Visualising sentencing patterns in New South Wales and Victorian magistrates courts.

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Introduction

Prison, community work or probation, fines and dismissals without conviction are radically different types of sanction, and can hardly be thought of as in any substantive way comparable. Yet judges and magistrates have to make choices between such penalties all the time, and develop their own cognitive schemas linking offence seriousness and penal severity. Not only do judicial decision-makers choose between *types* of penalty, they have to calculate *levels* of sanction in several different penal currencies, in terms of months (prison), hours (community service) or dollars (fines).

This paper is part of a wider study comparing the Australian states in terms of relative use of different types of sanction, using sentencing data produced by the ABS for the first time (previously states released their own, using varying concepts and collection approaches). This paper represents the first step – it lays out the method proposed, explores the data for NSW and Victoria, and provides some preliminary interpretations. This paper uses data from 3 sources: local courts in New South Wales, for the years 1992 to 1996, provided by the NSW Bureau of Crime Statistics (for which funding was kindly provided by the Criminology Research Council (Grant 33/96-7)), Victorian Magistrates Court data for 1992, provided by the Victorian Department of Justice; and ABS data published for 2004-5.

The wider study will contribute to the ongoing debate about disparities in the use of imprisonment or fines, and the different roles intermediate sanctions may play in different jurisdictions. It will explore how far down the sentencing hierarchy imprisonment goes (and whether this varies between states), how far up fines go, whether some spaces are relatively 'crowded' and others sparse – perhaps suggesting possible gaps in sentencing space that might require new sanctions to be developed.

To make such comparisons possible it would be very useful to have a way of transforming the complex mix of penalty types, each with their own metrics, into a single measure using a common metric. There are a number of ways of tackling this scaling problem, but one approach that appears to be promising is correspondence analysis. This provides a measures the dissimilarity of items based on their distribution between categories on another variable. A chi-square measure is used to compute the dissimilarity between each pair of measures,

and the greater the value of this measure, the more unlike the two observations are considered to be. In this study, penalties are compared with each other in terms of the mix of offences that are associated with each one.

This could potentially produce a 'severity measure', allowing penalties not only to be ordered, but relative distances between them estimated. Since there is no obvious start-point, it is not possible to make absolute judgements, about penal severity (e.g. 'prison is twice as severe as a fine', i.e. use a ratio level of measurement). But it would be possible to compare the distance between, say, prison and a community sanction, and a community sanction and a fine. This assumes that a single dimension adequately summarises the pattern of associations in the data.

If two dimensions are required to describe the pattern of dissimilarities, the data can be graphically represented in the form of a two-dimensional map with dissimilarities taking the form of distances; items that are spatially close are similar, those that are far apart are interpreted as being unlike, at least in terms of the distribution of the other variable.

If the other variable was continuous (say re-offending rates or level of harm resulting from the offence), parametric techniques like cluster analysis could be used for measuring similarity and plotting distances. With categorical data, correspondence analysis fulfils that function.

The method was developed by French statisticians, most notably Benzecri: see, for example, Benzecri (1992). The standard reference in English is Greenacre (1984). Correspondence analysis has been used successfully in the medical sciences (Greenacre (1992), environmental sciences (Digby and Kempton (1988) as well as the social sciences (Kosslyn (1985). But there seems to have been little use of the approach in criminology.

Data description

The BOCSAR data set used here was constructed for another purpose – measuring re-offending rates for different sentencing cohorts -- so there are a few limitations resulting from this objective that makes the population sizes somewhat different from published data. All persons without a unique identification number were dropped; mostly these were traffic cases. Other defendants were matched based on this identification number, and up to ten separate 'final appearances' for each individual were retained.

For the purposes of the correspondence analysis, a number of other restrictions were applied, mostly to ensure large enough cell sizes to get robust estimates. Offence types had to be numerous enough to withstand detailed cross-tabulation, there had to be a reasonable spread of penalties for these offences, and there

should not be too much missing data on other variables. As a result relatively rare offences like robbery (which mostly go to Higher Courts in NSW) were dropped from this analysis, as were public order offences and drug use (penalties unduly concentrated in the lower range), and traffic offences (missing data on other fields). Similarly, rare penalties like home detention and compensation orders only were not included.

The population includes some 161,000 offenders, with some 20,000 being sentenced to prison, another 20,000 give an intermediate sanction (like community service or probation), 84,000 a fine, and the remaining 34,000 a bond or dismissed without conviction (Table 1).

Table 1: Persons sentenced by magistrates,
Penalty type by selected principal offence
NSW Local Courts, 1992-1996

		Per cent given each penalty				
	Persons	Prison	Intermediate sanctions	Fine	Dismissal	Total
Offence						
Car theft	5505	29%	24%	35%	12%	100%
Burglary	7665	32%	35%	19%	13%	100%
Fraud	6834	10%	21%	46%	23%	100%
Damage	16626	4%	7%	70%	19%	100%
Shopstealing	13993	7%	10%	65%	18%	100%
Drug selling	9990	7%	14%	68%	11%	100%
Breach of order	9266	15%	15%	40%	29%	100%
Theft hi	8540	24%	20%	49%	7%	100%
Theft mid	16279	9%	15%	62%	14%	100%
Theft lo	9756	3%	8%	58%	31%	100%
Assault hi	17914	18%	18%	56%	8%	100%
Assault mid	27721	6%	15%	50%	29%	100%
Assault lo	11335	1%	7%	37%	54%	100%
		11%	15%	53%	21%	100%
Total	161424	17299	24063	85758	34304	

Nine offence categories are used: burglary, car theft, fraud, property damage, shopstealing, other theft, assault, selling drugs and breaching justice orders). Two of these offences, theft and assault, are numerous enough to warrant more detailed analysis, so each of these is further sub-divided according to number of counts the person was convicted of and prior criminal record (prior record and multiple counts, no prior record and single count, other).

The result is a 13 by 4 contingency table which is used as the basis for the initial analysis. The average cell size is 3104, while the smallest cell contains 170 persons.

Penalty distribution- BOCSAR data

Using the simplest classification of penalty, we can see that the four penalty types are approximately equally distributed along the principal axis that accounts for some 65 per cent of the dissimilarity in the table. This dimension could be plausibly described as 'sentence severity'. Examining the row co-ordinates (Appendix 1), we see that prison has a value of .75 on the first (and most important) dimension, scores for the other categories are .38 (intermediate sanctions), -.08 (fines) and -.43 (bonds and dismissals). This can be re-scaled to make it more intuitive, setting the lowest category (bonds and dismissals) as 0 and the highest category (prison) as 1 (table 2). Note that the columns and rows in table 1 were reversed, in order to estimate distances for penalty.

Table 2: Estimated distances between penalties
NSW local courts, 1992-1996

Penalty	Re-scaled Score	Distance between Penalties
Prison	1.00	
Intermediate	0.68	0.32
Fines	0.29	0.39
Dismissals etc.	0.00	0.29
(Total)		1.00

The principal dimension produced by correspondence Analysis was re-scaled, setting the lowest category as 0. and the highest category as 1

It can be seen that the categories are approximately equidistant, with the largest difference, .39 being between fines and intermediate sanctions, and the smallest difference, .29, being between fines and bonds or dismissals.

Greenacre and Hastie (1987) suggest that such differences can be considered. approximate Euclidean distances. (On the other hand, observed distances between column points should not be interpreted as distances; however rows and columns could simply be reversed if that interpretation was required).

But while two-thirds of the patterns of dissimilarity could be accounted for by a single dimension, fines do seem to be distinguished from the other three penalties according to a second dimension. Thus some 33 per cent of the dissimilarities in the data are attributed to this second dimension. This may be interpretable as distinguishing between penalties that are measured in terms of time (months -prison, hours- community orders, and months avoiding re-offending – bonds) and the remaining one, fines, measured in terms of money.

Or it could be an artefact of measurement, and not of substantive interest. Digby and Kempton (1987, p.94) note that a horseshoe shape of many correspondence analysis plots (such as this one) is a frequent feature resulting from the method scores are derived. Methods do exist for removing the curvature, and the resulting analysis is known as detrended correspondence analysis. We have not implemented it here.

Comparisons with Victoria

To get an idea of how this approach works in a slightly different context, let us take data from Victorian Magistrates Courts from a similar period, 1992. A limited number of offences against property were selected for another project (car theft, other theft, receiving stolen goods, fraud and property damage). The numbers are somewhat smaller than for the NSW example, some 15,000 offenders compared to 161,000. Victoria is interesting as a comparison for several reasons – magistrates made use of suspended prison sentences (unlike NSW at that time), but they were also less likely than NSW magistrates to record a 'dismissal without conviction recorded' after a finding of guilt.

Table 3: Persons sentenced by magistrates,
Penalty type by principal offence, selected property offences
Victorian Magistrates Courts, January-June 1992

	Offence						
	car theft	other theft	receiving	fraud	damage	Total	Persons
Penalty							
Prison	29%	8%	10%	13%	5%	10%	1512
Susp	20%	7%	12%	15%	4%	9%	1421
ICO/CBO	32%	17%	17%	23%	14%	18%	2812
Fines	7%	37%	41%	27%	54%	36%	5544
Bonds	12%	31%	20%	23%	23%	26%	3912
Total	100%	100%	100%	100%	100%	100%	15201
Persons	1229	8095	2205	1470	2202	15201	15201

The pattern is somewhat different In Victoria than NSW. The first thing to notice is fines – in NSW 53 per cent of offenders received a fine, in Victoria only 32 per cent. This is not the result of using somewhat different offender populations: in 2004, the ABS estimated that 51 per cent of those sentenced by magistrates were given a fine compared to 31 per cent of the same group in Victoria (see below for the analysis using these data; traffic offenders are excluded). Turning now to the scales emerging from the correspondence analysis, we can see that whereas in NSW fines were located at the first quartile on the sentencing scale, in Victoria they were at the bottom of the ladder. The distance between fines and community orders was .60 in Victoria, compared to .39 in NSW. The availability of suspended sentences close to prison at the top of the sentencing hierarchy

(only .16 away), suggests that this area on the sentencing map is more 'crowded' than the equivalent place in NSW. On the other hand the space between intermediate sanctions and fines is more sparse.

Table 4: Estimated distances between penalties
Victorian Magistrates Courts, 1992

	Re-scaled Score	Distance between Penalties
Prison	1	
Suspended	0.84	0.16
Com orders	0.60	0.24
Bonds	0.16	0.44
Fines	0	0.16

Furthering the comparison - ABS estimates

To see how robust these estimates are, it is useful to provide a comparison with data from the same two courts – NSW local courts and Victorian Magistrates Courts a decade later. (table 4). These data are published by the ABS and are claimed to be generally comparable. The most obvious difference between the states, noted already, is the relatively high proportion of monetary orders in NSW (51 per cent vs 31 per cent for Victoria), although the use of custodial orders is about the same (17 per cent vs 16 percent). The mix of offences going to the two courts is also rather different with many more assaults being handled by NSW magistrates, whereas Victorian magistrates deal with more burglaries and thefts. The first appears to reflect simply a higher level of assault in NSW, although it could perhaps reflect the way police aggregate charges into court appearances. The second phenomenon is largely explained by the fact that Victorian magistrates handle relatively serious cases of burglary and theft that in NSW would be sent up to the District Court. At any rate it is important to recognise that the two courts are not quite identical, and that some of the difference in penalty hierarchies may reflect that difference in function.

	Table 4:	**Penalty distribution (broad categories)**				
		by offence, NSW and Victoria, 2004-5				
		ABS, 4513.0				
		Penalty				
	Custodial orders	Monetary orders	Other non-custodial orders	Total(c)		
Offence		**NSW**				
Injury	24.8%	31.3%	43.9%	100.0%	14772	
Negligence	8.6%	71.2%	20.2%	100.0%	5795	
Burglary	66.5%	8.1%	25.4%	100.0%	1337	
Theft	24.9%	45.8%	29.2%	100.0%	8342	

Deception	16.1%	52.7%	31.1%	100.0%	7165	
Drugs	11.2%	64.9%	24.0%	100.0%	6202	
property damage	7.1%	64.9%	28.0%	100.0%	4271	
public order	4.5%	70.2%	25.3%	100.0%	7352	
justice offences	11.7%	55.7%	32.6%	100.0%	4978	
Total	16.9%	51.8%	31.3%	100.0%	60214	
Persons	10199	31179	18836	60214		
		Victoria				
	Custodial orders	Monetary orders	Other non-custodial orders	Total(c)		
Injury	20.6%	33.1%	44.8%	100.0%	3820	
Negligence	7.5%	64.3%	27.7%	100.0%	4576	
Burglary	51.8%	10.6%	36.0%	100.0%	2098	
Theft	24.8%	29.8%	44.6%	100.0%	10343	
Deception	15.4%	35.5%	48.0%	100.0%	2791	
Drugs	22.3%	40.3%	36.7%	100.0%	4310	
property damage	10.4%	34.7%	53.7%	100.0%	2519	
public order	2.8%	14.4%	82.5%	100.0%	11481	
justice offences	12.1%	56.6%	30.5%	100.0%	3438	
Total	15.8%	32.4%	51.0%	100.0%	45376	
Persons	7172	14713	23142	45376		

The three penalty categories are probably too few to test out the differences suggested above using earlier (and less comparable) data. Probably not too much should be made of this comparison, given the use of such a misleading miscellaneous category, grouping both intermediate sanctions and dismissals. The apparent difference in the states in terms of which category is the lowest should not be taken at face value (table 5).

Table 5: Estimated distances between penalties

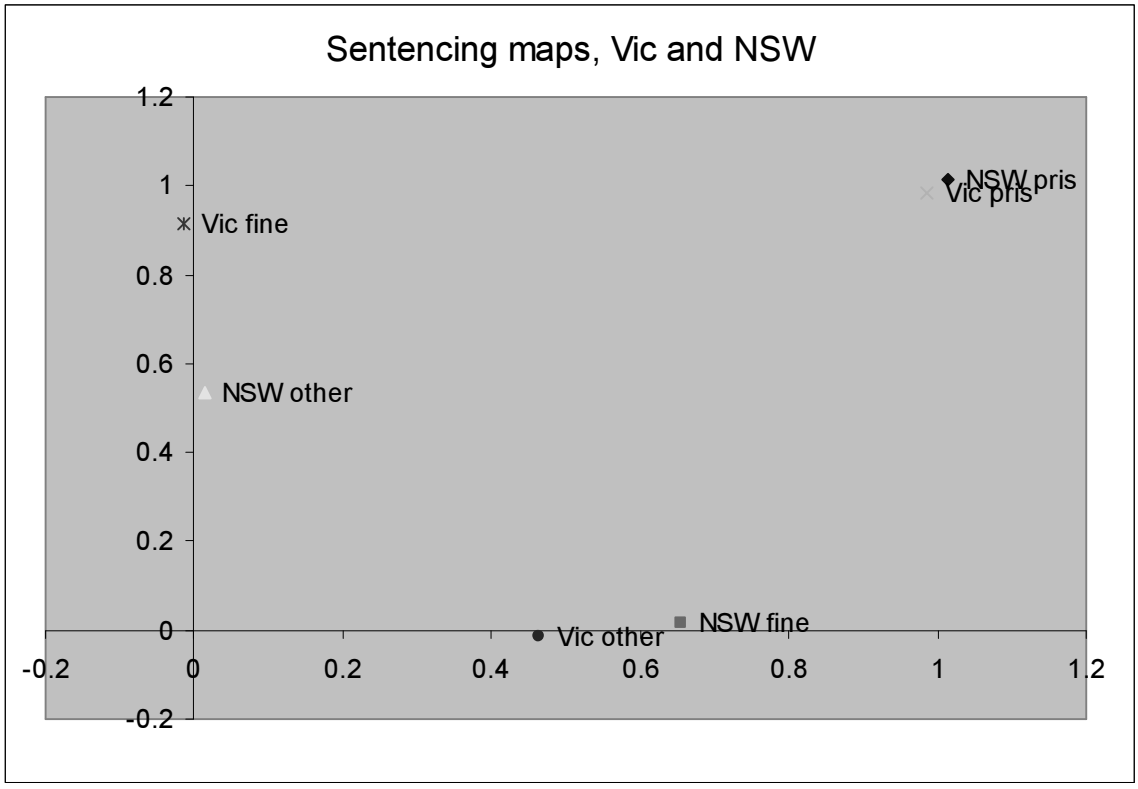
ABS, 4513.0, 2004

	NSW		*Victoria*	
	Re-scaled Score	**Distance between penalties**	**Re-scaled score**	**Distance between penalties**
Prison	1		1	
Fines	0	1	0.94	0.06
Other	0.53	0.53	0	0.94

It is probably more useful to look at the sentencing maps in two-dimensional space. For this purpose both the x axis and the y axis are standardised, again with 1 being high and 0 being low (figure 1), although with a tiny amount added to NSW data and a tiny amount taken away from Victorian data to allow them both to be shown. In this case, two separate analyses are combined on the same graph, for heuristic purposes.

The principal dimension is the Y axis, so as table 5 suggested, fines in Victoria are almost at the same level as prison. Since in the earlier study (with more fine-grained data), the two were at the opposite end of the spectrum, sentence severity is probably not the correct interpretation of this dimension.

Figure 1: Visual illustration of distances between sentences, NSW and Victoria.



While the distances between the points on the maps may not be strictly interpreted as Euclidian distances (according to Greenacre and Hastie), nevertheless the general pattern for both states illustrated on the diagram seems far more plausible than simply looking at a single dimension. Both states show a similar pattern, something like a triangle with each point of equal distance from the other two. In other words, the three penalty types are qualitatively different, and in neither state are two of these broad penalty types contiguous. Since directions are arbitrary, it is possible that the two are really much the same, although a mirror image. .But perhaps the real lesson is that three points are simply not enough to develop a sensible measure of penalty severity.

Conclusions

There are several useful lessons from this preliminary examination of sentencing data from NSW and Victoria, and comparison of three different sources. One practical lesson is that it is probably essential to have at least four data points to be able to develop a useful scale; while inclusion of a miscellaneous 'other' category confuses the matter still further.

The substantive lesson from tis exploration is that there does indeed appear to be major differences between the states in several aspects of sentencing practice. This may be associated with the relative punitiveness of judicial officers in one state compared to another (or harsher laws), or with different mixes between levels of court. But it may also result from different perceptions of sentence severity, different conceptual maps that place penalties in different spaces on sentencing maps, different equivalence scales. This paper has indicated ways in which these questions can be explored more thoroughly.

References

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Greenacre, M.J. (1984). *Theory and Application of Correspondence Analysis*. London: Academic Press.

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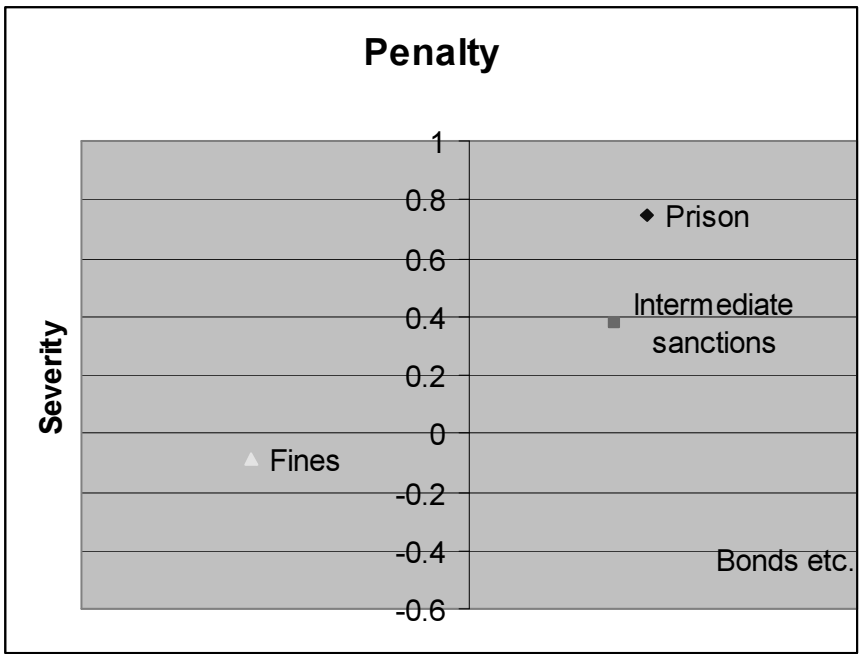
Greenacre, M.J. and Hastie, T.J. (1987). The geometric interpretation of correspondence analysis. *Journal of the American Statistical Association* **82**, 437 – 447.

Salfati, C. G., & Canter, D. V. (1999). Differentiating stranger murders: Profiling offender characteristics from behavioral styles. *Behavioral Sciences and the Law*, 17, 391-406.

Appendix Figure 2: Map of sentencing space, NSW Local Courts, Penalty distribution – broad categories



APPENDIX 1: Calculations for Correspondence Analysis, broad penalty categories
NSW Local Courts, 1992-1996, data from BOCSAR

Inertia and Chi-Square Decomposition

Singular Value	Principal Inertia	Chi-Square	Percent	Cumulative Percent
0.35236	0.12416	20041.9	65.09	65.09
0.24899	0.06200	10007.9	32.50	97.59
0.06787	0.00461	743.5	2.41	100.00
Total	0.19076	30793.3	100.00	

Degrees of Freedom = 36

Row Coordinates

	Dim1	Dim2
A	0.7485	0.1827
B	0.3766	0.1503
C	-0.0849	-0.2248
D	-0.4292	0.3644

APPENDIX 3

SAS CODE USED TO GENERATE DATA PRESENTED HERE

```
*BOCSAR data fro 1992-1996;
data offnsw;
 input pensevi $ 1-16 pens $ off1-off13;
label off1='a car'
        off2='b burg'
        off3='c fraud'
        off4='d damage'
        off5='e shop'
        off6='f drugsell'
        off7='g breach'
        off8='h theft hi'
        off9='i theft mid'
        off10='j theft lo'
        off11='k assault hi'
        off12='l assault mid'
        off13='m assault lo';
cards;
Prison              A   1582  2427  710        624    912       701
1425  2062  1501  263       3241    1681  170
Interm sanction   B     1298  2717  1406  1244  1413  1404  1400  1682
      2417  772       3199    4273  838
Fine          C   1947  1491  3124  11619 9089  6811  3720  4173  10154
      5650  9988  13765 4227
Bond/dismissal    D     678       1030    1594  3139  2579  1074  2721
      623       2207    3071  1486  8002  6100
;
 proc corresp data=offnsw out=resnsw observed rp short;
  var off1-off13;
 id pens;
  run;

options ls=100 ps=100 ;
proc plot data=resnsw ;
```

```
plot dim1 * dim2 =pens / box vspace=4 hspace=8
  haxis = -.6 to 0.6 by .2 vaxis=-.6 to 1.0 by .2;
run;

* NSW ABS data for 2004;
data offnsw;
 input pensevi $ 1-16 pens $ off1-off9;
label
off1  ='    a     injury            '
off2  ='    b     negligence        '
off3  ='    c     burglary          '
off4  ='    d     theft       '
off5  ='    e     deception         '
off6  ='    f     drugs       '
off7  ='    g     damage            '
off8  ='    h     pub order         '
off9  ='    i     justice offence         ';
cards;
Custodial       A 3664  498       889      2081 1156  694        302
      333        582
Monetary        B 4618  4126  108    3821 3778  4022  2772  5159  2775
Other non-cust  C 6490  1171  340    2440 2231  1486  1197  1860  1621
;

 proc corresp data=offnsw out=resnsw observed rp short;
  var off1-off9;
 id pens;
  run;

options ls=100 ps=100 ;
proc plot data=resnsw ;

plot dim1 * dim2 =pens / box vspace=4 hspace=8
  haxis = -.6 to 0.6 by .2 vaxis=-.6 to 1.0 by .2;
run;

* Victorian Magistrate Courts ABS data for 2004;
data offvic;
 input pensevi $ 1-16 pens $ off1-off9;
label
off1  ='    a     injury            '
off2  ='    b     negligence        '
off3  ='    c     burglary          '
off4  ='    d     theft       '
off5  ='    e     deception         '
off6  ='    f     drugs       '
off7  ='    g     damage            '
off8  ='    h     pub order         '
off9  ='    i     justice offence         ';
cards;
Prison          A 787        341    1087  2570  431      959      263
318   416
Fine            B 1263  2943  223       3081    990     1737      874
1656  1946
Non-cust        C 1711  1269  755       4612    1341  1581  1352  9472
      1049
```

```
;

 proc corresp data=offvic out=resvic observed rp short;
  var off1-off9;
 id pens;
  run;
options ls=100 ps=100 ;
proc plot data=resvic ;
plot dim1 * dim2 =pens / box vspace=4 hspace=8
  haxis = -.6 to 0.6 by .2 vaxis=-.6 to 1.0 by .2;
run;


* VIC Magistrates Court data from 1992;
data offvic;
 input pensevi $ 1-11 pens $ off1-off5;
label off1  ='    a     car theft   '
off2  ='    b     other theft '
off3  ='    c     receiving   '
off4  ='    d     fraud '
off5  ='    e     damage      '
;
cards;
Prison     A      351   651      223      185   102
Susp       B      247   603      269      216   86
ICO/CBO    C      396   1387   377  333   319
Fines      D      86    2970   896  404   1188
Bonds      E      149   2484  440   332   507
;
 proc corresp data=offvic out=resvic observed rp short;
  var off1-off5;
 id pens;
  run;
options ls=100 ps=100 ;
proc plot data=resvic ;
plot dim1 * dim2 =pens / box vspace=4 hspace=8
  haxis = -.6 to 0.6 by .2 vaxis=-.6 to 1.0 by .2;
run;
```