JAMES A. GRAASKAMP COLLECTION OF TEACHING MATERIALS
V.   INDUSTRY SEMINARS AND SPEECHES - SHORT TERM
     H.   Presentations Sponsored by Other Universities
          1.   "A Market Comparison Pricing Algorithm Based
                on Set Theory (Or Bill Shenkel Was Right All
                Along", sponsored by Center for Real Estate &
                Urban Economic Studies, The University of
                Connecticut, Market Comparison Lecture
                Series, October 25, 1985; includes sample of
                Experimental Automated Market Comparison
                Process" plus a slightly different
                version--probably a preliminary draft

20TH ANNIVERSARY CELEBRATION

CENTER FOR REAL ESTATE AND
URBAN LAND ECONOMIC STUDIES

UNIVERSITY OF CONNECTICUT
SCHOOL OF BUSINESS ADMINISTRATION

October 25, 1985

Howard Johnson's Conference Center
Windsor Locks, Connecticut

A MARKET COMPARISON PRICING ALGORITHM
BASED ON SET THEORY
(OR BILL SCHENKEL WAS RIGHT ALL ALONG)

I. The appraisal process is a specialty in the information game, specifically the search for patterns in a glut of data points with plausible relevance to any given decision.

    A. The metaphysics of information processing for decisions, especially appraisal decisions, should include at least four essential readings:

        1. Grammatical Man: Information, Entropy, Language, and Life by Jeremy Campbell, a Touchstone Book, Simon & Schuster, Inc., New York, 1982.

        2. The Complete Problem Solver by John R. Hayes, The Franklin Institute Press, Distributed by Charles Scribner's Sons, Philadelphia, PA, 1981.

        3. "Bounded Rationality" (See Exhibit 1 for summary statement of sources on this amended concept of prudent man.)

        4. Schenkel

    B. Gene Dilmore has stated that the appraiser must choose his comparable data subjectively, but then treat it in an objective manner. Schenkel would argue that using Set Theory forces the appraiser to have explicit rules for the selection of comparables, and Dilmore would add that Set Theory allows us to sidestep the degrees of freedom required for inference about a larger universe by presuming the set to be the universe.

    C. Dilmore has described the three approaches to value as Order, Chance, and Beauty

        1. ORDER assumes under everything is a universe in which the parts fit, information has a shape. Remember the test for color blindness, random dots in random colors until suddenly you see the red dots only as a letter or a number. As appraisers, we look for the red dots. Alternatively, appraisers are like the sculptor who chisels away that part of the rock that is not part of the figurine which is to remain.

        2. CHANCE acknowledges the possibility of alternative outcomes in our little closed system. Imprecision is inherent to behavioral science. No respectable scientist is afraid of the words "variance" or "error". We know in part

and see but through a glass darkly. We may be able to predict without always understanding cause and effect because of unknown cross-correlations.

3. BEAUTY can be a legitimate basis for constructing a hypothesis--elegance is the ultimate intuitive choice, judgment, or gut response. Models may be elegant and not fully understood but useful and sometimes dangerous like Ellwood, regression and cost. Remember Einstein created $E=MC^2$ using the speed of light for elegance 20 years before there was empirical justification.

D. A less poetic hierarchy for appraisal methodology using contemporary tools is provided by Ratcliff who rated techniques by their power to predict behavior to a most probable price forecast:

1. MARKET COMPARISON INFERENCE from past transactions of buyers of similar motivation purchasing properties with similar productivity to the subject property in order to find, inductively, the most probable price within a transaction zone acceptable to both buyers and sellers.

2. SIMULATION OF BUYER CALCULUS based on interviews of successful buyers in the marketplace with skills and past behavior necessary to implement the most probable use for the subject property, but this method was to be used in the absence of comparable sales to define the transaction zone of the buyer or as a check on values determined from market inference.

3. NORMATIVE METHODS representing deductive logical systems as to what the buyers/sellers might do if they thought like an appraiser are the last hope where the appraiser can find no pattern in sales or simulation.

II. One elegant system for inference from actual market transactions have evolved from the Ratcliff/Graaskamp weighted point process modified by Dilmore with an algorithm computed from non-parametric lattice statistics.

A. The Dilmore RATGRAM algorithm for pricing first tests a pricing formula for each selected comparable and then presumes the same algorithm can be applied to the subject property. The procedure requires:

1. Adjusting prices for terms of sale and time on comparable properties. Comparable properties

would be those bought for renovation, or for the owner's own use, etc. You may choose to abstract out land values where size or locational quality is significantly different.

2. Selecting a proper unit of comparison.

3. Developing a hierarchy of significant attributes thought to affect price and scoring each property on a point system.

4. Developing a weighting system to rank the relative importance ordinal attribute scores on a cardinal scale.

5. Developing a price per weighted point per unit of comparison.

6. Testing the price weighting formula for best estimate of the sales price of actual comparables in order to minimize dispersion and variance between actual price and price estimated by formula.

7. Applying a price per point per unit formula to the subject property to estimate range of alternative prices.

8. Adjusting of predicted price for unique externalities such as land, financing, or non-transferable license.

B. Search for appropriate unit of comparison as a single variable in a linear regression by trying three or four unit concepts, such as: (See Exhibit 2.)

1. Gross building area

2. Net leasable area

3. Cubage

4. Two times the first floor area plus gross building area

5. Barrels of cranberries rather than acres of cranberries

6. Number of bedrooms rather than square feet.

C. Arrive at a price per unit as the first step in establishing a price algorithm.

D.   Identify property attributes which distinguish subject properties qualitatively from one another and develop a simple scoring system.

1.   5-3-1 is one method, but scores may become multipliers and lead to distortion.

2.   Dilmore prefers:

Rating	Points
Excellent	26
Good	20
Average	15
Fair	13
Poor	10

E.   See selection of examples in Exhibits 3 through 14.

F.   The algorithm process offers several pluses while avoiding protocol problems with regression.

1.   The price algorithm is first justified by the degree of explanation it provides on specific comparable property prices.

2.   It can be replicated manually or with the aid of the mini-computer by juries, clients, or for the next similar subject property.

3.   It sidesteps the needs for large numbers of sales transactions and fits the theory of bounded rationality which is the modern interpretation of prudent man.

4.   It avoids the problem of appraisal protocol encountered by regression when the subject property is compared to a hypothetical set of means from a large number of observations with which the appraiser may not be familiar. Regression does not allow the appraiser to set his own adjustments on attributes nor identify and rank specific comps to the subject property.

5.   The RATGRAM-DILMORE algorithm is pragmatic and yet compatible with the development of in-house appraisal data bank or other techniques which admit of uncertainty such as fuzzy sets or of conflict such as game theory models.

EXHIBIT 2

CORRELATION COEFFICIENTS AND R^2 OF SALES PRICE

Space Unit	Correlation	R^2
First floor frontage (frt)	0.745	55.5%
Lot area	0.908	82.4
First floor (1st fl)	0.790	62.4
First floor + Upper floors (upp fl)	0.933	87.0
1st fl + .05 (upp fl)	0.919	84.5
2(1st fl) + upp fl	0.919	84.5
(1st fl) x (frt)	0.784	61.5
[1st fl + 0.5 (upp fl)] x (frt)	0.864	74.6
[2(1st fl) + upp fl)] x (frt)	0.864	74.6
(1st fl + upp fl) x (frt)	0.874	76.4

EXHIBIT 3

RATGRAM STYLE

WOOLWORTH BUILDING
SCALE FOR SCORING COMPARABLES ON
IMPORTANT INVESTOR CONSIDERATIONS FOR
OFFICE - RETAIL SPACE IN MADISON
C-4 ZONING

LOCATION
10%

5 = High visibility
3 = Corner visibility limited
1 = Inside lot

EXPANSION POTENTIAL
30%

5 = Potential for significant
increases of floor space
3 = Flexible layouts due to
bay spacing and elevator
position
1 = Inflexibility of layout due
to old bearing walls and
elevator shafts

CONDITION AT
TIME OF PURCHASE
25%

5 = Fully renovated and leased
3 = Long-term retail leases in
place. Serviceable as retail
in tired space.
1 = Vacant and in need of total
rehabilitation. Short-term
lease or large vacancy in
need of total rehabilitation.

ELEVATORS AT
TIME OF PURCHASE
20%

5 = Two passenger and freight
3 = Two passenger
1 = One passenger

FENESTRATION ON UPPER LEVEL
15%

5 = Large windows facing
the Square
3 = Limited window area
1 = No windows

WOOLWORTH BUILDING

WEIGHTED MATRIX FOR COMPARABLE PROPERTIES

SCORE/WEIGHTED SCORE

ATTRIBUTE	WEIGHT	COMPARABLE NO. 1 30 N. CARROLL WOLFF KUBLY	COMPARABLE NO. 2 14 W. MIFFLIN	COMPARABLE NO. 3 5 & 7 E. MIFFLIN CENTRE SEVEN	COMPARABLE NO. 4 50 E. MIFFLIN EMPORIUM	COMPARABLE NO. 5 2 W. MIFFLIN WOOLWORTH	SUBJECT
LOCATION	10%	3/0.30	1/0.10	1/0.10	3/0.30	5/0.50	5/0.50
EXPANSION POTENTIAL AT TIME OF SALE	30%	3/0.90	1/0.30	1/0.30	5/1.50	3/0.90	3/0.90
CONDITION AT TIME OF SALE	25%	1/0.25	5/1.25	1/0.25	3/0.75	3/0.75	1/0.25
ELEVATORS IN PLACE	20%	5/1.00	3/0.60	1/0.20	3/0.60	1/0.20	1/0.20
FENESTRATION ON UPPER FLOORS	15%	1/0.15	5/0.75	5/0.75	1/0.15	3/0.45	3/0.45
TOTAL WEIGHTED SCORE	100%	2.60	3.00	1.60	3.30	2.80	2.30
ADJUSTED SELLING PRICE [1]		$625,000	$750,000	$240,000	$850,000	$662,500	
DATE OF SALE		7/17/80	2/27/84	12/31/77	4/30/78	7/31/78	
GROSS BUILDING AREA (GBA)		41,000 SF	40,000 SF	26,000 SF	42,500 SF	39,000 SF	39,000 SF
ADJUSTED PRICE/GBA		$15.24	$18.75	$ 9.23	$20.00	$16.99	
ADJUSTED PRICE/GBA/ WEIGHTED POINT SCORE		$5.86	$6.25	$5.77	$6.06	$6.08	

[1] See Appendix _ for assumptions and calculations to determine adjusted selling price.

RATGRAM STYLE

EXHIBIT 4

EXHIBIT 5

WOOLWORTH - RATGRAM STYLE
1st RUN

\# Attributes = 5

Attribute Names, Prelim. Weights
  LOCATION 20
  EXPANSION POTENTIAL 20
  CONDITION AT TIME OF SALE 20
  ELEVATORS IN PLACE 20
  FENESTRATION ON UPPER FLOORS 20

\# of Observations = 5

Observ. # 1 WOLFF-KUBLY-30 N. CARROLL Price 15.24
        LOCATION 3
        EXPANSION POTENTIAL 3
        CONDITION AT TIME OF SALE 1
        ELEVATORS IN PLACE 5
        FENESTRATION ON UPPER FLOORS 1
Observ. # 2 14 S. MIFFLIN Price 18.75
        LOCATION 1
        EXPANSION POTENTIAL 1
        CONDITION AT TIME OF SALE 5
        ELEVATORS IN PLACE 3
        FENESTRATION ON UPPER FLOORS 5
Observ. # 3 CENTRE SEVEN-5 & 7 N. PINCKNEY Price 9.23
        LOCATION 1
        EXPANSION POTENTIAL 1
        CONDITION AT TIME OF SALE 1
        ELEVATORS IN PLACE :
        FENESTRATION ON UPPER FLOORS 5
Observ. # 4 EMPORIUM-50 E. MIFFLIN Price 20
        LOCATION 3
        EXPANSION POTENTIAL 5
        CONDITION AT TIME OF SALE 3
        ELEVATORS IN PLACE 3
        FENESTRATION ON UPPER FLOORS 1
Observ. # 5 WOOLWORTH-2 W. MIFFLIN Price 16.99
        LOCATION 5
        EXPANSION POTENTIAL 3
        CONDITION AT TIME OF SALE 3
        ELEVATORS IN PLACE 1
        FENESTRATION ON UPPER FLOORS 3
The Matr x:
    20   20   20   20   20
    10   10   10   10   10
    15   15   15   15   15
    25   25   25   25   25
    30   30   30   30   30

Median   = 5.861538
Mean   = 5.913863
Standard Deviation = .5837666

Weights:
LOCATION   = 20
EXPANSION POTENTIAL   = 20
CONDITION AT TIME OF SAL   = 20
ELEVATORS IN PLACE   = 20
FENESTRATION ON UPPER FL   = 20

Final Results:
Number of Combinations   = 3125
Number of Combinations Adding to 100% = 381

Median   = 6.060606
Mean   = 6.00175
Standard Deviation = .1893479

Weights:
LOCATION   = 10
EXPANSION POTENTIAL   = 30
CONDITION AT TIME OF SAL   = 25
ELEVATORS IN PLACE   = 20
FENESTRATION ON UPPER FL   = 15

EXHIBIT 5 (Continued)

```
**** WOOLWORTH DEMONSTRATION ****

# Attributes = 5

Attribute Names, Prelim. Weights
  LOCATION  20
  EXPANSION POTENTIAL  20
  CONDITION AT TIME OF SALE  20
  ELEVATORS IN PLACE  20
  FENESTRATION ON UPPER FLOORS  20


# of Observations = 5

Observ. # 1  WOLFF-KUBLY-30 N. CARROLL  Price  15.24
        LOCATION  3
        EXPANSION POTENTIAL  3
        CONDITION AT TIME OF SALE  1
        ELEVATORS IN PLACE  5
        FENESTRATION ON UPPER FLOORS  1
Observ. # 2  14 W. MIFFLIN  Price  18.75
        LOCATION  1
        EXPANSION POTENTIAL  1
        CONDITION AT TIME OF SALE  5
        ELEVATORS IN PLACE  3
        FENESTRATION ON UPPER FLOORS  5
Observ. # 3  CENTRE SEVEN-5 & 7 N. PINCKNEY  Price  9.23
        LOCATION  1
        EXPANSION POTENTIAL  1
        CONDITION AT TIME OF SALE  1
        ELEVATORS IN PLACE  1
        FENESTRATION ON UPPER FLOORS  5
Observ. # 4  EMPORIUM-50 E. MIFFLIN  Price  20
        LOCATION  3
        EXPANSION POTENTIAL  5
        CONDITION AT TIME OF SALE  3
        ELEVATORS IN PLACE  3
        FENESTRATION ON UPPER FLOORS  1
Observ. # 5  WOOLWORTH-2 W. MIFFLIN  Price  16.99
        LOCATION  5
        EXPANSION POTENTIAL  3
        CONDITION AT TIME OF SALE  3
        ELEVATORS IN PLACE  1
        FENESTRATION ON UPPER FLOORS  3
The Matrix:
   10   30   25   20   15
    0   20   15   10    5
    5   25   20   15   10
   15   35   30   25   20
   20   40   35   30   25




Median              =  6.060606
Mean                =  6.00175
Standard Deviation  =  .1893479

Weights:
LOCATION                    =  10
EXPANSION POTENTIAL         =  30
CONDITION AT TIME OF SAL    =  25
ELEVATORS IN PLACE          =  20
FENESTRATION ON UPPER FL    =  15




Final Results:
Number of Combinations                    =  3125
Number of Combinations Adding to 100% =  381




Median              =  6.060606
Mean                =  6.00175
Standard Deviation  =  .1893479

Weights:
LOCATION                    =  10
EXPANSION POTENTIAL         =  30
CONDITION AT TIME OF SAL    =  25
ELEVATORS IN PLACE          =  20
```

EXHIBIT 6

WOOLWORTH - RATGRAM STYLE

CALCULATION OF MOST PROBABLE PRICE USING
MEAN PRICE PER POINT EQUATION METHOD

COMPARABLE PROPERTY	SELLING PRICE PER SF OF GBA	POINT SCORE	PRICE PER SF OF GBA/ TOTAL WEIGHTED SCORE (x)
1	$15.24	2.60	$5.86
2	18.75	3.00	6.25
3	9.23	1.60	5.77
4	20.00	3.30	6.06
5	16.99	2.80	6.08
		TOTAL	$30.02

Total of Price Per SF of GBA = $30.02
          Total Weighted Score

Mean Value ($\bar{x}$) = 30.02/5 = $6.00

Standard Deviation = $\sqrt{\dfrac{\sum (x-\bar{x})^2}{n-1}}$ = $0.19 where:

x	$\bar{x}$	$(x-\bar{x})$	$(x-\bar{x})^2$	n	n-1
$5.86 - $6.00	=	-$0.14	0.0196	5	4
6.25 - 6.00	=	0.25	0.0625		
5.77 - 6.00	=	- 0.23	0.0529		
6.06 - 6.00	=	0.06	0.0036		
6.08 - 6.00	=	0.08	0.0064		
			0.1450		

$\sqrt{\dfrac{0.1450}{4}}$ = $\sqrt{0.03625}$ = 0.190394 or $0.19

EXHIBIT 6   (Continued)

Value Range of Price/Point Score: $6.00 ± $0.19

.

Since GBA of subject is 39,000 square feet and total weighted
point score of subject is 2.3, then:

High
Estimate: $6.19 x 2.3 x 39,000 SF = $555,243 or $560,000
              ($14.23/SF)

Central
Tendency: $6.00 x 2.3 x 39,000 SF = $538,200 or $540,000
              ($13.80/SF)

Low
Estimate: $5.81 x 2.3 x 39,000 SF = $521,159 or $520,000
              ($13.36/SF)

JUSTIFICATION OF COMPARABLE PRICE FORMULA FOR
WOOLWORTH BUILDING
BY MEANS OF ANALYSIS OF VARIANCE OF ACTUAL SALE PRICE VS. PREDICTED PRICE
OF COMPARABLES USING MEAN PRICE PER POINT EQUATION METHOD

NO.	COMPARABLE PROPERTY	WEIGHTED POINT SCORE	MEAN PRICE PER POINT SCORE	PREDICTED PRICE/ SF GBA	ACTUAL PRICE/ SF GBA	VARIANCE	% OF VARIANCE TO ACTUAL PRICE
1	WOLFF KUBLY 30 N. Carroll Street	2.60	$6.00	$15.60	$15.24	$ 0.36	2.4%
2	14 W. Mifflin Street	3.00	6.00	18.00	18.75	- 0.75	4.0
3	CENTRE SEVEN 5 & 7 N. Pinckney Street	1.60	6.00	9.60	9.23	0.37	4.0
4	EMPORIUM 50 E. Mifflin Street	3.30	6.00	19.80	20.00	- 0.20	1.0
5	WOOLWORTH 2 W. Mifflin Street	2.80	6.00	16.80	16.99	- 0.19	1.1
					NET VARIANCE	$ - 0.41	

EXHIBIT 7

RATGRAM STYLE

EXHIBIT 8

WOOLWORTH BUILDING
SCALE FOR SCORING COMPARABLES ON
IMPORTANT INVESTOR CONSIDERATIONS FOR
OFFICE - RETAIL SPACE IN MADISON
C-4 ZONING
DILMORE STYLE

LOCATION
15%

26 = High visibility
15 = Corner visibility limited
10 = Inside lot

EXPANSION POTENTIAL
30%

26 = Potential for significant increases of floor space
15 = Flexible layouts due to bay spacing and elevator position
10 = Inflexibility of layout due to old bearing walls and elevator shafts

CONDITION AT
TIME OF PURCHASE
40%

26 = Fully renovated and leased
15 = Long-term retail leases in place. Serviceable as retail in tired space.
10 = Vacant and in need of total rehabilitation. Short-term lease or large vacancy in need of total rehabilitation.

ELEVATORS AT
TIME OF PURCHASE
15%

26 = Two passenger and freight
15 = Two passenger
10 = One passenger

WOOLWORTH BUILDING

WEIGHTED MATRIX FOR COMPARABLE PROPERTIES

SCORE/WEIGHTED SCORE

DILMORE STYLE

===

ATTRIBUTE	WEIGHT	COMPARABLE NO. 1 30 N. CARROLL WOLFF KUBLY	COMPARABLE NO. 2 14 W. MIFFLIN	COMPARABLE NO. 3 5 & 7 E. MIFFLIN CENTRE SEVEN	COMPARABLE NO. 4 50 E. MIFFLIN EMPORIUM	COMPARABLE NO. 5 2 W. MIFFLIN WOOLWORTH	SUBJECT
LOCATION	15%	15/2.25	10/1.50	10/1.50	15/2.25	26/3.90	26/3.90
EXPANSION POTENTIAL AT TIME OF SALE	30%	15/4.50	10/3.00	10/3.00	26/7.80	15/4.50	15/4.50
CONDITION AT TIME OF SALE	40%	10/4.00	26/10.40	10/4.00	15/6.00	15/6.00	10/4.00
ELEVATORS IN PLACE	15%	26/3.90	15/2.25	10/1.50	15/2.25	10/1.50	10/1.50
TOTAL WEIGHTED SCORE	100%	14.65	17.15	10.00	18.30	15.90	13.90
ADJUSTED SELLING PRICE [1]		$625,000	$750,000	$240,000	$850,000	$662,500	
DATE OF SALE		7/17/80	2/27/84	12/31/77	4/30/78	7/31/78	
GROSS BUILDING AREA (GBA)		41,000 SF	40,000 SF	26,000 SF	42,500 SF	39,000 SF	39,000 SF
ADJUSTED PRICE/GBA		$15.24	$18.75	$ 9.23	$20.00	$16.99	
ADJUSTED PRICE/GBA ÷ WEIGHTED POINT SCORE		$1.04	$1.09	$0.92	$1.09	$1.07	

[1] See Appendix _ for assumptions and calculations to determine adjusted selling price.

EXHIBIT 9

EXHIBIT 10

**** WOOLWORTH-DILMORE STYLE ****

Attributes = 5

Attribute Names, Prelim. Weights
 LOCATION 20
 EXPANSION POTENTIAL 20
 CONDITION AT TIME OF SALE 20
 ELEVATORS IN PLACE 20
 FENESTRATION ON UPPER FLOORS 20

# of Observations = 5

Observ. # 1 WOLFF-KUBLY Price 15.24
        LOCATION 15
        EXPANSION POTENTIAL 15
        CONDITION AT TIME OF SALE 10
        ELEVATORS IN PLACE 26
        FENESTRATION ON UPPER FLOORS 10
Observ. # 2 14 W. MIFFLIN Price 18.75
        LOCATION 10
        EXPANSION POTENTIAL 10
        CONDITION AT TIME OF SALE 26
        ELEVATORS IN PLACE 15
        FENESTRATION ON UPPER FLOORS 26
Observ. # 3 CENTRE SEVEN Price 9.23
        LOCATION 10
        EXPANSION POTENTIAL 10
        CONDITION AT TIME OF SALE 10
        ELEVATORS IN PLACE 10
        FENESTRATION ON UPPER FLOORS 26
Observ. # 4 EMPORIUM Price 20
        LOCATION 15
        EXPANSION POTENTIAL 26
        CONDITION AT TIME OF SALE 15
        ELEVATORS IN PLACE 15
        FENESTRATION ON UPPER FLOORS 10
Observ. # 5 WOOLWORTH Price 16.99
        LOCATION 26
        EXPANSION POTENTIAL 15
        CONDITION AT TIME OF SALE 15
        ELEVATORS IN PLACE 10
        FENESTRATION ON UPPER FLOORS 15

The Matrix:
 20 20 20 20 20
 10 10 10 10 10
 15 15 15 15 15
 25 25 25 25 25
 30 30 30 30 30

Median   = 1.068765
Mean   = 1.012569
Standard Deviation = .1756356

Weights:
LOCATION   = 20
EXPANSION POTENTIAL   = 20
CONDITION AT TIME OF SAL   = 20
ELEVATORS IN PLACE   = 20
FENESTRATION ON UPPER FL   = 20

Final Results:
Number of Combinations   = 3125
Number of Combinations Adding to 100% = 381

Median   = 1.068553
Mean   = 1.024281
Standard Deviation = .1314307

Weights:
LOCATION   = 15
EXPANSION POTENTIAL   = 30
CONDITION AT TIME OF SAL = 30
ELEVATORS IN PLACE   = 15
FENESTRATION ON UPPER FL = 10

EXHIBIT 10   (Continued)

**** WOOLWORTH-DILMORE STYLE ****

WOOLWORTH - DILMORE STYLE
2nd RUN

Attributes = 5

Attribute Names, Prelim. Weights
 LOCATION 20
 EXPANSION POTENTIAL 20
 CONDITION AT TIME OF SALE 20
 ELEVATORS IN PLACE 20
 FENESTRATION ON UPPER FLOORS 20

 # of Observations = 5

Observ. # 1 WOLFF-KUBLY Price 15.24
        LOCATION 15
        EXPANSION POTENTIAL 15
        CONDITION AT TIME OF SALE 10
        ELEVATORS IN PLACE 26
        FENESTRATION ON UPPER FLOORS 10
Observ. # 2 16 W. MIFFLIN Price 18.75
        LOCATION 10
        EXPANSION POTENTIAL 10
        CONDITION AT TIME OF SALE 26
        ELEVATORS IN PLACE 15
        FENESTRATION ON UPPER FLOORS 26
Observ. # 3 CENTRE SEVEN Price 9.23
        LOCATION 10
        EXPANSION POTENTIAL 10
        CONDITION AT TIME OF SALE 10
        ELEVATORS IN PLACE 10
        FENESTRATION ON UPPER FLOORS 26
Observ. # 4 EMPORIUM Price 20
        LOCATION 15
        EXPANSION POTENTIAL 26
        CONDITION AT TIME OF SALE 15
        ELEVATORS IN PLACE 15
        FENESTRATION ON UPPER FLOORS 10
Observ. # 5 WOOLWORTH Price 16.99
        LOCATION 26
        EXPANSION POTENTIAL 15
        CONDITION AT TIME OF SALE 15
        ELEVATORS IN PLACE 10
        FENESTRATION ON UPPER FLOORS 15
The Matrix:
     15   30   30   15   10
      5   20   20   5   0
     10   25   25   10   5
     20   35   35   20   15
     25   40   40   25   20

Median   = 1.068553
Mean   = 1.024281
Standard Deviation = .1314307

Weights:
LOCATION   = 15
EXPANSION POTENTIAL   = 30
CONDITION AT TIME OF SAL   = 30
ELEVATORS IN PLACE   = 15
FENESTRATION ON UPPER FL   = 10

Final Results:
Number of Combinations   = 3125
Number of Combinations Adding to 100% = 381

Median   = 1.068553
Mean   = 1.043603
Standard Deviation = 7.084803E-22

Weights:
LOCATION   = 15
EXPANSION POTENTIAL   = 30
CONDITION AT TIME OF SAL   = 40

EXHIBIT 11

WOOLWORTH BUILDING
CALCULATION OF MOST PROBABLE PRICE USING
MEAN PRICE PER POINT EQUATION METHOD
DILMORE STYLE

COMPARABLE PROPERTY	SELLING PRICE PER SF OF GBA	POINT SCORE	PRICE PER SF OF GBA/ TOTAL WEIGHTED SCORE (x)
1	$15.24	14.65	$1.04
2	18.75	17.15	1.09
3	9.23	10.00	0.92
4	20.00	18.30	1.09
5	16.99	15.90	1.07
		TOTAL	$5.21

Total of $\dfrac{\text{Price Per SF of GBA}}{\text{Total Weighted Score}}$ = $5.21

Mean Value ($\bar{x}$) = $5.21 ÷ 5 = $1.04

Standard Deviation of the Mean = $\sqrt{\dfrac{\Sigma(x-\bar{x})^2}{n-1}}$ = $0.07 where:

x	$\bar{x}$	$(x-\bar{x})$	$(x-\bar{x})^2$	n	n-1
$1.04 - $1.04	=	$0.00	0.0000	5	4
1.09 - 1.04	=	0.05	0.0025		
0.92 - 1.04	= -	0.12	0.0144		
1.09 - 1.04	=	0.05	0.0025		
1.07 - 1.04	=	0.03	0.0009		
			0.0203		

$\sqrt{\dfrac{0.0203}{4}}$ = $\sqrt{0.005075}$ = 0.071239 or $0.07

EXHIBIT 11   (Continued)

· Value Range of Price/Point Score: $1.04 ± $0.07

Since GBA of subject is 39,000 square feet and total weighted
point score of subject is 13.90, then:

High
Estimate: $1.11 x 13.90 x 39,000 SF = $601,731 or $600,000
            ($15.43/SF)

Central
Tendency: $1.04 x 13.90 x 39,000 SF = $563,784 or $560,000
            ($14.46/SF)

Low
Estimate: $0.97 x 13.90 x 39,000 SF = $525,837 or $530,000
            ($13.48/SF)

COMPARISON OF WOOLWORTH DEMONSTRATION -
RATGRAM STYLE
AND WOOLWORTH - DILMORE STYLE

	RATGRAM STYLE	DILMORE STYLE	% VARIANCE RATGRAM TO DILMORE
Estimated Value Central Tendency	$540,000	$560,000	3.7%

JUSTIFICATION OF COMPARABLE PRICE FORMULA FOR
WOOLWORTH BUILDING
BY MEANS OF ANALYSIS OF VARIANCE OF ACTUAL SALE PRICE VS. PREDICTED PRICE
OF COMPARABLES USING MEAN PRICE PER POINT EQUATION METHOD
DILMORE STYLE

NO.	COMPARABLE PROPERTY	WEIGHTED POINT SCORE	MEAN PRICE PER POINT SCORE	PREDICTED PRICE/ SF GBA	ACTUAL PRICE/ SF GBA	VARIANCE	% OF VARIANCE TO ACTUAL PRICE
1	WOLFF KUBLY 30 N. Carroll Street	14.65	$1.04	$15.24	$15.24	$ 0.00	0.0%
2	14 W. Mifflin Street	17.15	1.04	17.84	18.75	- 0.91	4.9
3	CENTRE SEVEN 5 & 7 N. Pinckney Street	10.00	1.04	10.40	9.23	1.17	12.7
4	EMPORIUM 50 E. Mifflin Street	18.30	1.04	19.03	20.00	- 0.97	4.9
5	WOOLWORTH 2 W. Mifflin Street	15.90	1.04	16.54	16.99	- 0.45	2.6
					NET VARIANCE	$ - 1.16	

EXHIBIT 12

EXHIBIT 13

SAMPLE OF EXPERIMENTAL

AUTOMATED MARKET COMPARISON PROCESS.

DILMORE

AND

GRAASKAMP

EXHIBIT 13 (Continued)

SCALE FOR SCORING COMPARABLE SALES
BASED UPON PRICE SENSITIVE ATTRIBUTES
GOODWILL BUILDING

ATTRIBUTE	WEIGHT	SCORE
GROSS BUILDING ·AREA	30%	5 = Building less than 15,000 SF of GBA 3 = Building between 15,000 SF to 40,000 SF of GBA 1 = Building greater than 40,000 SF of GBA
LOCATION	30%	5 = Located in South Madison Industrial Park area with or without rail siding or along major highway with rail siding 3 = Located along or visible from a major road such as Highways 51, 151, 113, or 30 in a mixed use area without rail siding. 1 = Located in more isolated commercial mixed use area without rail siding
RATIO OF LAND TO GBA	10%	5 = Greater than 4:1 3 = Between 4:1 and 2.5:1 1 = Less than 2.5:1
EFFICIENCY OF BUILDING DESIGN FOR STORAGE AND DISTRIBUTION USES	10%	5 = Efficient layout for accessibility of stored goods with adequate number of overhead doors and truck height loading docks 3 = Adequate layout with limited number of overhead doors and truck height docks 1 = Deep space with inadequate number of overhead doors and truck height doors
QUALITY OF HVAC SYSTEM	20%	5 = Fully insulated with heat in warehouse and office area 3 = Partially heated warehouse space and adequate heated office space 1 = Minimal heat, if any, in warehouse area and small heated office space

WEIGHTED MATRIX FOR COMPARABLE PROPERTIES
SCORE/WEIGHTED SCORE

GOODWILL BUILDING

ATTRIBUTE	WEIGHT	COMPARABLE NO. 1 1115 O'Neill St.	COMPARABLE NO. 2 2810 Bryant St.	COMPARABLE NO. 3 910 Watson Ave.	COMPARABLE NO. 4 4401 Cottage Grove Rd.	COMPARABLE NO. 5 4610 - 4622 Fenrite Rd.	COMPARABLE NO. 6 3103 Watford Way	SUBJECT 2422 Pennsylvania
GROSS BUILDING AREA (GBA)	30%	5/1.50	3/0.90	1/0.30	3/0.90	5/1.50	5/1.50	3/0.90
LOCATION	30%	1/0.30	3/0.90	5/1.50	5/1.50	3/0.90	5/1.50	3/0.90
RATIO OF LAND TO GBA	10%	3/0.30	1/0.10	1/0.10	5/0.50	3/0.30	1/0.10	1/0.10
EFFICIENCY OF BUILDING DESIGN	10%	3/0.30	1/0.10	1/0.10	5/0.50	5/0.50	3/0.30	1/0.10
QUALITY OF HVAC SYSTEM	20%	5/1.00	3/0.60	3/0.60	1/0.20	5/1.00	1/0.20	5/1.00
TOTAL WEIGHTED SCORE	100%	3.40	2.60	2.60	3.60	4.20	3.60	3.00
CASH SELLING PRICE		$200,000	$212,000	$625,000	$525,000	$301,000	$209,000	
DATE OF SALE		6/27/84	6/12/83	6/30/83	1/4/82	2/29/84	6/30/82	
GROSS BUILDING AREA (GBA)		13,832 SF	19,760 SF	57,800 SF	34,517 SF	17,300 SF	14,000 SF	30,195 SF
CASH PRICE/ SF OF GBA		$14.46	$10.73	$10.81	$15.21	$17.40	$14.94	
CASH PRICE PER SF/ WEIGHTED POINT SCORE		$4.2529	$4.1269	$4.1577	$4.2290	$4.1429	$4.1500	

EXHIBIT 13 (Continued)

JUSTIFICATION OF COMPARABLE PRICE FORMULA
FOR THE GOODWILL BUILDING
BY MEANS OF ANALYSIS OF VARIANCE OF ACTUAL SALE PRICE
VS. PREDICTED PRICE OF COMPARABLES
USING MEAN PRICE PER POINT EQUATION METHOD

NO.	COMPARABLE SALE	WEIGHTED POINT SCORE	MEAN PRICE PER POINT SCORE	PREDICTED PRICE PER SF OF GBA	ACTUAL PRICE PER SF OF GBA	VARIANCE	% OF VARIANCE TO ACTUAL PRICES
1	1115 O'Neill Street	3.40	$4.18	14.21	14.46	- 0.25	1.7%
2	2810 Bryant Street	2.60	4.18	10.87	10.73	0.14	1.3%
3	901 Watson Avenue	2.60	4.18	10.87	10.81	0.06	0.6%
4	4401 Cottage Grove Road	3.60	4.18	15.05	15.21	- 0.16	1.1%
5	4610-22 Pemrite Road	4.20	4.18	17.56	17.40	0.16	0.9%
6	3103 Watford Way	3.60	4.18	15.05	14.94	0.11	0.7%
					NET VARIANCE	$ 0.06	

EXHIBIT 13 (Continued)

EXHIBIT 13 (Continued)

GOODWILL BUILDING

CALCULATION OF MOST PROBABLE PRICE USING
MEAN PRICE PER POINT EQUATION METHOD

COMPARABLE PROPERTY	CASH SELLING PRICE PER SF OF GBA	WEIGHTED POINT SCORE	PRICE PER SF OF GBA/TOTAL WEIGHTED SCORE (x)
1	$14.46	3.40	$4.25
2	10.73	2.60	4.13
3	10.81	2.60	4.16
4	15.21	3.60	4.23
5	17.40	4.20	4.14
6	14.94	3.60	4.15
			TOTAL $25.06

Total of $\dfrac{\text{Price per SF of GBA}}{\text{Total Weighted Score}}$ = $25.06

Mean Value (x) = $25.06/6 = $4.18

Standard Deviation = $\sqrt{\dfrac{\Sigma(x - \bar{x})^2}{n - 1}}$ = $0.05 where:

x	x̄	(x-x̄)	(x-x̄)\2	n	n - 1
4.25	4.18	0.07	0.0049	6	5
4.13	4.18	= - 0.05	0.0025		
4.16	4.18	= - 0.02	0.0004		
4.23	4.18	= 0.05	0.0025		
4.14	4.18	= - 0.04	0.0016		
4.15	4.18	= - 0.03	0.0009		
			0.0128		

$\sqrt{\dfrac{0.0128}{5}}$ = 0.050596

ESTIMATED RANGE OF MOST PROBABLE SELLING PRICE
OF THE GOODWILL BUILDING

	SCORE FOR SUBJECT	MEAN VALUE +/- $0.05/POINT SCORE	PRICE/SF OF GBA	GBA OF SUBJECT	ESTIMATED VALUE
LOW ESTIMATE	3.00	$4.13	$12.39	30,195 SF	$374,116 or $374,000
CENTRAL TENDENCY	3.00	$4.18	$12.54	30,195 SF	$378,645 or $379,000
HIGH ESTIMATE	3.00	$4.23	$12.69	30,195 SF	$383,175 or $383,000

EXHIBIT 13 (Continued)

EXHIBIT 14

COMPUTER OUTPUT OF DILMORE QUANTITATIVE

POINT WEIGHTING PROGRAM

AND

COMPUTERIZATION OF

ALL OF THE MARKET COMPARISON

CALCULATIONS

EXHIBIT 14 (Continued)

**** GOODWILL 3 ****

Attributes = 5

Attribute Names, Prelim. Weights ◄─────── Preliminary weights selected
 GROSS BUILDING AREA (GBA) 20   by the appraisers
 LOCATION 20
 RATIO OF LAND TO GBA 20
 EFFICIENCY OF BUILDING DESIGN FOR STORAGE AND DISTRIBUTION 20
 QUALITY OF HVAC SYSTEM 20

 # of Observations = 6 ◄────── Comparable sales with score for
                                      each comparable
Observ. # 1 1115 O'NEILL ST Price 14.46
        GROSS BUILDING AREA (GBA) 5
        LOCATION 1
        RATIO OF LAND TO GBA 3
        EFFICIENCY OF BUILDING DESIGN FOR STORAGE AND DISTRIBUTION 3
        QUALITY OF HVAC SYSTEM 5
Observ. # 2 2810 BRYANT ST Price 10.73
        GROSS BUILDING AREA (GBA) 3
        LOCATION 3
        RATIO OF LAND TO GBA 1
        EFFICIENCY OF BUILDING DESIGN FOR STORAGE AND DISTRIBUTION 1
        QUALITY OF HVAC SYSTEM 3
Observ. # 3 901 WATSON AVE Price 10.81
        GROSS BUILDING AREA (GBA) 1
        LOCATION 5
        RATIO OF LAND TO GBA 1
        EFFICIENCY OF BUILDING DESIGN FOR STORAGE AND DISTRIBUTION 1
        QUALITY OF HVAC SYSTEM 3
Observ. # 4 4401 COTTAGE GROVE RD Price 15.21
        GROSS BUILDING AREA (GBA) 3
        LOCATION 5
        RATIO OF LAND TO GBA 5
        EFFICIENCY OF BUILDING DESIGN FOR STORAGE AND DISTRIBUTION 5
        QUALITY OF HVAC SYSTEM 1
Observ. # 5 4610-22 FERMITE RD Price 17.4
        GROSS BUILDING AREA (GBA) 5
        LOCATION 3
        RATIO OF LAND TO GBA 3
        EFFICIENCY OF BUILDING DESIGN FOR STORAGE AND DISTRIBUTION 5
        QUALITY OF HVAC SYSTEM 5
Observ. # 6 3103 WATFORD WAY Price 14.94
        GROSS BUILDING AREA (GBA) 5
        LOCATION 5
        RATIO OF LAND TO GBA 1
        EFFICIENCY OF BUILDING DESIGN FOR STORAGE AND DISTRIBUTION 3
        QUALITY OF HVAC SYSTEM 1
 The Matrix: ◄─────── Test matrix to select optimal
    20   20   20   20   20   combination of weights
    10   10   10   10   10
    15   15   15   15   15
    25   25   25   25   25
    30   30   30   30   30

EXHIBIT 14 (Continued)

```
Median              = 4.565106   ◄─────────── Initial results using
Mean                = 4.528223              appraiser's weights
Standard Deviation  = .441591
```

```
Weights:                          ◄─────────── Appraiser's initial weights
GROSS BUILDING AREA (GBA = 20
LOCATION                 = 20
RATIO OF LAND TO GBA     = 20
EFFICIENCY OF BUILDING D = 20
QUALITY OF HVAC SYSTEM   = 20
```

```
Final Results:                               ◄─────── Iterations to
Number of Combinations              = 3125              select optimal
Number of Combinations Adding to 100% = 381             weight
```

```
Median              = 4.153846   ◄───────── Final results using
Mean                = 4.175902              optimal weights
Standard Deviation  = 5.067353E-02
```

```
Weights:                          ◄─────────── Optimal weights
GROSS BUILDING AREA (GBA = 30
LOCATION                 = 30
RATIO OF LAND TO GBA     = 10
EFFICIENCY OF BUILDING D = 10
QUALITY OF HVAC SYSTEM   = 20
```

EXHIBIT 14 (Continued)

COMPUTERIZATION OF ALL MARKET COMPARISON CALCULATIONS

Program Choices Are:

1. Enter/edit/display/file input data
2. Analyze quality point ratings
3. Display output to screen
4. Print output to printer
5. Select options
6. Quit

Enter your choice: ? 1

Load/edit file options   Current disk file: None

1. Create new data file
2. Load existing disk file for editing
3. Display current data
4. Edit current data
5. Save current data to disk file
6. Clear (erase) all current data
7. Quit load/edit options, return to main program

Enter selection number:

Enter selection number: 1

Enter new data

Enter heading for output: INDUSTRIAL WAREHOUSE

Enter number of attributes:? 5

Enter name for attribute: 1 ? GROSS BUILDING AREA (GBA)
       Preliminary weight: 1 ? 20
Enter name for attribute: 2 ? LOCATION
       Preliminary weight: 2 ? 20
Enter name for attribute: 3 ? RATIO OF LAND TO GBA
       Preliminary weight: 3 ? 20
Enter name for attribute: 4 ? EFFICIENCY OF BUILDING DESIGN -
       Preliminary weight: 4 ? 20
Enter name for attribute: 5 ? QUALITY OF HVAC SYSTEM

Weight for QUALITY OF HVAC SYSTEM is 20, so that total of weights is 100.

EXHIBIT 14 (Continued)

```
Enter number of observations:? 6
Do you want to <1> Enter a unit price or
               <2> Enter a total price & size
Enter your choice: ? 1




Observation number 1 :
 Enter name 1 ? 1115 O'NEILL ST.
 Enter price 1 ? 14.46

 Score for GROSS BUILDING AREA (GBA)? 5
 Score for LOCATION? 1
 Score for RATIO OF LAND TO GBA? 3
 Score for EFFICIENCY OF BUILDING DESIGN? 3
 Score for QUALITY OF HVAC SYSTEM? 5

Observation number 2 :
 Enter name 2 ? 2810 BRYANT ST.
 Enter price 2 ? 10.73

 Score for GROSS BUILDING AREA (GBA)? 3
 Score for LOCATION? 3
 Score for RATIO OF LAND TO GBA? 1
 Score for EFFICIENCY OF BUILDING DESIGN? 1
 Score for QUALITY OF HVAC SYSTEM? 3

Observation number 3 :
 Enter name 3 ?


 Score for QUALITY OF HVAC SYSTEM? 3

Observation number 3 :
 Enter name 3 ? 910 WATSON AVE.
 Enter price 3 ? 10.81

 Score for GROSS BUILDING AREA (GBA)? 1
 Score for LOCATION? 5
 Score for RATIO OF LAND TO GBA? 1
 Score for EFFICIENCY OF BUILDING DESIGN? 1
 Score for QUALITY OF HVAC SYSTEM? 3

Observation number 4 :
 Enter name 4 ? 4401 COTTAGE GROVE RD.
 Enter price 4 ? 15.21

 Score for GROSS BUILDING AREA (GBA)? 3
 Score for LOCATION? 5
 Score for RATIO OF LAND TO GBA? 5
 Score for EFFICIENCY OF BUILDING DESIGN? 5
 Score for QUALITY OF HVAC SYSTEM? 1
```

EXHIBIT 14 (Continued)

Observation number 5 :
  Enter name 5 ?

  Score for QUALITY OF HVAC SYSTEM? 1

Observation number 5 :
  Enter name 5 ? 4610-22 FEMRITE RD.
  Enter price 5 ? 17.40

  Score for GROSS BUILDING AREA (GBA)? 5
  Score for LOCATION? 3
  Score for RATIO OF LAND TO GBA? 3
  Score for EFFICIENCY OF BUILDING DESIGN? 5
  Score for QUALITY OF HVAC SYSTEM? 5

Observation number 6 :
  Enter name 6 ? 3103 WATFORD WAY
  Enter price 6 ? 14.94

  Score for GROSS BUILDING AREA (GBA)? 5
  Score for LOCATION? 5
  Score for RATIO OF LAND TO GBA? 1
  Score for EFFICIENCY OF BUILDING DESIGN? 3
  Score for QUALITY OF HVAC SYSTEM? 1

Enter subject property name:?   INDUSTRIAL WAREHOUSE

Enter the name of the designated unit of comparison
      (acre, square foot, etc.) ? SQUARE FOOT

Enter number of units of comparison for subject
      (acres, square feet, etc.) ? 30195

Enter attribute scores for subject property
GROSS BUILDING AREA (GBA)   ? 3
LOCATION   ? 3
RATIO OF LAND TO GBA   ? 1
EFFICIENCY OF BUILDING DESIGN? 1
QUALITY OF HVAC SYSTEM   ? 5

EXHIBIT 14 (Continued)

Load/edit file options   Current disk file: None

-1. Create new data file
2. Load existing disk file for editing
3. Display current data
4. Edit current data
5. Save current data to disk file
6. Clear (erase) all current data
-7. Quit load/edit options, return to main program

Enter selection number: 5

Enter name for data file:? SAMPLE

Load/edit file options   Current disk file: SAMPLE

1. Create new data file
2. Load existing disk file for editing
3. Display current data
4. Edit current data
5. Save current data to disk file
6. Clear (erase) all current data
7. Quit load/edit options, return to main program

Enter selection number: 3

Project title: INDUSTRIAL WAREHOUSE

Unit prices   Search interval = 5

	GROSS	LOCAT	RATIO	EFFIC	QUALI	Price
Prel. wts.	20	20	20	20	20	–
1115 O'NEIL	5	1	3	3	5	$14.46
2810 BRYANT	3	3	1	1	3	$10.73
910 WATSON	1	5	1	1	3	$10.81
4401 COTTAG	3	5	5	5	1	$15.21
4610-22 FEM	5	3	3	5	5	$17.40
3103 WATFOR	5	5	1	3	1	$14.94
INDUSTRIAL	3	3	1	1	5	–

Press any key to continue

EXHIBIT 14 (Continued)

QP   Version 2.1

Program Choices Are:

1. Enter/edit/display/file input data
2. Analyze quality point ratings
3. Display output to screen
4. Print output to printer
5. Select options
6. Quit

Enter your choice: ? 2

Pass # 1   Combination # 6

Standard deviation = .4693161   Mean = 4.497911

Status	GROSS	LOCAT	RATIO	EFFIC	QUALI	S.D.	Mean
Prelim. Wts.	20	20	20	20	0	.441591	4.528223

EXHIBIT 14 (Continued)

QP   Version 2.1

Program Choices Are:

1.~Enter/edit/display/file input data
2. Analyze quality point ratings
3. Display output to screen
4.~Print output to printer
5. Select options
6. Quit

Enter your choice: ? 3

Display Output to Screen

Select output to be displayed:

1. Weighted matrix for properties
2. Value range determination: mean price per point method
3. Value range per unit of dispersion
4. Transaction zone: mean price per point method
5. Transaction zone: linear regression method
6. Mean price per point method: predicted vs. actual price for comparables
7. Linear regression method: predicted vs. actual price for comparables
8. Input data
9. Computation matrix

<Return> to quit
Enter your choice: 1

EXHIBIT 14 (Continued)

Weighted Matrix

Feature/ Attribute	GROSS BU	LOCATION	RATIO OF	EFFICIEN	QUALITY	Wtd. score
Initial weights	20	20	20	20	0	100
Final weights	30	30	10	10	20	100
1115 O'NEILL S	5/ 1.50	1/ 0.30	3/ 0.30	3/ 0.30	5/ 1.00	3.40
2810 BRYANT ST	3/ 0.90	3/ 0.90	1/ 0.10	1/ 0.10	3/ 0.60	2.60
910 WATSON AVE	1/ 0.30	5/ 1.50	1/ 0.10	1/ 0.10	3/ 0.60	2.60
4401 COTTAGE G	3/ 0.90	5/ 1.50	5/ 0.50	5/ 0.50	1/ 0.20	3.60
4610-22 FEMRIT	5/ 1.50	3/ 0.90	3/ 0.30	5/ 0.50	5/ 1.00	4.20
3103 WATFORD W	5/ 1.50	5/ 1.50	1/ 0.10	3/ 0.30	1/ 0.20	3.60
INDUSTRIAL WAR	3/ 0.90	3/ 0.90	1/ 0.10	1/ 0.10	5/ 1.00	3.00

Press any key to continue

EXHIBIT 14 (Continued)

Display Output to Screen

Select output to be displayed:

1. Weighted matrix for properties
2. Value range determination: mean price per point method
3. Value range per unit of dispersion
4. Transaction zone: mean price per point method
5. Transaction zone: linear regression method
6. Mean price per point method: predicted vs. actual price for comparables
7. Linear regression method: predicted vs. actual price for comparables
8. Input data
9. Computation matrix

<Return> to quit
Enter your choice: 2   *(and 3)*

Value Range Determination: Mean Price Per Point Method

Mean price per point: $4.18
Dispersion About the Mean: $0.05
Coefficient of Dispersion: 0.0121

Value Range Per Unit of Dispersion

	Subject Point Score		Mean (+/- One Standard Deviation)		Price Per Unit
Low Estimate	3.00	X	$4.13	=	$12.38
Central Tendency	3.00	X	$4.18	=	$12.53
High Estimate	3.00	X	$4.23	=	$12.68

Press any key to continue

EXHIBIT 14 (Continued)

Display Output to Screen

Select output to be displayed:

1. Weighted matrix for properties
2. Value range determination: mean price per point method
3. Value range per unit of dispersion
4. Transaction zone: mean price per point method
5. Transaction zone: linear regression method
6. Mean price-per point method: predicted vs. actual price for comparables
7. Linear regression method: predicted vs. actual price for comparables
8. Input data
9. Computation matrix

<Return> to quit
Enter your choice: 4   (and 5)

Transaction Zone: Mean Price Per Point Method

Number of units in subject property: 30195

Low Estimate	$373,679	or	$374,000
Central Tendency	$378,274	or	$378,000
High Estimate	$382,869	or	$383,000

Transaction Zone: Linear Regression Method

a = -7.505322E-02   Standard Error of the Forecast = .2056632
b = 4.200016

Prediction equation: price =

  30195 units X [-7.505322E-02 +(4.200016 +/- .2056632) X 3]

Low Estimate	$359,562	or	$360,000
Central Tendency	$378,192	or	$378,000
High Estimate	$396,822	or	$397,000

Press any key to continue

EXHIBIT 14 (Continued)

Display Output to Screen

Select output to be displayed:

1. Weighted matrix for properties
2. Value range determination: mean price per point method
3. Value range per unit of dispersion
4. Transaction zone: mean price per point method
5. Transaction zone: linear regression method
6. Mean price per point method: predicted vs. actual price for comparables
7. Linear regression method: predicted vs. actual price for comparables
8. Input data
9. Computation matrix

<Return> to quit
Enter your choice: 6

Mean Price Per Point Method: Predicted vs. Actual Price for Comparables

	Predicted Price	Actual price	Error
1115 O'NEILL ST.	$14.20	$14.46	-$0.26
2810 BRYANT ST.	$10.86	$10.73	$0.13
910 WATSON AVE.	$10.86	$10.81	$0.05
4401 COTTAGE GROVE	$15.03	$15.21	-$0.18
4610-22 FEMRITE RD	$17.54	$17.40	$0.14
3103 WATFORD WAY	$15.03	$14.94	$0.09

Press any key to continue

EXHIBIT 14   (Continued)

Display Output to Screen

Select output to be displayed:

1. Weighted matrix for properties
2. Value range determination: mean price per point method
3. Value range per unit of dispersion
4. Transaction zone: mean price per point method
5. Transaction zone: linear regression method
6. Mean price per point method: predicted vs. actual price for comparables
7. Linear regression method: predicted vs. actual price for comparables
8. Input data
9. Computation matrix

<Return> to quit
Enter your choice: 7

Linear Regression Method: Predicted vs. Actual Price for Comparables

	Predicted Price	Actual price	Error
1115 O'NEILL ST.	$14.20	$14.46	-$0.26
2810 BRYANT ST.	$10.84	$10.73	$0.11
910 WATSON AVE.	$10.84	$10.81	$0.03
4401 COTTAGE GROVE	$15.05	$15.21	-$0.16
4610-22 FEMRITE RD	$17.57	$17.40	$0.17
3103 WATFORD WAY	$15.05	$14.94	$0.11

Press any key to continue

EXHIBIT 14 (Continued)

Display Output to Screen

Select output to be displayed:

1. Weighted matrix for properties
2. Value range determination: mean price per point method
3. Value range per unit of dispersion
4. Transaction zone: mean price per point method
5. Transaction zone: linear regression method
6. Mean price per point method: predicted vs. actual price for comparables
7. Linear regression method: predicted vs. actual price for comparables
8. Input data
9. Computation matrix

<Return> to quit
Enter your choice: 8

Project title: INDUSTRIAL WAREHOUSE

Unit prices   Search interval = 5

	GROSS	LOCAT	RATIO	EFFIC	QUALI	Price
Prel. wts.	30	30	10	10	20	-
1115 O'NEIL	5	1	3	3	5	$14.46
2810 BRYANT	3	3	1	1	3	$10.73
910 WATSON	1	5	1	1	3	$10.81
4401 COTTAG	3	5	5	5	1	$15.21
4610-22 FEM	5	3	3	5	5	$17.40
3103 WATFOR	5	5	1	3	1	$14.94
INDUSTRIAL	3	3	1	1	5	-

Press any key to continue

EXHIBIT 14 (Continued)

Display Output to Screen

Select output to be displayed:

1. Weighted matrix for properties
2. Value range determination: mean price per point method
3. Value range per unit of dispersion
4. Transaction zone: mean price per point method
5. Transaction zone: linear regression method
6. Mean price per point method: predicted vs. actual price for comparables
7. Linear regression method: predicted vs. actual price for comparables
8. Input data
9. Computation matrix

<Return> to quit
Enter your choice: 9

Computation Matrix

```
20  20  20  20   0
10  10  10  10  10
15  15  15  15  15
25  25  25  25  25
30  30  30  30  30
```

Press any key to continue

EXHIBIT 14 (Continued)

Display Output to Screen

Select output to be displayed:

1. Weighted matrix for properties
2. Value range determination: mean price per point method
3. Value range per unit of dispersion
4. Transaction zone: mean price per point method
5. Transaction zone: linear regression method
6. Mean price per point method: predicted vs. actual price for comparables
7. Linear regression method: predicted vs. actual price for comparables
8. Input data
9. Computation matrix

<Return> to quit
Enter your choice: 10

Iterations

	GROSS	LOCAT	RATIO	EFFIC	QUALI	S.D.	Mean
Prelim. Wts.	20	20	20	20	20	.441591	4.528223
Pass # 1	30	30	10	10	20	5.067353E-02	4.175902
Pass # 2	30	30	10	10	20	5.067353E-02	4.175902

Press any key to continue

EXHIBIT 14 (Continued)

QP   Version 2.1

Program Choices Are:

1. Enter/edit/display/file input data
2. Analyze quality point ratings
3. Display output to screen
4. Print output to printer
5. Select options
6. Quit

Enter your choice: ? 5

Special options

Enter your selection:
    --
1. Change search interval

<Return> for no changes
Enter your choice: ? 5

May be draft –

CENTER FOR REAL ESTATE & URBAN ECONOMIC STUDIES
The University of Connecticut

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"Market Comparison Methods Are Not Statistical or Lyrical,
But Are Set (Theory) in Their Ways in a Flight FROMM Degrees of Freedom:
Or Bill Shenkel Was Right With His Naive Theory of Comparability"

A. Market inference is the preferred method of valuation if we can discover a pricing pattern in the random dots of properties and transactions. The search for pattern must also be consistent with appraisal protocol.

　1. Valuation directly from a regression formula violates appraisal protocol if the appraiser has not inspected all of the comparables used, because the subject property is compared to a hypothetical mean property from the set of observations, and because the appraiser is not directly responsible for the selection or weights given the attributes selected as the basis of comparison. Moreover, the amount of data points were limited relative to the number of variables which were thought to be relevant so that the risk characteristic of statistical variance were also suspect.

　2. Market comparison is set theory using a limited number of subjectively selected properties in a relatively objective comparison on a few factors thought to be highly correlated to prices paid. An additive weighting system is one method for managing the information integration for a market comparison.

B. One inferential method is to develop a pricing algorithm which provides an estimated price for each comparable and then presumes the same algorithm can be applied to the subject property. The steps involved are as follows:

　1. Adjust prices for terms of sale and time on comparable properties. Comparable properties would be those bought for renovation, or for the owners own use, etc. You may choose to abstract out land values where size or locational quality is significantly different.

　2. Selecting a proper unit of comparison

　3. Developing a hierarchy of significant attributes thought to affect price and scoring each property on a point system

　4. Developing a weighting system to rank the relative importance of ordinal attribute scores on a cardinal scale

　5. Developing a price per weighted point per unit of comparison

　6. Testing the price weighting formula for best estimate of the sales price of actual comparables in order to minimize dispersion and variance between actual price and price estimated by formula

7. Application of a price per point formula to the subject property to estimate range of alternative prices

8. Adjustment of predicted price for unique externalities such as land, financing, or non-transferable license

C. Search for an appropriate unit of comparison as a single variable in a linear regression by trying three or four unit concepts, such as:

1. Gross building area

2. Net leasable area

3. Cubage

4. Two times the first floor area plus gross building area

5. Barrels of cranberries rather than acres of cranberries

6. Number of bedrooms rather than square feet

D. Arrive at a price per unit as the first step in establishing a price algorithm

E. Identify property attributes which distinguish subject properties qualitatively from one another and develop a simple scoring system

1. 5-3-1 is one method, but scores may become multipliers and lead to distortion

2. Dilmore prefers:

Rating	Points
Excellent	26
Good	20
Average	15
Fair	13
Poor	10