ED 434 932                                                      TM 030 184

AUTHOR            Tanguma, Jesus
TITLE             Variable Deletion Strategies in Canonical Correlation
                  Analysis.
PUB DATE          1999-11-17
NOTE              23p.; Paper presented at the Annual Meeting of the Mid-South
                  Educational Research Association (Point Clear, AL, November
                  1999).
PUB TYPE          Reports - Descriptive (141) -- Speeches/Meeting Papers (150)
EDRS PRICE        MF01/PC01 Plus Postage.
DESCRIPTORS       Functions (Mathematics); *Multivariate Analysis; Research
                  Methodology; Researchers
IDENTIFIERS       *Weighting (Statistical)

ABSTRACT
          This paper presents three variable deletion strategies in
canonical correlation analysis. All three strategies are illustrated by
examples. The first strategy uses the canonical communality (h2) coefficients
of the three functions to decide which variable to delete. The second
function also uses the canonical communality coefficients, but only after
deleting the least contributing function. The third strategy used weighted
canonical communality coefficients on all three functions to decide which
variable to delete. All three strategies attempt to provide the researcher
with a more parsimonious canonical solution. (Contains 11 tables and 4
references.) (Author/SLD)

Running head: VARIABLE DELETION STRATEGIES

Variable Deletion Strategies in Canonical Correlation Analysis

Jesus Tanguma

Texas A & M University

Paper presented at the annual meeting of the Mid-South Educational Research

Association, Point Clear, AL, November 17, 1999

Abstract

The present paper presents three variable deletion strategies in canonical correlation analysis. All three strategies are illustrated by means of an example. The first strategy uses the canonical communality ($h^2$) coefficients of the three functions to decide which variable to delete. The second function also uses the canonical communality ($h^2$) coefficients but only after deleting the least contributing function. The third strategy uses weighted canonical communality ($h^2$) coefficients on all three functions to decide which variable to delete. All three strategies strive to provide the researcher with a more parsimonious canonical solution.

## Variable Deletion Strategies in Canonical Correlation Analysis

Researchers, in an effort to make the results of a study more parsimonious and generalizable, often wish to delete predictor variables from a study. In other words, the researchers feel that more is not always better, but sometimes it may be worse. Simply put, by reducing the number of predictor variables, a more parsimonious canonical solution may be obtained. Consequently, the canonical solution may be more likely to be true and replicable (Thompson, 1984).

In regression analysis, the most frequently used variable deletion methods are the so-called stepwise methods. However, as Thompson (1996) has repeatedly stated, these methods are inherently flawed and should not be used for this or other purposes. In canonical correlation analysis, methods have been developed to assist the researcher in deciding which variables or functions to delete.

The purpose of the present paper is to discuss three variable deletion strategies for use in canonical correlation analysis. To do so, a data set originally analyzed by Holzinger and Swineford (1939) will be used.

## First Strategy

The first variable deletion strategy uses the canonical communality ($h^2$) coefficients to decide which variable to drop first. As Thompson (1991) pointed out, the canonical communality coefficients are "indicative of how much of the variance of an observed variable is contained within the set of synthetic variables" (p. 86). The canonical communality coefficients are obtained by adding the squared structure coefficient for each canonical function. For example, the canonical communality coefficient for T20, see Table 1, is obtained by adding

| | |
|---|---|
| 0.5944 | the squared structure coefficient for function I |
| 0.1218 | the squared structure coefficient for function II |
| 0.2841 | the squared structure coefficient for function III |
| 1.00 | |

Thus, indicating that the three synthetic variables can reproduce 100% of the variance of T20.

Another important factor in determining whether or not to drop a given variable is to look at the change of the squared canonical correlation coefficient ($R^2_c$). The squared canonical correlation coefficient ($R^2_c$) explains how much each function is contributing to the overall canonical solution. If there is little change in the $R^2_c$ after dropping a variable, the resulting canonical solution would be more parsimonious.

_____

Insert Table 1 About Here

_____

Since T17 had the lowest $h^2$ (15.50%), it was the first variable dropped. Table 2 presents the complete canonical solution after dropping T17. Notice that the squared canonical correlation coefficient ($R^2_c$) for Function I did not change. The change in $R^2_c$

for the second and third functions was very small (0.10% for each). Also, there were very small changes in the function, structure, and communality coefficients.

---

Insert Table 2 About Here

---

However, the canonical communality coefficient ($h^2$) for variable T18 (50.71%) was considerably lower than the others. Therefore, T18 was the next variable dropped. Table 3 presents the complete canonical solution after dropping this variable. Notice the small changes in $R^2_c$ for each function (i.e., 0.40 for Function I, 0.20 for Function II, and 0.10 for Function III). There were also very small changes in the function, structure, and communality coefficients. Thus, dropping variable T18 resulted in a more parsimonious canonical solution.

---

Insert Table 3 About Here

---

### Second Strategy

A second strategy in variable deletion involves looking at the contribution of the individual functions. As Table 1 indicates, the third function is contributing the least to the overall canonical solution ($h^2 = 0.60\%$). Consequently, the researcher might want to drop this function. Table 4 presents the complete canonical solution after dropping the third function. Notice that, again, T17 has the lowest $h^2$. Consequently, T17 is the first variable to be dropped. Notice that the squared canonical correlation coefficient ($R^2_c$) for Function I did not change. The change in $R^2_c$ for Function II was very small (0.10%). Also, there were very small changes in the function, structure, and communality

6

coefficients. Therefore, dropping variable T17 resulted in a more parsimonious canonical solution.

Insert Tables 4 and 5 About Here

However, the canonical communality coefficient ($h^2$) for variable T14 (19.80%) was considerably lower than the others. Therefore, T14 was the next variable dropped. Table 6 presents the complete canonical solution after dropping this variable. Notice the small changes in $R^2_c$ for each function (i.e., 0.10 for Function I and 0.20 for Function II). There were also very small changes in the function, structure, and communality coefficients. Thus, dropping variable T14 resulted in a more parsimonious canonical solution.

Insert Table 6 About Here

Although a more parsimonious solution had been obtained by dropping T17 and T14, the canonical communality coefficient for T18 was remarkably lower than the others ($h^2 =26.40\%$). Therefore, T18 was dropped. Table 7 presents the complete canonical solution after dropping variable T18. The remaining $h^2$s were very homogeneous in their numerical values.

Insert Table 7 About Here

Third Strategy

A third variable deletion strategy requires computing a weighted $h^2$. This weighted $h^2$ reflects the variable's contribution to the function as well as the function's

contribution to the complete canonical solution. Thus, the weighted $h^2$ provides a clearer picture as to each variable's total contribution to the complete canonical solution.

The weighted $h^2$ for each measured variable is found by multiplying the squared structure coefficient for each function times the $R^2_c$ for each function and then summing up all the products. For example, the weighted $h^2$ for T20 is

$$(0.5644*0.2790 + 0.1218*0.03 + 0.2841*0.006) = 0.1712 \text{ or } 17.12\%.$$

Table 8 presents the complete canonical solution using weighted $h^2$s. Notice that T17 has the lowest weighted $h^2$. Consequently, T17 was the first variable dropped. Table 9 presents the complete canonical solution after dropping T17. Notice that the $R^2_c$ for Function I did not change. The changes in $R^2_c$ for the second and third functions were very small (0.10% for each). Also, there were very small changes in the function, structure, and weighted communality coefficients. Therefore, dropping variable T17 resulted in a more parsimonious canonical solution.

---

Insert Tables 8 and 9 About Here

---

However, the weighted canonical communality coefficient ($R^2_c$) for variable T14 (5.62%) was lower than all the others. Therefore, T14 was the next variable dropped. Table 10 presents the complete canonical solution after dropping variable T14. The changes in $R^2_c$ for the first, second, and third functions were 0.10%, 0.20%, and 0.30%, respectively. There were also very small changes in the function, structure, and weighted communality coefficients. Thus, dropping variable T14 resulted in a more parsimonious canonical solution.

---

Insert Table 10 About Here

---

Although the weighted communality coefficients ($h^2$) for variables T15 (6.45%) and T18 (6.61%) were remarkably lower than all the others, these variables were not dropped from the final canonical solution. However, the effect of dropping each variable was investigated. For example, when variable T15 was dropped, the $R^2_c$ for Function III remained the same. But, the $R^2_c$ for Function I changed from 27.80% to 26.70%. Also, there was a big drop in $R^2_c$ for Function II. That is, the $R^2_c$ for Function II changed from 2.70% to 1.0%. Therefore, the researcher decided not to drop this (T15) variable. Similarly, when variable T18 was dropped, the squared canonical correlation coefficient ($R^2_c$) for the third function was computed to be zero. Consequently, the researcher decided not to drop this (T18) variable.

Table 11 presents a summary of the changes in $R^2_c$ for each variable deletion strategy as well as the effects of deleting a particular variable.

Insert Table 11 About Here

Conclusion

Three variable deletion strategies were presented and applied to nine variables (i.e., three in one set, and six in the other set) from the Holzinger and Swineford (1939) data. All three strategies strive to provide the researcher with a more parsimonious canonical solution. In other words, all three strategies try to reproduce approximately the same amount of variance with a reduced (smaller) variable set than with the original (larger) variable set. The smaller set is a more parsimonious solution, and consequently more likely to be true and replicable (Thompson, 1984).

Glossary

Canonical Correlation Coefficient ($R^2_c$) The Pearson product-moment correlation

 between the two sets of synthetic variable scores computed for a given canonical

 function.

Communality Coefficient ($h^2$) The proportion or percentage of variance in a measured

 variable that is useful in defining the canonical solution.

Function The set (in some analyses called equation or factor) of weights (e.g., regression

 beta weights, factor pattern coefficients, canonical function coefficients) applied

 to the measured variables to yield scores on synthetic variables (e.g., regression

 YHAT scores, factor scores, canonical scores).

Function Coefficient The multiplicative constant or weight applied to a given measured

 variable as part of the calculation of scores on synthetic variables.

Redundancy Coefficient (Rd) A canonical coefficient in a squared metric that is not

 multivariate, and which is useful in CCA only in very unusual cases where a "g"

 function with perfect effect size is expected.

Structure Coefficient ($r_s$) The Pearson product-moment correlation between scores on a

 given measured variable and the synthetic variable scores on a given function for

 the variable set to which the measured variable belongs.

Synthetic/Latent Variable Estimates of latent constructs computed by applying weights to

 the measured variables (e.g., regression YHAT scores, factor scores, canonical

 function scores).

Weight The multiplicative constants (e.g., regression beta weights, factor pattern

 coefficients, canonical function coefficients) applied to the measured variables to

yield scores on synthetic variables (e.g., regression YHAT scores, factor scores,

canonical function scores).

# References

Thompson, B. (1984). Canonical correlation analysis: Uses and Interpretation. Newbury Park, CA: SAGE.

Thompson, B. (1991). A primer on the logic and use of canonical correlation analysis. Measurement and Evaluation in Counseling and Development, 24(2) 80-95.

Thompson, B. (1996). Canonical correlation analysis. In L. Grimm & P. Yarnold (Eds), Reading and understanding multivariate statistics, 2. Washington, DC: American Psychological Association.

Table 1

Complete canonical solution

| | Function I | | | Function II | | | Function III | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Funct | Struct | Struct2 | Funct | Struct | Struct2 | Funct | Struct | Struct2 | H2 |
| T20 | -0.434 | -0.771 | 59.44% | 0.652 | 0.349 | 12.18% | 0.821 | 0.533 | 28.41% | 100.00% |
| T21 | -0.525 | -0.82 | 72.25% | 0.294 | 0.15 | 2.25% | -0.952 | -0.553 | 30.58% | 78.08% |
| T22 | -0.334 | -0.703 | 49.42% | -1.057 | -0.689 | 47.47% | 0.209 | 0.175 | 3.07% | 99.96% |
| Adequacy | | | 60.37% | | | 20.63% | | | 20.69% | |
| Rd | | | 16.84% | | | 0.62% | | | 0.12% | |
| Rc2 | | | 27.90% | | | 3.00% | | | 0.60% | |
| Rd | | | 9.14% | | | 2.42% | | | 0.57% | |
| Adequacy | | | 32.77% | | | 80.76% | | | 95.73% | |
| T14 | 0.29 | -0.437 | 19.20% | -0.356 | -0.081 | 0.66% | 0.878 | 0.717 | 51.41% | 71.27% |
| T15 | -0.11 | -0.415 | 17.22% | 0.925 | 0.718 | 51.55% | 0.189 | 0.433 | 18.75% | 87.52% |
| T16 | -0.625 | -0.831 | 69.06% | 0.287 | 0.256 | 6.55% | -0.437 | -0.063 | 0.39% | 76.00% |
| T17 | -0.034 | -0.374 | 13.99% | -0.059 | -0.034 | 0.12% | -0.263 | 0.118 | 1.39% | 15.50% |
| T18 | -0.116 | -0.478 | 22.85% | -0.327 | -0.204 | 4.16% | 0.542 | 0.479 | 22.94% | 49.95% |
| T19 | -0.514 | -0.737 | 54.32% | -0.392 | -0.421 | 17.72% | -0.352 | -0.092 | 0.85% | 72.89% |

Table 2
Variable t17 has been dropped.

| | Function I | | | Function II | | | Function III | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Funct | Struct | Struct2 | Funct | Struct | Struct2 | Funct | Struct | Struct2 | H2 |
| T20 | -0.435 | -0.772 | 59.59% | 0.646 | 0.345 | 11.91% | 0.825 | 0.534 | 28.52% | 100.00% |
| T21 | -0.524 | -0.819 | 67.08% | 0.30 | 0.153 | 2.34% | -0.950 | -0.552 | 30.47% | 99.89% |
| T22 | -0.334 | -0.703 | 49.42% | -1.058 | -0.690 | 47.61% | 0.202 | 0.170 | 2.89% | 99.92% |
| Adequacy | | | 58.69% | | | 20.62 | | | 20.63% | |
| Rd | | | 16.65% | | | 0.61% | | | 0.10% | |
| Rc2 | | | 27.90% | | | 2.90% | | | 0.50% | |
| Adequacy | | | 12.75% | | | 0.59% | | | 0.12% | |
| Rd | | | 45.70% | | | 20.19% | | | 24.86% | |
| T14 | 0.022 | -0.437 | 19.09% | -0.371 | -0.084 | 0.71% | 0.839 | 0.733 | 53.73% | 73.53% |
| T15 | -0.114 | -0.416 | 17.31% | 0.919 | 0.717 | 51.41% | 0.176 | 0.453 | 20.52% | 89.24% |
| T16 | -0.627 | -0.832 | 69.22% | 0.284 | 0.255 | 6.50% | -0.466 | -0.067 | 0.45% | 76.17% |
| T18 | -0.125 | -0.478 | 22.85% | -0.344 | -0.206 | 4.24% | 0.481 | 0.486 | 23.62% | 50.71% |
| T19 | -0.516 | -0.737 | 54.32% | -0.395 | -0.423 | 17.89% | -0.384 | -0.106 | 1.12% | 73.33% |

Table 3
Variables t17 and t18 have been dropped.

| | Function I | | | Function II | | | Function III | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Funct | Struct | Struct2 | Funct | Struct | Struct2 | Funct | Struct | Struct2 | H2 |
| T20 | -0.438 | -0.772 | 59.59% | 0.702 | 0.376 | 14.14% | 0.777 | 0.513 | 26.13% | 99.86% |
| T21 | -0.534 | -0.825 | 68.06% | 0.221 | 0.101 | 1.02% | -0.966 | -0.556 | 30.91% | 99.99% |
| T22 | -0.319 | -0.693 | 48.02% | -1.044 | -0.684 | 46.79% | 0.284 | 0.227 | 5.15% | 99.96% |
| Adequacy | | | 58.56% | | | 20.65% | | | 20.73% | |
| Rd | | | 16.10% | | | 0.56% | | | 0.01% | |
| Rc2 | | | 27.50% | | | 2.70% | | | 0.40% | |
| Adequacy | | | 11.12% | | | 0.57% | | | 0.01% | |
| Rd | | | 40.44% | | | 21.21% | | | 22.90% | |
| T14 | 0.021 | -0.439 | 19.27% | -0.37 | -0.08 | 0.64% | 1.037 | 0.87 | 75.69% | 95.60% |
| T15 | -0.147 | -0.421 | 17.72% | 0.883 | 0.75 | 56.25% | 0.163 | 0.392 | 15.37% | 89.34% |
| T16 | -0.644 | -0.838 | 70.22% | 0.226 | 0.232 | 5.38% | -0.487 | -0.073 | 0.53% | 76.13% |
| T19 | -0.55 | -0.74 | 54.76% | -0.539 | -0.475 | 22.56% | -0.156 | 0.013 | 0.01% | 77.33% |

15

Table 4
Function #3 has been deleted.

| | Function I | | | Function II | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| | Funct | Struct | Struct2 | Funct | Struct | Struct2 | H2 |
| T20 | -0.434 | -0.771 | 59.44% | 0.652 | 0.349 | 12.18% | 71.62% |
| T21 | -0.525 | -0.82 | 72.25% | 0.294 | 0.15 | 2.25% | 74.50% |
| T22 | -0.334 | -0.703 | 49.42% | -1.057 | -0.689 | 47.47% | 96.89% |
| Adequacy | | | 60.37% | | | 20.63% | |
| Rd | | | 16.84% | | | 0.62% | |
| Rc2 | | | 27.90% | | | 3.00% | |
| Rd | | | 9.14% | | | 2.42% | |
| Adequacy | | | 32.77% | | | 80.76% | |
| T14 | 0.29 | -0.437 | 19.20% | -0.356 | -0.081 | 0.66% | 19.86% |
| T15 | -0.11 | -0.415 | 17.22% | 0.925 | 0.718 | 51.55% | 68.77% |
| T16 | -0.625 | -0.831 | 69.06% | 0.287 | 0.256 | 6.55% | 75.61% |
| T17 | -0.034 | -0.374 | 13.99% | -0.059 | -0.034 | 0.12% | 14.11% |
| T18 | -0.116 | -0.478 | 22.85% | -0.327 | -0.204 | 4.16% | 27.01% |
| T19 | -0.514 | -0.737 | 54.32% | -0.392 | -0.421 | 17.72% | 72.04% |

16

Table 5
Function #3 has been deleted. Variable t17 has been dropped.

|  | Function I | | | Function II | | | |
|---|---|---|---|---|---|---|---|
|  | Funct | Struct | Struct2 | Funct | Struct | Struct2 | H2 |
| T20 | -0.435 | -0.772 | 59.59% | 0.646 | 0.345 | 11.90% | 71.49% |
| T21 | -0.524 | -0.819 | 67.08% | 0.3 | 0.153 | 2.34% | 69.42% |
| T22 | -0.334 | -0.703 | 49.42% | -1.058 | -0.69 | 47.61% | 97.03% |
| Adequacy |  |  | 58.70% |  |  | 20.62% |  |
| Rd |  |  | 16.38% |  |  | 0.59% |  |
| Rc2 |  |  | 27.90% |  |  | 2.90% |  |
| Rd |  |  | 10.20% |  |  | 0.46% |  |
| Adequacy |  |  | 36.56% |  |  | 16.15% |  |
| T14 | 0.022 | -0.437 | 19.09% | -0.371 | -0.084 | 0.71% | 19.80% |
| T15 | -0.114 | -0.416 | 17.31% | 0.919 | 0.717 | 51.41% | 68.72% |
| T16 | -0.627 | -0.832 | 69.22% | 0.284 | 0.255 | 6.51% | 75.73% |
| T18 | -0.125 | -0.478 | 22.85% | -0.344 | -0.206 | 4.24% | 27.09% |
| T19 | -0.516 | -0.737 | 54.32% | -0.395 | -0.423 | 17.89% | 72.21% |

Table 6
Function #3 has been deleted.
Variables t17 and t14 have been dropped because low h2.

| | Function I | | | Function II | | | |
|---|---|---|---|---|---|---|---|
| | Funct | Struct | Struct2 | Funct | Struct | Struct2 | H2 |
| T20 | -0.436 | -0.772 | 59.59% | 0.74 | 0.407 | 16.56% | 76.15% |
| T21 | -0.521 | -0.818 | 66.91% | 0.187 | 0.089 | 0.79% | 67.70% |
| T22 | -0.337 | -0.705 | 49.70% | -1.027 | -0.664 | 44.09% | 93.79% |
| Adequacy | | | 58.73% | | | 20.48% | |
| Rd | | | 16.33% | | | 0.55% | |
| Rc2 | | | 27.80% | | | 2.70% | |
| Rd | | | 11.39% | | | 0.61% | |
| Adequacy | | | 40.96% | | | 22.45% | |
| T15 | -0.108 | -0.415 | 17.22% | 0.867 | 0.773 | 59.75% | 76.97% |
| T16 | -0.622 | -0.832 | 69.22% | 0.194 | 0.267 | 7.12% | 76.34% |
| T18 | -0.125 | -0.479 | 22.94% | -0.341 | -0.186 | 3.46% | 26.40% |
| T19 | -0.513 | -0.738 | 54.46% | -0.486 | -0.441 | 19.45% | 73.41% |

18

Table 7
Function #3 has been deleted.
Variables t17, t14, and t18 have been dropped because of low h2.

| | Function I | | | Function II | | | |
|---|---|---|---|---|---|---|---|
| | Funct | Struct | Struct2 | Funct | Struct | Struct2 | H2 |
| T20 | -0.438 | -0.772 | 59.59% | 0.795 | 0.438 | 19.18% | 78.77% |
| T21 | -0.532 | -0.824 | 67.90% | 0.098 | 0.031 | 0.01% | 67.91% |
| T22 | -0.322 | -0.695 | 48.30% | -0.999 | -0.649 | 42.12% | 90.42% |
| Adequacy | | | 58.60% | | | 20.44% | |
| Rd | | | 16.12% | | | 0.49% | |
| Rc2 | | | 27.50% | | | 2.40% | |
| Rd | | | 13.09% | | | 0.75% | |
| Adequacy | | | 47.62% | | | 31.28 | |
| T15 | -0.141 | -0.421 | 17.72% | 0.828 | 0.801 | 64.16% | 81.88% |
| T16 | -0.639 | -0.838 | 70.22% | 0.134 | 0.242 | 5.86% | 76.08% |
| T19 | -0.547 | -0.741 | 54.91% | -0.622 | -0.488 | 23.81% | 78.72% |

19

Table 8
Complete canonical solution with weighted h2.

| | Function I | | | Function II | | | Function III | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Funct | Struct | Struct2 | Funct | Struct | Struct2 | Funct | Struct | Struct2 | weighted h2 |
| T20 | -0.434 | -0.771 | 59.44% | 0.652 | 0.349 | 12.18% | 0.821 | 0.533 | 28.41% | 17.12% |
| T21 | -0.525 | -0.82 | 72.25% | 0.294 | 0.15 | 2.25% | -0.952 | -0.553 | 30.58% | 20.41% |
| T22 | -0.334 | -0.703 | 49.42% | -1.057 | -0.689 | 47.47% | 0.209 | 0.175 | 3.07% | 15.23% |
| Adequacy | | | 60.37% | | | 20.63% | | | 20.69% | |
| Rd | | | 16.84% | | | 0.62% | | | 0.12% | |
| Rc2 | | | 27.90% | | | 3.00% | | | 0.60% | |
| Rd | | | 9.14% | | | 2.42% | | | 0.57% | |
| Adequacy | | | 32.77% | | | 80.76% | | | 95.73% | |
| T14 | 0.29 | -0.437 | 19.20% | -0.356 | -0.081 | 0.66% | 0.878 | 0.717 | 51.41% | 5.69% |
| T15 | -0.11 | -0.415 | 17.22% | 0.925 | 0.718 | 51.55% | 0.189 | 0.433 | 18.75% | 6.46% |
| T16 | -0.625 | -0.831 | 69.06% | 0.287 | 0.256 | 6.55% | -0.437 | -0.063 | 0.39% | 19.47% |
| T17 | -0.034 | -0.374 | 13.99% | -0.059 | -0.034 | 0.12% | -0.263 | 0.118 | 1.39% | 3.92% |
| T18 | -0.116 | -0.478 | 22.85% | -0.327 | -0.204 | 4.16% | 0.542 | 0.479 | 22.94% | 6.64% |
| T19 | -0.514 | -0.737 | 54.32% | -0.392 | -0.421 | 17.72% | -0.352 | -0.092 | 0.85% | 15.69% |

Table 9
Canonical solution with weighted h2. Variable t17 has been dropped.

| | Function I | | | Function II | | | Function III | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| | Funct | Struct | Struct2 | Funct | Struct | Struct2 | Funct | Struct | Struct2 | weighted h2 |
| T20 | -0.435 | -0.772 | 59.59% | 0.646 | 0.345 | 11.91% | 0.825 | 0.534 | 28.52% | 17.11% |
| T21 | -0.524 | -0.819 | 67.08% | 0.30 | 0.153 | 2.34% | -0.950 | -0.552 | 30.47% | 18.94% |
| T22 | -0.334 | -0.703 | 49.42% | -1.058 | -0.690 | 47.61% | 0.202 | 0.170 | 2.89% | 15.18% |
| Adequacy | | 58.69% | | | 20.62 | | | 20.63% | | |
| Rd | | 16.65% | | | 0.61% | | | 0.10% | | |
| Rc2 | | 27.90% | | | 2.90% | | | 0.50% | | |
| Adequacy | | 12.75% | | | 0.59% | | | 0.12% | | |
| Rd | | 45.70% | | | 20.19% | | | 24.86% | | |
| T14 | 0.022 | -0.437 | 19.09% | -0.371 | -0.084 | 0.71% | 0.839 | 0.733 | 53.73% | 5.62% |
| T15 | -0.114 | -0.416 | 17.31% | 0.919 | 0.717 | 51.41% | 0.176 | 0.453 | 20.52% | 6.42% |
| T16 | -0.627 | -0.832 | 69.22% | 0.284 | 0.255 | 6.50% | -0.466 | -0.067 | 0.45% | 19.50% |
| T18 | -0.125 | -0.478 | 22.85% | -0.344 | -0.206 | 4.24% | 0.481 | 0.486 | 23.62% | 6.62% |
| T19 | -0.516 | -0.737 | 54.32% | -0.395 | -0.423 | 17.89% | -0.384 | -0.106 | 1.12% | 15.68% |

21

Table 10
Canonical solution with weighted h2. Variables t17 and t14 have been dropped.

| | Function I | | | Function II | | | Function III | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Funct | Struct | Struct2 | Funct | Struct | Struct2 | Funct | Struct | Struct2 | weighted h2 |
| T20 | -0.436 | -0.772 | 59.59% | 0.74 | 0.407 | 16.56% | 0.742 | 0.488 | 23.81% | 17.01% |
| T21 | -0.521 | -0.818 | 66.91% | 0.187 | 0.089 | 0.79% | -0.98 | -0.568 | 32.26% | 18.69% |
| T22 | -0.337 | -0.705 | 49.70% | -1.027 | -0.664 | 44.09% | 0.325 | 0.248 | 6.15% | 15.02% |
| Adequacy | | | 58.73% | | | 20.48% | | | 20.74 | |
| Rd | | | 16.33% | | | 0.55% | | | 0.01% | |
| Rc2 | | | 27.80% | | | 2.70% | | | 0.20% | |
| Rd | | | 11.39% | | | 0.61% | | | 0.01% | |
| Adequacy | | | 40.96% | | | 22.45% | | | 22.09% | |
| T15 | -0.108 | -0.415 | 17.22% | 0.867 | 0.773 | 59.75% | 0.293 | 0.379 | 14.36% | 6.43% |
| T16 | -0.622 | -0.832 | 69.22% | 0.194 | 0.267 | 7.12% | -0.512 | -0.233 | 5.43% | 19.45% |
| T18 | -0.125 | -0.479 | 22.94% | -0.341 | -0.186 | 3.46% | 0.929 | 0.828 | 68.56% | 6.61% |
| T19 | -0.513 | -0.738 | 54.46% | -0.486 | -0.441 | 19.45% | -0.19 | 0.002 | 0.01% | 15.67% |

Table 11
Summary of changes in $R^2_c$

| | Function I $R^2_c$ | Function II $R^2_c$ | Function III $R^2_c$ |
|---|---|---|---|
| Variables deleted | | | |
| | 27.90% | 3.00% | 0.60% |
| T17 | 27.90% | 2.90% | 0.50% |
| T17, T18 | 27.50% | 2.70% | 0.40% |
| | | | |
| | 27.90% | 3.00% | |
| T17 | 27.90% | 2.90% | |
| T17,T14 | 27.80% | 2.70% | |
| T17, T14, T18 | 27.50% | 2.40% | |
| | | | |
| | 27.90% | 3.00% | 0.60% |
| T17 | 27.90% | 2.90% | 0.50% |
| T17,T14 | 27.80% | 2.70% | 0.20% |

**U.S. DEPARTMENT OF EDUCATION**
Office of Educational Research and Improvement (OERI)
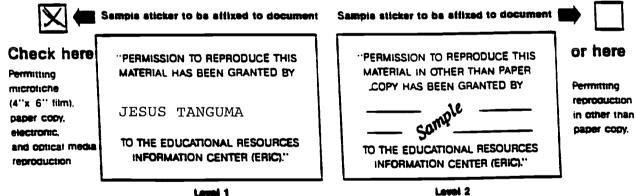Educational Resources Information Center (ERIC)

# REPRODUCTION RELEASE
(Specific Document)

## I.   DOCUMENT IDENTIFICATION:

Title:
VARIABLE DELETION STRATEGIES IN CANONICAL CORRELATION ANALYSIS

Author(s): JESUS TANGUMA

| Corporate Source: | Publication Date: |
|---|---|
| | 11/99 |

## II.   REPRODUCTION RELEASE:

In order to disseminate as widely as possible timely and significant materials of interest to the educational community, documents announced in the monthly abstract journal of the ERIC system. *Resources in Education* (RIE), are usually made available to users in microfiche, reproduced paper copy, and electronic/optical media, and sold through the ERIC Document Reproduction Service (EDRS) or other ERIC vendors. Credit is given to the source of each document, and, if reproduction release is granted, one of the following notices is affixed to the document.

If permission is granted to reproduce the identified document, please CHECK ONE of the following options and sign the release below.

Sample sticker to be affixed to document          Sample sticker to be affixed to document ➡ ☐

**Check here**
Permitting
microfiche
(4"x 6" film),
paper copy,
electronic,
and optical media
reproduction

"PERMISSION TO REPRODUCE THIS
MATERIAL HAS BEEN GRANTED BY

JESUS   TANGUMA

TO THE EDUCATIONAL RESOURCES
INFORMATION CENTER (ERIC)."

Level 1

"PERMISSION TO REPRODUCE THIS
MATERIAL IN OTHER THAN PAPER
COPY HAS BEEN GRANTED BY

_____ *Sample* _____

TO THE EDUCATIONAL RESOURCES
INFORMATION CENTER (ERIC)."

Level 2

**or here**
Permitting
reproduction
in other than
paper copy.

## Sign Here, Please

Documents will be processed as indicated provided reproduction quality permits. If permission to reproduce is granted, but neither box is checked, documents will be processed at Level 1.

"I hereby grant to the Educational Resources Information Center (ERIC) nonexclusive permission to reproduce this document as indicated above. Reproduction from the ERIC microfiche or electronic/optical media by persons other than ERIC employees and its system contractors requires permission from the copyright holder. Exception is made for non-profit reproduction by libraries and other service agencies to satisfy information needs of educators in response to discrete inquiries."

| Signature: | Position: RES ASSOCIATE |
|---|---|
| Printed Name: JESUS TANGUMA | Organization: TEXAS A&M UNIVERSITY |
| Address: TAMU DEPT EDUC PSYC COLLEGE STATION, TX 77843-4225 | Telephone Number: (409 ) 845-1831 |
| | Date: 9/15/99 |