate probability of arrest per crime for free criminals. This would allow some judgement to be made on whether the ROFPEM selection actually resulted in a balance of arrests that was consistent with informed opinion (it is doubtful that data will be available in the immediate future).

APPENDIX C

DATA AND ITS SOURCES

Introduction

All constants, ratios and initial conditions used for the criminal

justice system dynamic model are described in this appendix. To

conserve space, the sources of the data will be referenced in

parentheses. For example: (Reference number, page number).

The reference number refers to the reference list in this appendix.

In most cases, data were not available in the detail needed.

When this occurred, the author's practice was to select numerical

values for the model that would approximate the reference informa-

tion if they were aggregated to correlate with reference statistics.

When this has been done, the letter "a" follows the reference

parentheses.

Items are presented in the same order they are listed in the

model description to facilitate referencing.

Constants

GPBPBR	= .16	(1, p. 60)a
CWOBPBR	= .08	(1, p. 86)
GPOBRBR	= .14	(1, p. 60)a
CONPBR	= .06	(1, p. 60)a
CONRCR	= .64	(1, p. 60)a

GPJRCR   = .73   (1, p.60)a

CWOBRCR = .7   (1, p.60), (2, p.464-65)a

GPBRCR   = .75   (1, p.60), (2, p.464-65)a

PRISCAP   = 2500   (3) The capacity was assumed to

be slightly higher than the 1969

average population at the end of 1969.

This capacity excludes that available

for alcoholics, mental patients,

juvenile farms, etc.

POLICE   = 10,500   (4, p. 174)

BRN   = 14   Approximately correct for the United

States - not an important value.

CTCAP   = 43700   (3) Court capacity was selected to

be equal to the total number of

trials conducted in 1969.

TTCCC   = .2   The time delay required for the judges

to see a need for a change in their

court and initiate administrative

modifications was selected by the

author.

CONVR   = .52   (1, p. 71)

CONRB	= .44	(1, p. 71)
PSEN	= 20	(5, p. 231) The percentage of the total sentence offered in return for a guilty plea was selected by the author as no quantitative data were found. However, the reference does support the concept of substantial reductions.
DRN	= 14	Selected to be the same as the birth rate.
JCAP	= 1460	(3) The capacity was assumed to be equal to the 1969 average population.
CRSMT	= 1	Crime rates are reported yearly. As a result, one year was chosen for the smoothing time.
NRCONST	= 1	Selected by author.
TRSMT	= .3	Selected by author.
REPR	= .4	(5, pp. 14-15)a
FXCERC	= .7	Selected by author.
GPISM	= 1.34	Scaling multiplier selected to normalize initial conditions.

ARTOPR = 8   This constant is selected with SCMPOLC to provide an upper limit on police capacity. This is based on the belief that the police arrest rate cannot expand without limit unless there are changes in police effectiveness (due to public co-operation or other changes) or increases in the police numbers. The particular constants selected limit the model Massachusetts arrest rate to 121,000 arrests per year (50% greater than the present 81,000) if there are no changes in police effectiveness. The formulation for capacity limitation automatically adjusts the capacity for increases in the number of police or changes in police effectiveness.

PROBOC = 15000   (6, p.56) Authors estimate based on reference data.

PROBWL = 137   (7)

PAROC   = 22000   Author's estimate based in part on

                                 substantial overhead.

NOPRSR = .05   (3, p. 76 and 90) Estimated from the

                                 reference data.

SCMPOLC = 20   Scaling multiplier selected to give

                                 the correct value of POLCAP after

                                 SCMPEFF has been chosen to

                                 properly scale POLEFF.

ROFPEM = 10   Estimated by the author.

DOPEA   = 4000   (9) 1969 estimate.

APROBT = 2   (9, p. 56) Inferred from reference

                                 data.

ASEN   = .75   (7) Reference states that average

                                 sentences to houses of correction

                                 are six months to one year.

APART   = 2   (3, p. 9), (7) Inferred from data in

                                 the references.

STDGPR = 8.57   Selected by the author to provide an

                                 adequate guilty plea rate to initially

                                 roughly match jail inflow with out-

flow (as it exists in the Common-

wealth).

POLOFC	= 18000	Author's estimate.
AVECPC	= 250	Author's estimate based on a number of sources.
CPERTR	= 250	(8) Information from the reference was extrapolated to Massachusetts.
BAILJP	= .05	Author's estimate.
PARVP	= .1	(8, p. 79) Reference indicates a re-committal rate of .07 per year.
PROBVP	= .1	Author's estimate.
ASENC	= 0	Only used to evaluate changes in the court imposed sentence length without affecting the initialization of AOC.
DISR	= .06	Interest rate assigned by author.
PDELAY	= 2	Selected by the author as the time required for changes regarding attractiveness of crime to travel informal information channels (it might be appropriate to have dif-

ferent values for those already

in the CJS and those entering).

SCR   = 1300

(5, p. 53) The reference discusses

a survey in which it was found that

91% of those involved had committed

one or more offenses for which they

might have received jail or prison

sentences. Since the standard crime

rate is applied to the entire popula-

tion and the average life span is 70

years, a standard crime rate of

approximately 1300 crimes per year

per 100,000 population is indicated.

FOCRM   = 1

Unity crime rate multiplier incor-

porated to make changes more

easily.

Crime rate multipliers were determined in two ways. For

classes of people (PAROLE, etc) that were identified in the FBI

cohort study (reference 4), the necessary crime rate multipliers

were calculated based on the following:

a. SCR = 1300

b. Arrest rates can be directly related to crime rates.

c. Crime reporting ratio of 0.4.

d. Police clearance rate for reported crimes of 20%.

With the rearrest data from the FBI report, and the above assumptions, the crime rate multipliers were calculated. These are identified with the notation "FBI data".

Then, the remainder of the multipliers were estimated by the author based on his judgement of the risk relative to the previously calculated values. This is a grossly unsatisfactory approach but the author was unable to find any relevant data. These are identified as "author's estimate".

RCCRM	= 290	Author's estimate
ROBCRM	= 200	Author's estimate
SDADCR	= 50	Author's estimate
CPBCRM	= 75	Author's estimate
PROBCRM	= 150	FBI data
PARCRM	= 200	FBI data
CPARCRM	= 100	Author's estimate
EXCCM	= 220	FBI data
FNOCRM	= 50	Author's estimate
UXCCM	= 420	Author's estimate
FCRIMMX	= 420	Author's estimate

UXCTTE   = .5   Author's estimate of the average

time (years) for an unemployed

ex-convict to obtain employment.

The average times required by the various categories of individuals before they return to the non-criminal population (go straight) were estimated by the author after he was unable to locate any data. The estimating procedure was to select a set of times that appeared to be consistent with respect to each other and intuitively reasonable. These were then adjusted as a group to provide stable initial conditions which would provide a total crime rate approximately equal to the actual value (actual was determined by dividing the reported crime rate by the reporting ratio).

STLIM   = 15   Author's estimate.

REHABTX = 14   Author's estimate.

REHABTP = 12   Author's estimate.

REHABT   = 16   'Author's estimate.

RHTPROB = 11   Author's estimate.

RHABTNO = 9.3   Author's estimate.

The following prison and jail costs are the author's rough allocation of costs from references 3 and 7.

FPCOST   = 4000

MPCOST = 1000

RHPCOST = 20

FJCOST = 1000

MJCOST = 800

PARBCAP = 1260   (3, pp. 7-11) a   Based on the assumption that the parole board capacity is approximately equal to the number being paroled per year.

FNOPEM = 1   Unity multiplier incorporated to allow police allocation on reruns.

ARHTE = .5   Author's estimate of an appropriate exponent to relate AOCD to rehabilitation times. Varying it between .5 and 1.0 does not seem to affect the trend of the results although it does influence the magnitude and the timing.

SCMAOC = .0485   Selected to set AOC approximately equal to one with initial conditions.

SCMPEFF   = .0345   Selected to provide the correct

value for POLEFF with initial

conditions.

Initial Conditions

The following three items are used to initialize the cost caculations.

DISF   = 1

NPVCOST   = 0

TCOST   = 0

SMTCR   = 1,010,000   (3, p. 65), (4), (5, pp. 14-15)

This smoothed total crime rate is a

calculated value based on the number

of arrests in 1969 and FBI statistics

which indicate a 20% clearance rate

and a .4 reporting rate.

TOTPOP   = 5,500,000   Approximate 1969 population of

Massachusetts.

PRISN   = 2440   (3) The approximate average popula-

tion during 1969 after excluding

traffic offenses, drunkeness and

mental patients.

JAILL   = 1460   (3) The approximate average popula-

tion during 1969 after appropriate

exclusions.

AR	= 81,000	(3, p. 65)
DPAR	= 2,530	(7)
DPROB	= 52,000	(6, p.56)
ARPNOM	= 1.031	Required for Dynamo initialization. It is calculated from other defined terms.
PROBPSN	= 0.56	Required for Dynamo initialization. It is calculated from other defined terms.

The following initial conditions were automatically calculated

from special initialization equations for standard conditions. To

provide relative evaluations of policy changes, it is necessary to

fix these values for subsequent model runs. They are consistent

with previously defined values.

FNO	= 357,500
EMEXC	= 900
RLC	= 11,000
PROB	= 3,000
CPROB	= 1,360

UNEX   =   170

PAROLE   =   143

FCRIN   =   74,770

DROB   =   10,410

ROB   =   9,300

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