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USER'S GUIDE TO ORDINARY AND GENERALIZED STOCHASTIC DOMINANCE COMPUTER PROGRAMS

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I. Introduction

The inherent stochastic nature of the production and marketing of agricultural products makes the analysis of risk and its effect on decision making processes an important area of research for agricultural economists. An efficiency criterion referred to as stochastic dominance is a relatively new technique used in evaluating alternative courses of action characterized by uncertain outcomes.

The general literature on stochastic dominance techniques, both theoretical and empirical, is large and growing. Applications to agriculture are rather limited but certain to increase in the next few years. The purpose of this paper is to provide instructions to potential users of computer programs who perform stochastic dominance analysis. The three programs which are discussed are STODOM, SDWRF3, and INTID 1. Respectively these deal with ordinary and generalized stochastic dominance, and interval estimation of risk preferences. Since the technical details of these techniques will not be discussed here, the reader is encouraged to read Zentner, Greene, Hickenbotham and Eidman (1981) as the technical companion volume to this paper. King and Robison (1981a, b) also is recommended reading, especially for the risk interval estimation procedure. These two papers provide in a readable format the theoretical basis and implementation guidelines for stochastic dominance procedures.

II. Ordinary Stochastic Dominance (STODOM)

A. Introduction

Stochastic efficiency analysis provides the researcher the opportunity to reduce a set of possible decision strategies to a subset of the best or most efficient alternatives. By making a series of assumptions about the risk preferences of a decision maker, the stochastic dominance procedures will reduce the total set of strategies by eliminating those that are dominated by other strategies in the set. The efficient set may contain more than one strategy. Stochastic dominance eliminates all strategies that are dominated by other strategies in the choice set, but it does not necessarily reduce the efficient set to one.

Although there are numerous degrees of ordinary stochastic dominance, first, second and third degree stochastic dominance have proven to be the most common and useful criteria for empirical research. Zentner, et. al. (1981) and Anderson, Dillon and Hardaker (1977) provide excellent discussions on each of these criteria STODOM is a computer program which operationalizes these three criteria. It is a slight modification of the subprograms presented in Anderson, et al. (pp. 313-318).

B. Data Supplied by the User

The data requirements of STODOM are simple, provided the data exists and the number of observations of each distribution is the same.

Parameter	Description
NA	Identifies the number of distributions to be analyzed by STODOM. The maximum number is 48.

Parameter	Description
NC	Represents the number of observations or points on the cumulative distribution. The maximum number is 100.

C. Organization of the Data

The input format statements for STODOM have been written in free format which only requires that a space separates each data entry on a particular card. The following is an example of how the user supplied information might be organized in free format. Other spacing arrangements would be acceptable as long as the free format requirements are satisfied.

Card 1

Columns	Description
1-5	NA
6-10	NC

Card 2,3,...624(max.)

Columns	
1-10	Observation 1, Distribution 1
11-20	Observation 2, Distribution 1
21-30	Observation 3, Distribution 1
.	.
.	.
.	.
11-20	Observation n, Distribution 1
1-10	Observation 1, Distribution 2
.	.
.	.
71-80	Observation n, Distribution m

D. Example

Suppose the decision maker is faced with choosing between six alternative resource combinations which generate possible streams of income represented by the six distributions shown below. (Taken from King and Robison (1981a).)

Dist 1	Dist 2	Dist 3	Dist 4	Dist 5	Dist 6
250	0	50	150	350	350
1,450	200	500	1,600	1,100	2,150
2,000	250	1,850	2,150	1,700	2,250
3,250	1,550	3,800	3,150	3,500	2,650
5,200	2,250	5,400	5,150	5,150	4,550
6,600	4,600	7,800	6,350	6,800	5,250
8,150	5,250	9,750	7,900	8,350	5,900
8,400	5,750	9,850	8,400	8,500	6,900
8,850	9,850	10,200	8,700	8,700	7,100
9,000	10,500	10,300	8,900	8,950	7,100
9,200	10,650	10,450	9,300	9,000	7,600
9,350	13,800	10,500	9,450	9,200	7,800
9,700	14,500	10,650	9,650	10,200	8,900
11,400	16,250	13,300	11,400	11,300	8,950
11,600	17,500	14,150	11,450	11,900	9,400
13,800	18,000	16,550	13,900	13,550	11,150
14,200	18,000	17,100	14,300	13,950	11,650
14,400	19,000	17,100	14,600	14,050	11,950
15,300	19,350	17,850	15,400	15,100	12,650
17,450	19,600	19,750	17,750	16,800	15,000

STODOM can be used to select the efficient set of resource allocation strategies in the following manner. The user must supply the information expressed in lower case letters.

1. INPUT

Job card, time.

Account, account no., password.

BIN card, if needed.

GET STODOM/UN = GQM6013.

STODOM.

(7-8-9 EOR CARD)

6 20

250.00	1450.00	2000.00	3250.00	5200.00	6600.00	8150.00	8400.00
8850.00	9000.00	9200.00	9350.00	9700.00	11400.00	11600.00	13800.00
14200.00	14400.00	15300.00	17450.00				
0.00	200.00	250.00	1550.00	2250.00	4600.00	5250.00	5750.00
9850.00	10500.00	10650.00	13800.00	14500.00	16250.00	17500.00	18000.00
18000.00	19000.00	19350.00	19600.00				
50.00	500.00	1850.00	3800.00	5400.00	7800.00	9750.00	9850.00
10200.00	10300.00	10450.00	10500.00	10650.00	13300.00	14150.00	16550.00
17100.00	17100.00	17850.00	19750.00				
150.00	1600.00	2150.00	3150.00	5150.00	6350.00	7900.00	8400.00
8700.00	8900.00	9300.00	9450.00	9650.00	11400.00	11450.00	13900.00
14300.00	14600.00	15400.00	17750.00				
350.00	1100.00	1700.00	3500.00	5150.00	6800.00	8350.00	8500.00
8700.00	8950.00	9000.00	9200.00	10200.00	11300.00	11900.00	13550.00
13950.00	14050.00	15100.00	16800.00				
350.00	2150.00	2250.00	2650.00	4550.00	5250.00	5900.00	6900.00
7100.00	7100.00	7600.00	7800.00	8900.00	8950.00	9400.00	11150.00
11650.00	11950.00	12650.00	15000.00				

2. PRINTED OUTPUT

6 Efficient Prospects of Degree 1

Initial Efficient Range 1(1) 6

5 Efficient Prospects of Degree 2

1 2 3 5 6

1 Efficient Prospects of Degree 3

6

3. Interpretation of Results

We have started with a set of six alternatives. First-degree stochastic dominance does not reduce the set of alternatives which implies the cumulative distributions all cross each other at least once. Only one alternative (Distribution 4) is eliminated from the efficient set using second-degree stochastic dominance. This implies that Distribution 4 is dominated by at least one of the remaining strategies. Using the criteria of third-degree stochastic dominance, all the remaining distributions are eliminated except for Distribution 6 which makes up the efficient set. These same six distributions are used in Example 2 of the next section on generalized stochastic dominance. The reader may find a comparison of the efficient set from these two examples to be somewhat revealing, particularly in terms of the relative sensitivity of these two stochastic dominance techniques.

III. Generalized Stochastic Dominance (SDWRF3)

A. Introduction

Stochastic dominance with respect to a function (SDWRF) is a more powerful technique than ordinary stochastic dominance. Distributions of a performance indicator can be ranked for a given level or levels of risk aversion. Whereas ordinary SD ranked distributions for decision makers whose preferences are characterized by positive utility (first degree SD), risk aversion (second degree SD) and declining risk aversion (third degree), SDWRF ranks distributions for any type of known or assumed risk preferences. Therefore SD forms a subset of SDWRF.

SDWRF is an analytical tool which was developed by Jack Meyer (1975, 1977a, b) in a series of theoretical articles. Robert King (1979) modified Meyer's computer program for implementing SDWRF. King and Robison (1981a) report the usefulness of the technique and provide general operational guidelines. The modified program has been adjusted for larger data sets but otherwise it is identical to the King and Robison program.

B. Data Requirements

Given the broader power of SDWRF, the data requirements for the SDWRF3 program are somewhat more demanding. A detailed description of the user supplied information will be discussed in this section using the notation in the FORTRAN IV program. The actual organization and format of the data will be presented in the next section. The user specified variables are:

Variable	Description
ND	Represents the number of distributions to be ordered. The maximum value is 40.
NE	Represents the common number of elements in each distribution to be ordered. In SDWRF3 the maximum value for NE is 100.
NAME	Each distribution which is to be ranked must be assigned a name or label, e.g. DIST 1, DIST 2, etc. Letters and/or numbers may be used to identify the name of the distribution.
YMIN	Defines the lower level of the performance indicator for which utility values will be calculated.
YMAX	Defines the upper level of the performance indicator for which utility values will be calculated.
DY	Represents the increment in the performance indicator which is used in the numerical integration procedure to calculate the utility function.
YINT	Defines the interval between performance indicator levels for which utility values will be stored.

*Note: The magnitude of the performance indicator will influence the size of the variables DY and YINT. If the values of these variables are small relative to the range of the performance indicator infinite values result and the program will not run. From experience, if the performance indicator ranges from -25.00 to 10.00, values of .20 and 1.00 for DY and YINT respectively are acceptable. For ranges of 0 to 20,000, values of 5.0 and 50 have proven acceptable.

Variable	Description
IFLAG	This variable, when set equal to 0, directs the program to read the utility information from a permanent file. Otherwise the information is provided as input.
NDM	Represents the number of risk preference intervals to be used in the analysis.
RARG(M)	Establishes the lower bound of the performance indicator for which the interval applies.
RARG(M+1)	Establishes the upper bound of the performance indicator for which the interval applies.
RAL(M)	Defines the lower bound of the absolute risk aversion interval.
RAU(M)	Defines the upper bound of the absolute risk aversion interval.

C. Data Organization

The information discussed in the previous section is inputed into the computer by a series of cards or commands. The format for this information is:

Card 1

Column	Description
1-5	ND: Number of distributions
6-10	NE: Number of elements in each distribution

Card 2

1-10	NAME of first distribution

Card 3+

1-10	First element of first distribution
11-20	2nd Element
.	.
.	.
.	.

* Note: Eight data elements will be provided on each card. If the distribution has 100 elements then twelve cards will have eight elements each and the thirteenth card will have four elements. The data does not have to be arranged in any particular order. SDWRF3 will reorder the elements from lowest to highest values. This is the first program card to follow the data cards. It is called CARD 4 for ease of presentation. Likewise for Card 5 and 6.

Card 4	
1-10	YMIN
11-20	YMAX
21-30	DY
31-40	YINT
41-45	IFLAG
Card 5	
1-5	NDM
Card 6	
1-10	RARG(M)
11-20	RARG(M+1)
21-30	RAL(M)
31-40	RAU(M)

*Note: If NDM > 1 then a CARD 6 is needed for each risk interval and the relevant range of the performance indicator, e.g. if NDM = 3 then there would be three CARD 6's (See Example 2).

D. Interpretation of Results

The first section of the output from SDWRF3 is a listing of each distribution with the elements in ascending order. The mean and standard deviation of each distribution is also printed. The second half of the output is the stochastic dominance rankings for a given risk interval (Example 1) or an approximate risk aversion function (Example 2). If the ranking is "1" then the first distribution named stochastically dominates the second. A ranking of "-1" implies the second dominates the first. A "0" ranking indicates that the two distributions cannot be ordered for the given risk preference level(s).

E. Deck Set-up

1. Example 1

This is an example of using SDWRF3 to order four distributions of data. The data is average monthly price data for hundredweights of hogs sold in four midwestern states, Minnesota (MINN), Iowa (IOWA), Illinois (ILL) and Indiana (IND) in 1979. It is assumed that risk attitudes are constant across the entire range of the performance indicator (price). Hence, the one risk interval is [-.0001,.0001].

a. INPUT

```
Job name, time.
Acccount, account no., password.
BIN card, if needed.
GET, SDWRF3/UN=GQM6013.
SDWRF3.
  (7-8-9  EOR CARD)
```

```
  4   12
MINN
   47.80   51.10   53.30   50.00   44.30   43.90   39.00   37.10
   34.80   36.50   33.10   33.80
IOWA
   47.80   51.00   52.80   48.00   44.10   42.90   39.10   37.70
   36.10   36.90   33.90   33.70
ILL
   48.40   50.80   52.20   48.70   44.10   43.40   41.00   38.50
   37.50   38.20   34.40   35.50
IND
   48.00   51.20   52.30   47.30   43.60   42.80   39.20   38.10
   36.10   37.60   34.40   34.80
   33.10   53.30     .50    1.00  1
  1
   33.10   53.30  -.0001    .0001
(6-7-8-9)EOF CARD)
```

b. PRINTED OUTPUT

```
MINN   MEAN=   42.06   STD = 6.94
       33.10   33.80   34.80   36.50   37.10   39.00   43.90   44.30   47.80   50.00
       51.10   53.30
IOWA   MEAN=   42.00   STD = 6.42
       33.70   33.90   36.10   36.90   37.70   39.10   42.90   44.10   47.80   48.00
       51.00   52.80
```

ILL MEAN = 42.72 STD = 5.88

34.40	35.50	37.50	38.20	38.50	41.00	43.40	44.10	48.40	48.70
50.80	52.20								

IND MEAN = 42.12 STD = 6.09

34.40	34.80	36.10	37.60	38.10	39.20	42.80	43.60	47.30	48.00
51.20	52.30								

NAME	VERSUS	NAME	
MINN		IOWA	1
MINN		ILL	-1
MINN		IND	-1
IOWA		MINN	-1
IOWA		ILL	-1
IOWA		IND	-1
ILL		MINN	1
ILL		IOWA	1
ILL		IND	1
IND		MINN	1
IND		IOWA	1
IND		ILL	-1

2. Example 2

When the performance indicator is an income measure with a broad range of values, the assumption of a constant absolute risk interval may no longer be valid. SDWRF3 can rank distributions in the case of decreasing, constant, increasing and mixed absolute risk aversion with respect to the income level. Six distributions of income data are analyzed below to determine the efficient set of distributions. Assume for this example that risk preferences have been measured for a particular decision maker. The measurements are:

Income Interval	Estimated Risk Interval
[2000, 4000]	[0.00, .0003]
[9000, 11000]	[-.0001, .0001]
[16000, 18000]	[-.0003, 0.00]

and have been incorporated into the input.

a. INPUT

Job name, time.

ACCOUNT, account no., password.

BIN card if needed.

GET, SDWRF3/UN = GQM6013.

SDWRF3.

(7-8-9 EOR CARD)

```
 6    20

 DIST  1

 250.00   1450.00   2000.00   3250.00   5200.00   6600.00   8150.00   8400.00
8850.00   9000.00   9200.00   9350.00   9700.00  11400.00  11600.00  13800.00
14200.00  14400.00  15300.00  17450.00
 DIST  2
   0.00    200.00    250.00   1550.00   2250.00   4600.00   5250.00   5750.00
9850.00  10500.00  10650.00  13800.00  14500.00  16250.00  17500.00  18000.00
 DIST  3
  50.00    500.00   1850.00   3800.00   5400.00   7800.00   9750.00   9850.00
10200.00  10300.00  10450.00  10500.00  10650.00  13300.00  14150.00  16550.00
 DIST  4
 150.00   1600.00   2150.00   3150.00   5150.00   6350.00   7900.00   8400.00
8700.00   8900.00   9300.00   9450.00   9650.00  11400.00  11450.00  13900.00
14300.00  14600.00  15400.00  17750.00
 DIST  5
 350.00   1100.00   1700.00   3500.00   5150.00   6800.00   8350.00   8500.00
8700.00   8950.00   9000.00   9200.00  10200.00  11300.00  11900.00  13550.00
13950.00  14050.00  15100.00  16800.00
 DIST  6
 350.00   2150.00   2250.00   2650.00   4550.00   5250.00   5900.00   6900.00
7100.00   7100.00   7600.00   7800.00   8900.00   8950.00   9400.00  11150.00
11650.00  11950.00  12650.00  15000.00
   0.00  19750.00       5.0     50.00     1
 3
2000.00   4000.00      0.00     .0003
9000.00  11000.00    -.0001     .0001
16000.00  18000.00    -.0003       0.0

(6-7-8-9 EOF CARDS)
```

B. PRINTED OUTPUT

```
DIST 1   MEAN= 8977.50      STD=4692.69
 250.00   1450.00   2000.00   3250.00   5200.00   6600.00   8150.00   8400.00  8850.00  9000.00
9200.00   9350.00   9700.00  11400.00  11600.00  13800.00  14200.00  14400.00 15300.00 17450.00

DIST 2   MEAN= 10342.00     STD=7103.82
      0    200.00    250.00   1550.00   2250.00   4600.00   5250.00   5750.00  9850.00 10500.00
10650.00  13800.00  14500.00  16250.00  17500.00  18000.00  18000.00  19000.00 19350.00 19600.00

DIST 3   MEAN=10345.00      STD=5689.22
  50.00    500.00   1850.00   3800.00   5400.00   7800.00   9750.00   9850.00 10200.00 10300.00
10450.00  10500.00  10650.00  13300.00  14150.00  16550.00  17100.00  17100.00 17850.00 19750.00
```

b. OUTPUT (continued)

```
DIST 4  MEAN=8982.50     STD= 4749.72
  150.00    1600.00    2150.00    3150.00    5150.00  6350.00  7900.00  8400.00  8700.00  8900.00
 9300.00    9450.00    9650.00   11400.00   11450.00 13900.00 14300.00 14600.00 15400.00 17750.00

DIST 5  MEAN=8907.50     STD= 4609.59
  350.00    1100.00    1700.00    3500.00    5150.00  6800.00  8350.00  8500.00  8700.00  8950.00
 9000.00    9200.00   10200.00   11300.00   11900.00 13550.00 13950.00 14050.00 15100.00 16800.00

DIST 6  MEAN=7462.50     STD=3799.34
  350.00    2150.00    2250.00    2650.00    4550.00  5250.00  5900.00  6900.00  7100.00  7100.00
 7600.00    7800.00    8900.00    8950.00    9400.00 11150.00 11650.00 11950.00 12650.00 15000.00
```

NAME	VERSUS	NAME	
DIST 1		DIST 2	0
DIST 1		DIST 3	-1
DIST 1		DIST 4	0
DIST 1		DIST 5	1
DIST 1		DIST 6	1
DIST 2		DIST 1	0
DIST 2		DIST 3	0
DIST 2		DIST 4	0
DIST 2		DIST 5	0
DIST 2		DIST 6	1
DIST 3		DIST 1	1
DIST 3		DIST 2	0
DIST 3		DIST 4	1
DIST 3		DIST 5	1
DIST 3		DIST 6	1
DIST 4		DIST 1	0
DIST 4		DIST 2	0
DIST 4		DIST 3	-1
DIST 4		DIST 5	1
DIST 4		DIST 6	1
DIST 5		DIST 1	-1
DIST 5		DIST 2	0
DIST 5		DIST 3	-1
DIST 5		DIST 4	-1
DIST 5		DIST 6	1
DIST 6		DIST 1	-1
DIST 6		DIST 2	-1
DIST 6		DIST 3	-1
DIST 6		DIST 4	-1
DIST 6		DIST 5	-1

IV. Interval Approach for Estimating Risk Attitudes (INTID1)

A. Introduction

The economics profession, especially agricultural economists, has used a variety of techniques in its attempt to measure the risk preferences of decision makers. Direct elicitation (e.g. Ramsey method), programming, experimental and econometric techniques have proven to be less than totally satisfactory from either a theoretical or practical point of view. The interval approach developed by King and Robison (1981a, b) is a relatively new direct elicitation approach. Very little empirical work has been done using this technique so its soundness as a measurement tool is still being evaluated.

INTID1 uses the criterion developed by Meyer to order distributions according to user specified risk intervals. The program generates a series of distributions of a performance indicator from a given mean and standard deviation. At present the simulated distributions are normal distributions but this could be changed to beta or gamma distributions with a slight modification in the program. Pairs of the simulated distributions are compared using each risk interval until a boundary interval is identified. That is, given a risk interval $[r_1, r_2]$, if distribution F is preferred to distribution G for all values of r below r_1 and G is preferred to F above r_2 for all r, then $[r_1, r_2]$ is identified as the boundary interval. INTID1 generates a listing of all possible pairs of distributions for the specified intervals.

A straightforward questioning process can be developed to elicit risk attitudes by using this listing of boundary intervals. King and Robison discuss this programmed learning-type questioning procedure in great detail so it will not be repeated here.

B. Data Requirements

The user must provide INTID1 with (1) information for generating the distributions and (2) the actual risk intervals that will be used. The parameters are:

Parameter	Description
ND	Defines the number of distributions that will be generated. The maximum number is 50. Forty distributions generally have proven to be sufficient.
NE	Establishes the number of elements in each distribution. Although the maximum number is 10 we suggest using 6 or possibly 5.
YMEAN	Represents the mean of the distributions which are to be generated. What is often done is to specify YMEAN = 0.00 and then use the generated values of the performance indicator to shift an expected value, y*, to the left or to the right.
YSTD	Defines the standard deviation to be used in generating the distributions. Although experience is limited, a recommended value of YSTD is five percent of the relevant range of the performance indicator.

Parameter	Description
IROUND	Establishes the level of rounding for elements of the distributions. For example, elements can be rounded to the nearest 10, 50 or 100 units.
NG	Defines the number of reference levels on the risk preference grid. The maximum number is 64 which is the number required for a six question sequence. The relationship between NG and the number of question(s) is NG = 2^Q. That is,

NG	Q
2	1
4	2
8	3
16	4
32	5
64	6

RA	Establishes the NG reference levels in ascending order, e.g. -.0003, -.0001, .0001, etc.

C. Data Organization

The information discussed in the previous section is organized for computer input in the following manner:

Card 1: FORMAT(3I5)

Column	Description
1-5	ND
6-10	NE
11-15	NG

Card 2: FORMAT(2F10.2,I5)

1-10	YMEAN
11-20	YSTD
21-25	IROUND

CARD 3: FORMAT(8F10.8)

1-10	r_1
11-20	r_2
21-30	r_3
.	.
.	.
.	.
71-80	r_8

D. Example

Let us imagine that we want to measure the risk attitudes of the faculty members of the Department of Agricultural and Applied Economics at the University of Minnesota. For the sake of this example assume that the average take home pay of the faculty members is $32,000 per year. Using the five percent level for the standard deviation, we have YSTD = 1600. We will round all values of the distributions to the nearest $50. Since we want a three question sequence in the questionnaire, we have eight reference levels for the risk coefficient (NG = 8). Only twenty distributions will be generated in order to shorten the output.

1. INPUT

```
Job name, time.
ACCOUNT, account no., password.
BIN card, if needed.
GET, INTID1/UN=GQM6013.
INTID1.
    (7-8-9 EOR CARD)
```

20	6	8						
	0.00	1600.00	50					
	-.001	-.0003	-.0001	.00	.0001	.0003	.0005	.001

2. PRINTED OUTPUT

SAMPLE DISTRIBUTIONS

DIST 1	MEAN = 491.67		STD = 1236.06			
	-1000.00	-850.00	-300.00	1550.00	1550.00	2000.00
DIST 2	MEAN = 850.00		STD = 1719.25			
	-1850.00	-100.00	100.00	1350.00	2050.00	3550.00
DIST 3	MEAN = -800.00		STD = 1179.69			
	-2150.00	-1750.00	-1500.00	-950.00	500.00	1050.00
DIST 4	MEAN = -308.33		STD = 789.73			
	-1450.00	-950.00	-750.00	150.00	400.00	750.00
DIST 5	MEAN = -433.33		STD = 792.50			
	-2000.00	-500.00	-400.00	-400.00	150.00	550.00
DIST 6	MEAN = -208.33		STD = 1601.41			
	-2200.00	-1450.00	-1200.00	-200.00	1850.00	1950.00
DIST 7	MEAN = 150.00		STD = 2195.83			
	-3200.00	-1550.00	-600.00	1250.00	1500.00	3500.00
DIST 8	MEAN = -341.67		STD = 1295.32			
	-3150.00	-250.00	-50.00	200.00	500.00	700.00
DIST 9	MEAN = -141.67		STD = 1783.82			
	-2400.00	-1300.00	-1100.00	250.00	500.00	3200.00
DIST 10	MEAN = 216.67		STD = 1212.32			
	-1550.00	-1350.00	600.00	950.00	1100.00	1550.00
DIST 11	MEAN = 316.67		STD = 1431.10			
	-1450.00	-800.00	-550.00	850.00	1000.00	2850.00
DIST 12	MEAN = 125.00		STD = 962.09			
	-1150.00	-550.00	-500.00	400.00	850.00	1700.00
DIST 13	MEAN = 541.67		STD = 1261.42			
	-1000.00	-600.00	-200.00	1150.00	1250.00	2650.00
DIST 14	MEAN = -275.00		STD = 1479.51			
	-2350.00	-1800.00	-350.00	-200.00	1450.00	1600.00
DIST 15	MEAN = -1516.67		STD = 564.70			
	-2300.00	-2250.00	-1400.00	-1300.00	-950.00	-900.00
DIST 16	MEAN = -591.67		STD = 1474.34			
	-3100.00	-1750.00	-300.00	-200.00	300.00	1500.00
DIST 17	MEAN = -525.00		STD = 2725.92			
	-3300.00	-3050.00	-2750.00	0	2350.00	3600.00
DIST 18	MEAN = -808.33		STD = 1312.89			
	-3050.00	-1950.00	-850.00	100.00	350.00	550.00

DIST 19	MEAN = 408.33		STD = 1739.83			
	-2400.00	-300.00	300.00	500.00	850.00	3500.00
DIST 20	MEAN = -266.67		STD = 1791.80			
	-2450.00	-2200.00	-1350.00	1000.00	1350.00	2050.00

ABSOLUTE RISK AVERSION LEVELS DEFINING *MEASUREMENT SCALE

.001000

.000500

.000300

.000100

0

-.000100

-.000300

-.001000

SPECIFICATION OF BOUNDARY INTERVALS

.000500	TO	.001000	DIST 2	PREFERRED BELOW	.000500	DIST 1	PREFERRED ABOVE	.001000
-.000300	TO	-.000100	DIST 7	PREFERRED BELOW	-.000300	DIST 1	PREFERRED ABOVE	-.000100
-.001000	TO	-.000300	DIST 9	PREFERRED BELOW	-.001000	DIST 1	PREFERRED ABOVE	-.000300
-.001000	TO	-.000300	DIST 11	PREFERRED BELOW	-.001000	DIST 1	PREFERRED ABOVE	-.000300
-.001000	TO	-.000300	DIST 17	PREFERRED BELOW	-.001000	DIST 1	PREFERRED ABOVE	-.000300
.000500	TO	.001000	DIST 2	PREFERRED BELOW	.000500	DIST 12	PREFERRED ABOVE	.001000
.000300	TO	.000500	DIST 2	PREFERRED BELOW	.000300	DIST 13	PREFERRED ABOVE	.000500
-.001000	TO	-.000300	DIST 3	PREFERRED BELOW	-.001000	DIST 5	PREFERRED ABOVE	-.000300
.000500	TO	.001000	DIST 7	PREFERRED BELOW	.000500	DIST 3	PREFERRED ABOVE	.001000
.000300	TO	.000500	DIST 16	PREFERRED BELOW	.000300	DIST 3	PREFERRED ABOVE	.000500
0	TO	.000100	DIST 17	PREFERRED BELOW	0	DIST 3	PREFERRED ABOVE	.000100
.000500	TO	.001000	DIST 20	PREFERRED BELOW	.000500	DIST 3	PREFERRED ABOVE	.001000
.000100	TO	.000300	DIST 7	PREFERRED BELOW	.000100	DIST 4	PREFERRED ABOVE	.000300
.000100	TO	.000300	DIST 9	PREFERRED BELOW	.000100	DIST 4	PREFERRED ABOVE	.000300
0	TO	.000100	DIST 14	PREFERRED BELOW	0	DIST 4	PREFERRED ABOVE	.000100
-.001000	TO	-.000300	DIST 16	PREFERRED BELOW	-.001000	DIST 4	PREFERRED ABOVE	-.000300
-.000100	TO	0	DIST 17	PREFERRED BELOW	-.000100	DIST 4	PREFERRED ABOVE	0
.000500	TO	.001000	DIST 19	PREFERRED BELOW	.000500	DIST 4	PREFERRED ABOVE	.001000
0	TO	.000100	DIST 20	PREFERRED BELOW	0	DIST 4	PREFERRED ABOVE	.000100
.000100	TO	.000300	DIST 6	PREFERRED BELOW	.000100	DIST 5	PREFERRED ABOVE	.000300
.000100	TO	.000300	DIST 7	PREFERRED BELOW	.000100	DIST 5	PREFERRED ABOVE	.000300
.000100	TO	.000300	DIST 8	PREFERRED BELOW	.000100	DIST 5	PREFERRED ABOVE	.000300
.000100	TO	.000300	DIST 9	PREFERRED BELOW	.000100	DIST 5	PREFERRED ABOVE	.000300

.000100	TO	.000300	DIST 14	PREFERRED BELOW	.000100	DIST 5	PREFERRED ABOVE	.000300
-.000300	TO	-.000100	DIST 16	PREFERRED BELOW	-.000300	DIST 5	PREFERRED ABOVE	-.000100
-.000100	TO	0	DIST 17	PREFERRED BELOW	-.000100	DIST 5	PREFERRED ABOVE	0
.000500	TO	.001000	DIST 19	PREFERRED BELOW	.000500	DIST 5	PREFERRED ABOVE	.000100
.000100	TO	.000300	DIST 20	PREFERRED BELOW	.000100	DIST 5	PREFERRED ABOVE	.000300
.000300	TO	.000500	DIST 7	PREFERRED BELOW	.000300	DIST 6	PREFERRED ABOVE	.000500
-.001000	TO	-.000300	DIST 6	PREFERRED BELOW	-.001000	DIST 10	PREFERRED ABOVE	-.000300
-.001000	TO	-.000300	DIST 6	PREFERRED BELOW	-.001000	DIST 12	PREFERRED ABOVE	-.000300
-.000300	TO	-.000100	DIST 17	PREFERRED BELOW	-.000300	DIST 6	PREFERRED ABOVE	-.000100
.000300	TO	.000500	DIST 7	PREFERRED BELOW	.000300	DIST 8	PREFERRED ABOVE	.000500
.000300	TO	.000500	DIST 7	PREFERRED BELOW	.000300	DIST 9	PREFERRED ABOVE	.000500
-.000100	TO	0	DIST 7	PREFERRED BELOW	-.000100	DIST 10	PREFERRED ABOVE	0
-.000300	TO	-.000100	DIST 7	PREFERRED BELOW	-.000300	DIST 11	PREFERRED ABOVE	-.000100
0	TO	.000100	DIST 7	PREFERRED BELOW	0	DIST 12	PREFERRED ABOVE	.000100
.000300	TO	.000500	DIST 7	PREFERRED BELOW	.000300	DIST 14	PREFERRED ABOVE	.000500
.000500	TO	.001000	DIST 7	PREFERRED BELOW	.000500	DIST 16	PREFERRED ABOVE	.001000
-.001000	TO	-.000300	DIST 17	PREFERRED BELOW	-.001000	DIST 7	PREFERRED ABOVE	-.000300
.000500	TO	.001000	DIST 7	PREFERRED BELOW	.000500	DIST 20	PREFERRED ABOVE	.001000
-.000100	TO	0	DIST 17	PREFERRED BELOW	-.000100	DIST 8	PREFERRED ABOVE	0
-.001000	TO	-.000300	DIST 9	PREFERRED BELOW	-.001000	DIST 10	PREFERRED ABOVE	-.000300
-.001000	TO	-.000300	DIST 9	PREFERRED BELOW	-.001000	DIST 11	PREFERRED ABOVE	-.000300
-.000300	TO	-.000100	DIST 9	PREFERRED BELOW	-.000300	DIST 12	PREFERRED ABOVE	-.000100
-.001000	TO	-.000300	DIST 9	PREFERRED BELOW	-.001000	DIST 13	PREFERRED ABOVE	-.000300
-.000300	TO	-.000100	DIST 17	PREFERRED BELOW	-.000300	DIST 9	PREFERRED ABOVE	-.000100
-.000300	TO	-.000100	DIST 17	PREFERRED BELOW	-.000300	DIST 10	PREFERRED ABOVE	-.000100

.000100	TO	.000300	DIST 19	PREFERRED BELOW	.000100	DIST 10	PREFERRED ABOVE	.000300
.000300	TO	.000500	DIST 11	PREFERRED BELOW	.000300	DIST 12	PREFERRED ABOVE	.000500
-.001000	TO	-.000300	DIST 11	PREFERRED BELOW	-.001000	DIST 13	PREFERRED ABOVE	-.000300
-.001000	TO	-.000300	DIST 17	PREFERRED BELOW	-.001000	DIST 11	PREFERRED ABOVE	-.000300
.000100	TO	.000300	DIST 19	PREFERRED BELOW	.000100	DIST 11	PREFERRED ABOVE	.000300
-.000300	TO	-.000100	DIST 17	PREFERRED BELOW	-.000300	DIST 12	PREFERRED ABOVE	-.000100
.000100	TO	.000300	DIST 19	PREFERRED BELOW	.000100	DIST 12	PREFERRED ABOVE	.000300
-.001000	TO	-.000300	DIST 20	PREFERRED BELOW	-.001000	DIST 12	PREFERRED ABOVE	-.000300
-.001000	TO	-.000300	DIST 17	PREFERRED BELOW	-.001000	DIST 13	PREFERRED ABOVE	-.000300
-.000300	TO	-.000100	DIST 19	PREFERRED BELOW	-.000300	DIST 13	PREFERRED ABOVE	-.000100
-.000100	TO	0	DIST 17	PREFERRED BELOW	-.000100	DIST 14	PREFERRED ABOVE	0
0	TO	.000100	DIST 20	PREFERRED BELOW	0	DIST 14	PREFERRED ABOVE	.000100
.000300	TO	.000500	DIST 17	PREFERRED BELOW	.000300	DIST 15	PREFERRED ABOVE	.000500
.000500	TO	.001000	DIST 18	PREFERRED BELOW	.000500	DIST 15	PREFERRED ABOVE	.001000
0	TO	.000100	DIST 17	PREFERRED BELOW	0	DIST 16	PREFERRED ABOVE	.000100
-.001000	TO	-.000300	DIST 17	PREFERRED BELOW	-.001000	DIST 19	PREFERRED ABOVE	-.000300
-.000300	TO	-.000100	DIST 17	PREFERRED BELOW	-.000300	DIST 20	PREFERRED ABOVE	-.000100

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