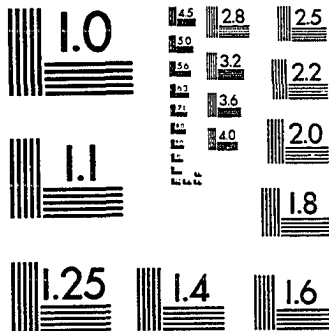
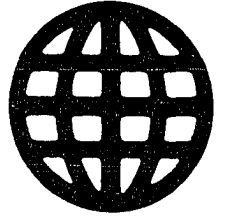


# UMI University Microfilms International



MICROCOPY RESOLUTION TEST CHART  
NATIONAL BUREAU OF STANDARDS  
STANDARD REFERENCE MATERIAL 1010a  
(ANSI and ISO TEST CHART No. 2)

**University Microfilms Inc.**

300 N. Zeeb Road, Ann Arbor, MI 48106



## INFORMATION TO USERS

This reproduction was made from a copy of a manuscript sent to us for publication and microfilming. While the most advanced technology has been used to photograph and reproduce this manuscript, the quality of the reproduction is heavily dependent upon the quality of the material submitted. Pages in any manuscript may have indistinct print. In all cases the best available copy has been filmed.

The following explanation of techniques is provided to help clarify notations which may appear on this reproduction.

1. Manuscripts may not always be complete. When it is not possible to obtain missing pages, a note appears to indicate this.
2. When copyrighted materials are removed from the manuscript, a note appears to indicate this.
3. Oversize materials (maps, drawings, and charts) are photographed by sectioning the original, beginning at the upper left hand corner and continuing from left to right in equal sections with small overlaps. Each oversize page is also filmed as one exposure and is available, for an additional charge, as a standard 35mm slide or in black and white paper format.\*
4. Most photographs reproduce acceptably on positive microfilm or microfiche but lack clarity on xerographic copies made from the microfilm. For an additional charge, all photographs are available in black and white standard 35mm slide format.\*

\*For more information about black and white slides or enlarged paper reproductions, please contact the Dissertations Customer Services Department.

**UMI** University  
Microfilms  
International



8602122

**Watanabe, Judith Ellen**

INDEXATION OF CAPITAL GAINS AND LOSSES: A COMPLEXITY STUDY

*The University of Nebraska - Lincoln*

PH.D. 1985

**University  
Microfilms  
International** 300 N. Zeeb Road, Ann Arbor, MI 48106



**PLEASE NOTE:**

In all cases this material has been filmed in the best possible way from the available copy. Problems encountered with this document have been identified here with a check mark .

1. Glossy photographs or pages \_\_\_\_\_
2. Colored illustrations, paper or print \_\_\_\_\_
3. Photographs with dark background \_\_\_\_\_
4. Illustrations are poor copy \_\_\_\_\_
5. Pages with black marks, not original copy \_\_\_\_\_
6. Print shows through as there is text on both sides of page \_\_\_\_\_
7. Indistinct, broken or small print on several pages
8. Print exceeds margin requirements \_\_\_\_\_
9. Tightly bound copy with print lost in spine \_\_\_\_\_
10. Computer printout pages with indistinct print \_\_\_\_\_
11. Page(s) \_\_\_\_\_ lacking when material received, and not available from school or author.
12. Page(s) \_\_\_\_\_ seem to be missing in numbering only as text follows.
13. Two pages numbered \_\_\_\_\_. Text follows.
14. Curling and wrinkled pages \_\_\_\_\_
15. Dissertation contains pages with print at a slant, filmed as received \_\_\_\_\_
16. Other \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

University  
Microfilms  
International





INDEXATION OF CAPITAL GAINS AND LOSSES: A COMPLEXITY STUDY

by

Judith Ellen Watanabe

A DISSERTATION

Presented to the Faculty of  
The Graduate College in the University of Nebraska  
In Partial Fulfillment of Requirements  
For the Degree of Doctor of Philosophy

Major: Interdepartmental Area of Business

Under the Supervision of Professor Richard W. Metcalf

Lincoln, Nebraska

August, 1985

**TITLE**

Indexation of Capital Gains and Losses: A Complexity Study

**BY**

Judith Ellen Watanabe

**APPROVED**

**DATE**

<u>Richard W. Metcalf</u>	<u>August 9, 1985</u>
<u>Manferd O. Peterson</u>	<u>August 9, 1985</u>
<u>Virginia L. Bean</u>	<u>August 9, 1985</u>
<u>Robert H. Michaelsen</u>	<u>August 9, 1985</u>
<u> </u>	<u> </u>
<u> </u>	<u> </u>
<u> </u>	<u> </u>

**SUPERVISORY COMMITTEE**

**GRADUATE COLLEGE**

**UNIVERSITY OF NEBRASKA**

INDEXATION OF CAPITAL GAINS AND LOSSES: A COMPLEXITY STUDY

Judith Ellen Watanabe, Ph.D.

University of Nebraska, 1985

Adviser: Richard W. Metcalf

Since 1921, when special provisions for capital gains and losses were first adopted, these provisions have been subject to continuous modifications. The modifications reflect Congressional responses to taxpayers dissatisfied with inequitable laws and to pressure groups seeking special tax benefits. Many feel the resulting complex tax law is an intolerable burden to the average taxpayer. Indexing has been suggested as a solution to inequities created by inflation. Although some authors feel that indexation would result in less complexity, others disagree.

The present study compares the complexity under current law with the complexity which would be introduced if indexation was used for all capital asset transactions. This study differs from earlier ones in that it measures tax complexity as experienced by the taxpayer. Complexity is defined as a function of taxpayer errors and time. The time/error dimension of tax complexity is explored by examining four decision frames. The frames are composed of parallel (present and indexation

methods) test instruments which include pertinent facts and required computations for capital asset transactions common to the individual taxpayer. The test instruments were completed by University of Nebraska at Omaha faculty, staff, and students. All but four of the 142 participants had filed 1984 tax returns.

A Time/Error Complexity index, expressing the relationship of the present method to indexation weighted for time and errors, is used for analysis. Relatively more complexity was experienced by the subjects under the present method than under indexation. The Wilcoxon ranked-sum test confirms the Time/Error Complexity index results. At a 99 percent confidence level, there is a statistically significant difference between the two methods: the present method is more complex than the indexation method in three out of the four decision frames and for all frames combined.

The complexity in current law pertaining to the capital gain and loss provisions examined in this study is greater than the complexity which would be introduced if an indexation method was adopted for capital gain taxation.

## TABLE OF CONTENTS

LIST OF ILLUSTRATIONS . . . . .	iv
LIST OF TABLES. . . . .	v
ACKNOWLEDGMENTS . . . . .	vi
Chapter	
1. INTRODUCTION . . . . .	1
Taxation of Capital Gains and Losses in the United States . . . . .	1
Brief History. . . . .	1
Rationale for Special Treatment of Capital Gains	5
Bunching . . . . .	5
Inflationary Gain . . . . .	6
Mobility of Capital . . . . .	7
Problems Created by Special Treatment of Capital Gain . . . . .	9
Inequity . . . . .	9
Complexity. . . . .	11
Proposals for Reform . . . . .	13
Purpose of Study . . . . .	15
Methodology of Study . . . . .	16
Overview . . . . .	16
Development of Test Instruments. . . . .	17
Design . . . . .	17
Evaluation. . . . .	17
Pilot Study . . . . .	18
The Simulation . . . . .	18
Analysis of Results. . . . .	18
Limitations . . . . .	19
Capital Gains and Losses . . . . .	19
Individual Taxpayers . . . . .	19
Appropriate Index. . . . .	20
Averaging Provisions . . . . .	21
Realization . . . . .	22
Organization of Study. . . . .	22

2. REVIEW OF LITERATURE . . . . .	23
Studies in Tax Complexity . . . . .	24
Schroeder . . . . .	24
Karlinsky . . . . .	26
Milliron . . . . .	28
Long/Swingen . . . . .	32
Complexity Research Summary . . . . .	32
Indexation Proposals for Reform . . . . .	33
Waggoner . . . . .	33
Feldstein/Slemrod . . . . .	33
AICPA . . . . .	35
AAA Federal Tax Committee . . . . .	36
Treasury Proposal . . . . .	38
Political Considerations in Taxation. . . . .	40
Economists' Studies . . . . .	42
Summary . . . . .	43
3. METHODOLOGY . . . . .	44
Tax Complexity . . . . .	44
Data Gathering . . . . .	45
Development of the Test Instruments . . . . .	46
Design . . . . .	46
Decision Frame 1 . . . . .	48
Decision Frame 2 . . . . .	51
Decision Frame 3 . . . . .	52
Decision Frame 4 . . . . .	53
Other Considerations . . . . .	54
Tax Experts' Evaluation . . . . .	55
Pilot Study . . . . .	56
The Simulation . . . . .	57
Data Gathering Summary . . . . .	59
Data Analysis Methodology . . . . .	59
An Index Measure . . . . .	60
Construction of an Index . . . . .	61
Fisher's "Ideal" Index . . . . .	63
Time/Error Complexity Index. . . . .	65
Ranking Text . . . . .	66
Wilcoxon Ranked-Sum Test . . . . .	66
Test Application . . . . .	67
Summary . . . . .	71

4. DATA ANALYSIS . . . . .	72
Data . . . . .	72
Time/Error Complexity Index. . . . .	78
Wilcoxon Test . . . . .	81
Summary . . . . .	83
5 . SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS . . . . .	85
Summary . . . . .	85
Test Instruments . . . . .	88
Methodology . . . . .	91
Limitations . . . . .	92
Conclusions . . . . .	92
Recommendations . . . . .	94
APPENDIX A: TEST INSTRUMENTS . . . . .	95
APPENDIX B: TIME/ERROR COMPLEXITY INDEX . . . . .	109
Time/Error Complexity Index Calculations . . . . .	110
All Frames Combined . . . . .	113
Decision Frame 1 . . . . .	117
Decision Frame 2 . . . . .	121
Decision Frame 3 . . . . .	125
Decision Frame 4 . . . . .	129
APPENDIX C: WILCOXON TEST . . . . .	133
Wilcoxon Test Calculations . . . . .	134
All Frames Combined . . . . .	137
Decision Frame 1 . . . . .	141
Decision Frame 2 . . . . .	145
Decision Frame 3 . . . . .	149
Decision Frame 4 . . . . .	153
BIBLIOGRAPHY . . . . .	157

LIST OF ILLUSTRATIONS

1. Computation of Tax for Two Taxpayers . . . . .	10
2. Wilcoxon Test Action Limit . . . . .	70
3. Wilcoxon Test Action Limit . . . . .	82



## LIST OF TABLES

1. Decision Frames . . . . .	49
2. Preliminary Analysis of Time (Minutes) . . . . .	74
3. Preliminary Analysis of Errors . . . . .	75
4. Preliminary Analysis of Time and Errors Combined . . .	75
5. Time/Error Complexity Indexes . . . . .	79
6. Wilcoxon Test Results . . . . .	83

## ACKNOWLEDGMENTS

I am deeply indebted to my doctoral committee for their guidance. Professor Richard Metcalf, my chairman, and Professor Robert Michaelson have given me encouragement and technical support. Professor Virginia Bean has devoted an incredible amount of time to the project and words cannot express my appreciation. Virginia's emotional support, generous tutoring, and considerable patience have immeasurably benefited me and this dissertation. My gratitude is extended to Professor Justin Stolen for his valuable assistance in helping me to select the methodology used in the study.

In addition, I wish to express my sincere appreciation to my family. My parents, Opal and Lester Smith, have provided constant love and loyal support; and without the understanding, love, and assistance of my husband, Mike, and my children, David and Scott, I could not have completed this project.

## CHAPTER 1

### INTRODUCTION

Throughout history governments have levied taxes to provide services and to wage war; unequal and unfair taxation has often led to revolutions. Even the birth of the United States can be traced to the perception of inequitable taxation of the Colonies by Parliament. In 1913, the Sixteenth Amendment to the Constitution gave Congress the power to tax income. Since 1921, when special treatment for capital gains and losses was first added to the tax law, the provisions relating to the taxation of capital gains and losses have been subject to continuous changes and modifications.

#### Taxation of Capital Gains and Losses in the United States

##### Brief History

In the United States, almost every major piece of income tax legislation since 1913 has contained some modification to the taxation of capital gains and losses. The following paragraphs draw from Sommerfeld's history of capital gain and loss provisions.<sup>1</sup>

---

<sup>1</sup>Ray M. Sommerfeld, Hershel M. Anderson, and Horace R. Brock, An Introduction to Taxation, 10th ed., (New York: Harcourt Brace Jovanovich, 1984), pp. 425-440.

In 1913, capital gains were taxed the same as any other income but capital losses were not deductible; in 1916, capital losses were allowed to the extent of capital gains; and in 1918, capital losses became fully deductible regardless of the amount of capital gains. These frequent early modifications by Congress set the stage for the future.

The 1921 Revenue Act marked a radical change in tax policy: Congress for the first time defined "capital assets" and introduced a special treatment for the taxation of capital gains. Taxpayers holding capital assets for more than two years were given the option of paying a 12.5 percent alternative rate rather than being taxed at the ordinary income rate which could run as high as 77 percent.

In the 1934 Revenue Act, Congress repealed the 12.5 percent alternative rate and instituted percentage exclusions. These provisions were intended to alleviate the inequity of taxing in a single year, at progressive rates, the gain which had occurred over several years. The percentage exclusions varied from 70 percent for capital assets held more than ten years to no exclusion for assets held one year or less. The resulting gain after the exclusion was then subject to ordinary income tax rates.<sup>2</sup>

---

<sup>2</sup>Anita Wells, "Legislative History of Treatment of Capital Gains Under the Federal Income Tax, 1913 - 1948," National Tax Journal 2 (March, 1949), p. 14.

The 1938 Revenue Act modified the holding period requirements, providing for three categories of capital gains: (1) long-term (held longer than 24 months), 50 percent excludable; (2) medium-term (held longer than 18, but not longer than 24 months), 33 1/3 percent excludable; and (3) short-term (held 18 months or less), not excludable. In 1942, the holding period requirements were further modified to provide for only two classes of capital gains: short-term gains (capital asset held six months or less) and long-term gains (capital asset held for more than six months). Long-term capital gains qualified for a 50 percent capital gain deduction. Congress felt that a six-month holding period effectively separated speculators from investors.

During 1950-1969, Congress began to close loopholes as taxpayers found clever ways to convert ordinary income into capital gain. The top tax rate of 91 percent encouraged high bracket taxpayers to create such vehicles as "collapsible corporations" to escape burdensome taxation. Many minor provisions were enacted in this nineteen-year period but none changed the basic capital gain concept.

Beginning in 1969, Congress attempted to respond to revelations showing that many high income taxpayers were liberally using the capital gain provisions to reduce their

total tax bill.<sup>3</sup> A significant response was the Tax Reform Act of 1976 which increased the holding period for long-term capital gains from more than six months to more than one year, and attempted to eliminate the tax free gain provided by the step up in basis at date of death by enacting carryover basis rules.

After ten years of attempting to reduce the advantages of capital gain over ordinary income, Congress did an about-face in 1978. The Revenue Act of 1978 increased the long-term capital gain deduction from 50 percent to 60 percent; the carry-over basis rules were repealed by the 1980 Windfall Profit Tax Act; and the Deficit Reduction Tax Act of 1984 reduced the holding period for long-term capital gain treatment from more than one year to more than six months.

The frequency and magnitude of changes in capital gain provisions are briefly summarized above. As Banks stated in 1953:

We have now had more than 30-years' experience in this country with special treatment of capital gains and losses. The innovation developed in 1921 has grown to adulthood. The question is, what kind of adult has the infant become? Is the adult, from the standpoint of tax equity, benign or malignant? In short, have we evolved a lady or a tiger?<sup>4</sup>

---

<sup>3</sup>Martin David, Alternative Approaches to Capital Gains Taxation (Washington, D.C.: The Brookings Institution, 1968), p. 86.

<sup>4</sup>Robert Bangs, "The Dilemma of the Cut-Rate Tax" (1953) cited by Ray M. Sommerfeld, Hershel M. Anderson, and Horace R. Brock, An Introduction to Taxation (New York: Harcourt, Brace & World, 1969), p. 227.

The rationale behind the special treatment given to capital gains has been explained in a variety of ways at different times. Regardless of explanations offered, special capital gains provisions do cause differences in the tax paid by different taxpayers with the same amount of real income and do add complexity to tax law.

#### Rationale for Special Treatment of Capital Gain

Blum stated in 1957: "The issue [special treatment of capital gain] is almost as old as the income tax itself; over the years it has been subjected to searching analysis and resounding debate; everything there now is to say on the problem has already been said."<sup>5</sup> Since that time not much has been added, but his arguments and those of others include the following:

##### Bunching

Taxing in one year a capital gain, which occurs over many years, results in higher tax because of progressive tax rates. Therefore, it is argued, the long-term capital gain deduction provides a rough form of income averaging. However, the capital gain provisions give the same special benefit to all long-term capital gains regardless of the holding period. It is undeniable that a taxpayer may be pushed into a higher

---

<sup>5</sup>Walter J. Blum, "A Handy Summary of the Capital Gains Arguments," Taxes - The Tax Magazine 35 (April, 1957), p. 247.

tax bracket because of the realization of a capital gain on the sale of an asset. However, the 60 percent long-term capital gain deduction does not seem to be the appropriate solution to this problem. An averaging provision tied to the actual asset holding period would solve the bunching problem in a more appropriate way. Present tax laws allow the capital gain deduction as well as income averaging. Neither of these is related to the length of time over which the gain occurred.

As pointed out by Waggoner, some consider unrealized appreciation to be income (even though not taxable under current law). Under this concept the taxpayer is viewed as receiving an interest-free loan from the government for the amount of tax he would owe (but does not pay currently) on the appreciation. The result of the trade-off between the benefits of deferral and the cost of future higher taxes depends on the discount rate, the difference in marginal tax rates, and the length of time the tax is deferred.<sup>6</sup>

#### Inflationary Gain

When property is held for several years its apparent increase in value may be partially or totally due to inflation. The real value of the property may not have increased at all; and thus, no real gain may actually exist. Some argue the

---

<sup>6</sup>Michael J. Waggoner, "Eliminating the Capital Gains Preference. Part I: The Problems of Inflation, Bunching and Lock-In," University of Colorado Law Review 48 (Spring, 1977), p. 322.



capital gain deduction is an approximate correction for inflation. However, the same treatment is available whether an asset is held one day more than six months or more than forty years. In addition, the deduction is not related to the inflation rate.

#### Mobility of Capital

Yet another justification made for preferential treatment of capital gains is that it encourages taxpayers to make investments in new industries and keep the economy of the country growing. This is an argument frequently given for reduced, or no taxation of capital gains. Blum outlined this argument as follows:

Assume an investor owns an asset which has appreciated in value substantially. Like any intelligent investor, he will weigh periodically the desirability of continuing his investment against holding cash or purchasing some other asset. If there were no tax on capital gains these decisions would be based on the merits of the alternatives. A tax on capital gains interferes by adding a tax cost to selling without adding a comparable cost to keeping it. Investors as a class thus will be more disposed to hold on to appreciated investments and capital will become less mobile.

This is often referred to as the "lock-in" effect. The "lock-in" effect is the assumption underlying the Treasury Department's analysis of the availability of venture capital to high technology industries in the 1970's:

---

<sup>7</sup>Blum, "A Handy Summary of Capital Gains Arguments," pp. 256-257.

The supply of venture capital largely dried up during the 1970's when effective tax rates on real gains were high due to inflation and other provisions in the Code, but revived dramatically after the 1978 and 1981 tax changes reduced the maximum tax rate on realized long-term capital gains to 20 percent and inflation rates fell significantly from earlier levels.<sup>8</sup>

However, some authors feel that this rationale, while it has some merit, does not justify the preferential capital gains treatment. Waggoner pointed out that since capital gains treatment is available whether or not sale proceeds are reinvested, capital gains treatment may indeed promote disinvestment.<sup>9</sup> Blum stated that it is highly improbable that investments might stagnate in dying industries.<sup>10</sup> Intelligent investors recognize that the possibility for capital appreciation in growing industries may outweigh the cost of paying tax on current disinvestment. If preferential capital gains taxation is to be used to encourage conversion of investments into venture capital, Eisenstein suggested that only those who actually provide venture capital should be allowed the capital gains deduction on the profitable investments they sell; the

---

<sup>8</sup>U.S. Department of the Treasury, Tax Reform for Fairness, Simplicity, and Economic Growth, Vol. 1 (Washington, D.C.: Government Printing Office, 1984), p. 103.

<sup>9</sup>Waggoner, "Eliminating the Capital Gains Preference. Part I," p. 323.

<sup>10</sup>Blum, "A Handy Summary of Capital Gains Arguments," pp. 257-258.

deduction should not be available to those who simply switch from one marketable security to another.<sup>11</sup> Sommerfeld pointed out that although the "lock-in" effect reasoning appears valid enough on an a priori basis, little empirical evidence supports this claim.<sup>12</sup>

#### Problems Created by Special Treatment of Capital Gain

The problems created by special treatment of capital gain center around the issues of equity and complexity. In 1951, a statement by the Treasury Department pointed out that:

. . . finding satisfactory formulas for achieving the divergent equity and incentive objectives that are entwined in the philosophy of capital-gains taxation has been a difficult problem. Consequently, the history of the legal provisions has been a record<sup>13</sup> of compromise and change without satisfactory solution.

#### Inequity

A taxpayer with a dollar of capital gain has the same purchasing power as a taxpayer with a dollar of ordinary income. Although their economic position is the same, since 1921 the tax paid has been different. For example, take the case of two taxpayers, David and Scott. David received a

---

<sup>11</sup>Louis Eisenstein, The Ideologies of Taxation (New York: The Ronald Press Company, 1961), p. 96.

<sup>12</sup>Sommerfeld, An Introduction to Taxation, p. 442.

<sup>13</sup>U.S. Treasury Department Tax Advisory Staff, Federal Income Tax Treatment of Capital Gains and Losses (Washington, D.C.: Government Printing Office, 1951), p. 22.

salary of \$35,000. Scott received a \$20,000 salary and had a \$15,000 long-term capital gain from the sale of stock. Both David and Scott were unmarried, under 65 in age, and had no other income or deductions. As shown in Figure 1, David paid tax of \$7,482 and Scott paid \$4,573, a difference of \$2,909.

FIGURE 1

## COMPUTATION OF TAX FOR TWO TAXPAYERS

	<u>David</u>	<u>Scott</u>
Salaries	\$35,000	\$20,000
Capital Gain	<u>-0-</u>	<u>15,000</u>
Gross Income	\$35,000	\$35,000
Less: 60% Capital Gain Deduction	<u>-0-</u>	<u>9,000</u>
Adjusted Gross Income	35,000	26,000
Less: Personal Exemption	<u>1,000</u>	<u>1,000</u>
Taxable Income	<u>\$34,000</u>	<u>\$25,000</u>
Tax Liability at 1984 Rates	<u>\$ 7,482</u>	<u>\$ 4,573</u>

Because of the difference in tax paid, many oppose special treatment of capital gains. They feel that those who are similarly situated should be similarly taxed. According to Eisenstein, ". . . equity is the privilege of paying as little tax as somebody else."<sup>14</sup> This principle is frequently called

---

<sup>14</sup>Eisenstein, The Ideologies of Taxation, p. 176.

horizontal equity. The corollary to horizontal equity, vertical equity, is that people with unequal ability to pay (differently situated) should be taxed differently.

The most familiar example of vertical equity is progressive taxation. Under current law a second kind of inequity results when an asset held during an inflationary period is sold. The reported gain includes the increase in the asset value because of the general price level increase. Those that advocate vertical equity feel that taxpayers with higher incomes should pay a higher rate of tax on the higher income: as evidenced in progressive taxation. Because a long-term capital gain may occur over a period of years (bunching) progressive taxation on that gain may result in a much higher rate of tax.

The current complexities in tax law reflect responses by Congress to dissatisfied taxpayers, as well as to other special interest groups. Taxation is a political process and special tax benefits are sought by a variety of pressure groups within the economy.

#### Complexity

A major argument against the special treatment of capital gain is that it is a major source of complexity in our income tax laws. Tax complexity has been given a limited

amount of study. In two separate studies, Karlinsky<sup>15</sup> and Schroeder<sup>16</sup> focused primarily on analyzing code sections, regulations, revenue rulings, and court cases for the complexity attributable to special treatment of capital gains and losses. Each concluded that the capital gain provisions result in extreme complexity. Schroeder found that over 40 percent of the income tax code sections are directly or indirectly affected by the capital gain and loss provisions.<sup>17</sup> Karlinsky reported that in the 1970's only 7 to 9 percent of all individual tax returns reported any capital gains or losses; yet his complexity model shows that the capital gain provisions result in 15 percent of the complexity found in current tax law.<sup>18</sup>

Recent newspaper and magazine articles report a tax law ". . . so complex that even experts approach April 15 with trepidation."<sup>19</sup> The Treasury Department reviewed the U.S. tax

---

<sup>15</sup>Stewart S. Karlinsky, "Complexity in the Federal Income Tax Law Attributable to the Capital Gain and Loss Preference: A Measurement Model" (Ph.D. dissertation, New York University, 1981).

<sup>16</sup>Jack D. Schroeder, "Potential Simplification of the Federal Income Tax Law by Eliminating Special Treatment of Capital Gains and Losses" (Ph.D. dissertation, Michigan State University, 1975).

<sup>17</sup>Ibid., p. 123.

<sup>18</sup>Karlinsky, "Complexity in the Federal Income Tax Law," p. 22 and p. 108.

<sup>19</sup>See, for instance, Tom Herman, "Tax Tomes - A Guide to the Guides," The Wall Street Journal, March 4, 1985, Sec. 1, p. 24.

system in 1984 with the objective of determining ". . . how to reduce the complexities, inequities, and economic distortions in the tax system . . . ." <sup>20</sup>

Over the years, astute taxpayers and their tax advisors have continually discovered new loopholes and Congress has continually attempted to restrict them. Many feel the complexity in tax law has become an intolerable burden to the average taxpayer and a fertile field for the tax advisor.

#### Proposals for Reform

The present capital gains tax structure invites a variety of proposals for change. Some of them would base the tax treatment of capital gains on an accretion concept of income. Others reflect concern over the impact of the capital gains tax on financial markets and on saving and investment. Some proposals reflect the personal interest of those who seek a further reduction in their tax liability. <sup>21</sup>

These statements are as true today as when they were made by David in 1968. A recent study by Cairns concluded that a different tax treatment, which uses the holding period of the capital asset as a basis for averaging the gain or loss, may be an acceptable compromise to both proponents and oppo-

---

<sup>20</sup>U.S. Department of the Treasury, Tax Reform for Fairness, Simplicity, and Economic Growth, Vol. 1, p. 2.

<sup>21</sup>David, Alternative Approaches to Capital Gains Taxation, p. 109.

nents of preferential capital gains treatment.<sup>22</sup> Cairns' treatment is similar to one described by Seltzer in 1951.<sup>23</sup> David also discussed an averaging procedure and said that it would reduce the problems associated with taxation of "lumpy capital gains."<sup>24</sup>

Indexing has been advocated by a number of authors as a solution for the tax problems caused by inflation.<sup>25</sup> The implementation of structural indexing, scheduled for the 1985 tax year, will provide inflation adjustment to tax rate brackets, personal exemptions, and zero bracket amounts. Structural indexing does not adjust for the inflation effect on the basis of capital assets; but tax base, or measurement, indexing would adjust the cost basis of assets.

According to the Treasury Department, its recent proposal, Tax Reform for Fairness, Simplicity, and Economic Growth (hereinafter cited as Treasury Proposal), is a revenue neutral

---

<sup>22</sup>Scott N. Cairns, "An Empirical Investigation into the Effects of Tax Equity of Selected Alternative Methods of Taxing Capital Gains and Losses" (Ph.D. dissertation, University of Illinois at Urbana-Champaign, 1983), p. 180.

<sup>23</sup>Lawrence H. Seltzer, The Nature and Tax Treatment of Capital Gains and Losses (New York: National Bureau of Economic Research, Inc., 1951), pp. 307-308.

<sup>24</sup>David, Alternative Approaches to Capital Gains Taxation, p. 228.

<sup>25</sup>See, for instance, Henry J. Aaron, ed., Inflation and the Income Tax (Washington, D.C.: The Brookings Institution, 1976), p. 27, and Waggoner, "Eliminating the Capital Gains Preference: Part I," p. 397.



reform which addresses not only the inequity and complexity created by capital gain provisions but also the inequity and complexity in many other areas of business and individual taxation.<sup>26</sup> The Treasury Proposal recommends indexation of capital assets for inflation and elimination of the capital gain deduction. The indexation of depreciation, inventories, and interest is also proposed by the Treasury.

Although some think indexation would result in a more equitable, less complex income tax law, others disagree. Shapiro, in referring to the Treasury Proposal, said: "These indexing changes will undoubtedly add complexity to the tax system, despite the simplification the Treasury is striving for."<sup>27</sup>

#### Purpose of Study

In order to compare the complexity that arises under current law with the complexity that would be introduced if a full form of indexation were provided for all capital gains and losses, a quasi-experimental research study was conducted.

---

<sup>26</sup>U.S. Department of the Treasury, Tax Reform for Fairness, Simplicity, and Economic Growth, Vol. 1, pp. 3-11.

<sup>27</sup>Ira Shapiro is a Washington-based partner and national director of tax policy for Coopers & Lybrand. He is quoted from Coopers & Lybrand, Executive Alert Newsletter, December 1984/ January 1985, p. 7.

The objective of the study was to examine the complexity that indexation of the tax base (in respect to capital gains and losses) creates in tax computations by comparing two alternative tax treatments. The existing law was compared with an indexation method, similar to the one presented in the Treasury Proposal.

#### Methodology of Study

A quasi-experimental research design<sup>28</sup> was used. Use of a true experimental research design<sup>29</sup> was not possible for a variety of reasons. A random sample of all taxpayers could not be obtained. Taxpayers must file returns under the existing law. (They could not compute their tax using an indexation method or any other alternative method.) Most significantly, taxpayers are extremely hesitant to divulge actual personal financial or tax information to researchers. A quasi-experimental research design was a feasible approach in achieving cooperation of subjects.

#### Overview

Each subject was asked to make a series of computations under current law and under an indexation method. The time

---

<sup>28</sup>James E. Mauch and John W. Birch, Guide to the Successful Thesis and Dissertation (New York: Marcel Dekker, Inc., 1983), p. 72.

<sup>29</sup>Ibid., p. 71.

required for the computations and the errors made by the subjects provided a measure of the relative complexity of the two treatments.

### Development of Test Instruments

#### Design

Test instruments [a statement of the facts (transactions) for an individual taxpayer, instructions for computations under the current law, and instructions for computations under indexation] were developed. The facts included capital gains and losses arising from transactions common to individual taxpayers.

#### Evaluation

After development of the test instruments, input was requested from tax experts in order to provide:

(1) an evaluation of the statement of facts relating to the taxpayer to determine if the facts were (a) stated in a clear and unambiguous manner and (b) represented transactions common to individual taxpayers and

(2) an evaluation of instructions for computation under current law and under indexation to determine that they were clear.

### Pilot Study

Following evaluation of test instruments by the tax experts, a pilot test was conducted using a small group of individual taxpayers. The pilot study results were evaluated to determine if corrections or modifications were needed in any of the test instruments.

### The Simulation

A sample group of 142 taxpayers from varied backgrounds and occupations was obtained. Demographic information was collected from the subjects. A goodness-of-fit test was used to determine how closely the sample resembled the general population.

The sample was divided into smaller groups (due to the physical limitations at the test location) for the purpose of conducting the complexity simulation. The test was carefully explained and test instruments were given to the participants. Half of the subjects completed the test instruments under existing law first and then completed the test instruments under indexation. The other half did indexation first, then current law. The time taken to complete the test instruments and the error rate were measured.

### Analysis of Results

The test results were analyzed and evaluated using the

Time/Error Complexity Index and the Wilcoxon ranked-sum test.<sup>30</sup> The Time/Error Complexity Index is derived from the Fisher "ideal" index.<sup>31</sup> The Wilcoxon ranked-sum test, a non-parametric test, is uniquely suited to the analysis of matched-pair data.

### Limitations

#### Capital Gains and Losses

This study dealt with taxation of the gain or loss on the disposition of capital assets. It did not deal with income (i.e., interest, rents, and dividends) produced during the time the asset was held. Neither did it deal with the allocation of the cost of an asset over the life of the asset (depreciation, cost recovery, amortization, or depletion); nor did it deal with inventories even though many complexities and inequities exist there as well.

#### Individual Taxpayers

The test subjects were all individuals. A number of complexities exist for corporate and fiduciary taxpayers and

---

<sup>30</sup>John Neter, William Wasserman, and G. A. Whitman, Applied Statistics (Boston: Allyn and Bacon, Inc., 1978), pp. 379-382.

<sup>31</sup>Frederick E. Croxton and Dudley J. Cowder, Applied General Statistics, 2nd ed., (Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1960), pp. 427-428.

for partnerships. These entities are likely to be more sophisticated in tax matters than the individual taxpayer and results of this study cannot be generalized to these entities.

#### Appropriate Index

Many concerns have been articulated concerning the proper index to be used for tax base adjustment computations. There are three available major general inflation indexes. These include the Wholesale Price Index, the Consumer Price Index, and the Gross National Product Implicit Price Deflator. The Wholesale Price Index is based on prices of commodities and does not include services. Also, it reflects bulk sales rather than retail sales. Since it covers such a small part of the economy, the Wholesale Price Index may not accurately reflect the dollar value needed for the implementation of indexation.

The Consumer Price Index measures the goods and services consumed by urban wage earners. Therefore, it may or may not reflect consumption patterns of other members of the economy.

The Gross National Product Implicit Price Deflator is the broadest inflation index and it includes everything which is a part of the Gross National Product. Its major defect is that it includes government expenditures and investment expenditures. Government expenditures are not a direct cost to persons in the society. The change in value of investments con-

tain a measure of risk or uncertainty that may not be the result of inflation.

Although none of the indexes are totally appropriate, Waggoner concluded that the Consumer Price Index or that portion of the Gross National Product Implicit Price Deflator attributable to personal consumption expenditures should be used for implementation of indexation.<sup>32</sup> Friedman supported only the use of the Gross National Product Implicit Price Deflator because of its broad base and because it is the index proposed by the Financial Accounting Standards Board for use in making general price level adjusted statements.<sup>33</sup> The AICPA recommends the use of the Consumer Price Index.<sup>34</sup> The Consumer Price Index was used in this study. In any case, the particular index used should not affect the complexity of the computations.

#### Averaging Provisions

There have been proposals for reform that have recommended revising income averaging as a partial solution to the

---

<sup>32</sup>Waggoner, "Eliminating the Capital Gains Preference. Part I." p. 356.

<sup>33</sup>Charles S. Friedman, "The Adverse Consequences of the United States Tax Structure During Inflationary Times," Journal of Contemporary Business 10 (1981), p. 79.

<sup>34</sup>AICPA, Statement of Tax Policy No. 9: Implementing Indexation of the Tax Laws (New York: 1981), p. 7.

bunching problem. This study did not address the income averaging provisions.

### Realization

An accretion concept, as opposed to a realization concept, has been suggested as an additional refinement. Under an accretion concept, gains would be taxed as they accrue rather than at the time of the disposition of the asset. This study utilized the realization concept.

### Organization of Study

A review of the complexity and indexation literature, as related to capital gains provisions, is included in Chapter 2. Chapter 3 describes the research methodology in detail. Chapter 4 analyzes the results of the complexity study using the Time/Error Complexity Index and the Wilcoxon ranked-sum test. The final chapter includes a summary of the study and conclusions.



## CHAPTER 2

### REVIEW OF THE LITERATURE

The review of the literature examines the areas of complexity and indexation proposals for reform as related to the capital gain and loss provisions.

Complexity in taxation impacts on individuals in several different ways. Complex tax laws result in high taxpayer compliance costs. Compliance costs include the time spent in preparing returns, as well as costs incurred in obtaining information to file an accurate return. In 1976, over \$700 million was paid by individuals for assistance in tax return preparation. Browning and Browning attributed the fact that more than half of all taxpayers sought out professional assistance in 1976 to complexity in tax laws.<sup>35</sup>

Tax evasion, which results in taxpayers paying less than their fair share, has been discussed by researchers. In 1984, Milliron completed a project which addresses the issue of whether tax complexity influences an individual's tax reporting position. In the four tax cases used in her study, she concluded that complexity significantly affected taxpayer

---

<sup>35</sup>Edgar K. Browning and Jacqueline M. Browning, Public Finance and the Price System (New York: Macmillan Publishing Co., Inc., 1979), p. 346.

choice of an aggressive reporting position. Choosing an aggressive reporting position was interpreted by Milliron as a propensity towards tax evasion.<sup>36</sup> Tax evasion results in lost government revenues; thus, a greater tax load is borne by taxpayers who do not evade.

#### Studies in Tax Complexity

Previous research in the area of tax complexity is limited. The authors of four studies have each approached the subject in a different way.

#### Schroeder

Schroeder explored the issue of tax complexity by examining basic sources of tax law. His stated objective was to determine the extent to which capital gain and loss provisions complicated governmental administration of income tax laws and taxpayer compliance with these laws.<sup>37</sup>

Schroeder divided tax complexity into three categories: (1) complexity arising from a vast and intricate economic system, (2) complexity arising from the revenue raising func-

---

<sup>36</sup>Valerie C. Milliron, "Taxpayer Perceptions of Complexity and the Effect of Complexity on Reporting Positions" (Ph.D. dissertation, University of Southern California, 1984), p. 131.

<sup>37</sup>Schroeder, "Potential Simplification of the Federal Income Tax Law."

tion of an income tax, and (3) complexity resulting from provisions (grafted onto the basic structure of the income tax) which bear no relation to the basic structure and which are not a necessary part of its operation. He determined that there was little hope for simplification in the first two categories; however, the third category was an area for potential simplification. In this category, he included the provisions relating to capital gain and loss.

Basic sources of tax law examined by Schroeder were the Internal Revenue Code, Revenue Rulings, and court cases. Schroeder examined Sections 1 through 1399, that portion of the code which pertains to income taxation. The Revenue Rulings and court cases reviewed covered the ten-year period from 1964 through 1973. The decisions of the U.S. Tax Court, District Courts, Court of Claims, Court of Appeals, and Supreme Court involved issues pertaining to sections 1 through 1399 of the code. All code sections and decisions of the Court of Claims and Supreme Court were examined. Revenue Rulings and decisions of the District Courts, Tax Court, and Court of Appeals were reviewed on a random sample basis.

Each of the basic tax sources (code sections, Revenue Rulings, and court cases) was classified into one of three categories:

1. Totally eliminated if there were no special treatment of capital gains or losses.
2. Somewhat affected if there were no special treatment of capital gains or losses.
3. Completely unaffected if there were no special treatment of capital gains or losses.

Schroeder concluded that over 40 percent of the code sections, 11 percent of Revenue Rulings, and 27 percent of court decisions were directly or indirectly affected by the capital gain or loss provisions. He recommended that special provisions for capital gains and losses be eliminated and more liberal averaging provisions be adopted.

Schroeder defined complexity as "the complex technical structure of the federal income tax."<sup>38</sup> His approach to analysis of tax complexity reflected his concern with the basic sources of the law.

#### Karlinsky

Another attempt to measure tax complexity was made by Karlinsky.<sup>39</sup> His hypothesis was that the capital gain and loss preference adds severe complexity to the income tax law.

Karlinsky divided complexity attributable to the capital gain and loss preference into five more or less distinct areas.

---

<sup>38</sup>Ibid., p. 48.

<sup>39</sup>Karlinsky, "Complexity in the Federal Income Tax Law."

These areas included:

1. Holding period.
2. Definition of a capital asset.
3. Sale or exchange of a capital asset.
4. Conversion of ordinary income into capital gain income.
5. Conversion of capital loss into ordinary loss.

Although he discussed the complexity caused by these five separate causes, the study did not relate the causes to his measure of complexity. Instead, content analysis was used to measure the complexity of all capital gain and loss provisions found in the code sections and regulations.

Content analysis is an education, psychology, and behavioral science technique. Karlinsky felt the technique to be appropriate for use in measuring the complexity of the capital gain or loss preference concept. He applied content analysis in a two-step process. First, a weighting of each code section's total complexity was determined by counting the number of paragraphs in the code section and underlying regulations. Each of the 584 code sections and the related regulations were analyzed by paragraph to determine which paragraphs were affected by capital gain and loss provisions. The number of affected paragraphs were compared to the total paragraphs in each code section and underlying regulations to determine the

relative complexity pertaining to the capital gain and loss provisions for the code section.

Karlinsky found that special treatment of capital gains and losses contributed to over 15 percent of the tax law's complexity; and that ". . .383 out of 584 (65%) income tax code and regulation sections are affected in some small or large way by the capital gain and loss preference."<sup>40</sup> He concluded that the capital gain and loss preference created a disproportionately large amount of complexity in the income tax law.

Although Karlinsky did not provide a definition of tax complexity, his content analysis appears to indicate that he was focusing on the law itself as a source of complexity.

### Milliron

In 1984, Milliron completed a two-part study which focused on taxpayers' perceptions of tax complexity.<sup>41</sup> The general objective of the first phase was to define complexity as perceived by the taxpayer. The second phase tested whether taxpayers' perceptions of complexity had a significant effect on the taxpayers' reporting positions.

According to Milliron, tax complexity has never been rigorously defined in the literature. In order to arrive at an

---

<sup>40</sup>Ibid., p. 52.

<sup>41</sup>Milliron, "Taxpayer Perceptions of Complexity."

operational definition, she attempted to elicit taxpayers' impressions of the concept. Thirty taxpayers, randomly selected from those awaiting jury duty at the Los Angeles County Courthouse, were the subjects of testing in phase one. Each subject was asked to read thirteen tax topic scenarios. The topics included child care, capital gains, gifts and awards, interest deductions, and entertainment expenses, as well as others. The subjects were requested to evaluate each scenario in terms of each of the following criteria: technical, fair, an area susceptible to cheating, familiar, abusive, personally beneficial, or a changing area of the law.

Milliron employed multidimensional scaling methodology in phase one of the study. She identified four distinct complexity dimensions. The first dimension was: personal versus financial. The subjects perceived increasing complexity when moving from personal topics (i.e., child care) to financial topics (i.e., interest and capital gains).

The second dimension identified by Milliron was quantitiveness. In this dimension, taxpayers perceived complexity as related to the amount of computations required and the degree of change in the law. Few computations and little change were perceived to have a low level of complexity.

Dimension three was the social justice dimension. Taxpayers perceived that tax topics which were subject to

widespread abuse and difficult to enforce were more complex than topics thought to be fair and personally beneficial.

The fourth dimension was labeled as the readability dimension. Unfamiliar, changing, and technical scenarios were perceived as the most complex by the subjects; whereas familiar, unchanging, and less technical scenarios were felt to be less complex.

Of particular interest to the present study are the subjects' perceptions of the capital gains provisions. Milliron composed the capital gains scenario as follows:

The name of the tax game in the United States is capital gains. Section 1202 authorized individuals to claim a special deduction equal to 60 percent of the net capital gain realized in a year. This special deduction is the equivalent of a 60 percent tax deduction. If, in 1983, an individual had only net capital gain income from stocks and bonds, then the real effective tax rate for the taxpayer would range from 4.4 to 20 percent rather than the normal rate range of 11 to 50 percent which applies to salaries, wages, interest, and dividend income.<sup>42</sup>

In dimension one, the capital gains scenario and the nonrecognition of gains scenario were ranked as the most complex of the financial topics. Taxpayers perceived capital gains as highly complex. In dimension two, quantitiveness,

---

<sup>42</sup>Ibid., p. 147.



capital gains was rated as more complex than eight, but less complex than four of the scenarios. In social justice, the third dimension, the capital gains scenario ranked very low. Only entertainment costs ranked lower. Thus, taxpayers perceived capital gains as highly complex in this dimension. In the fourth dimension, capital gains rated about average in readability. Thus, in two out of the four complexity dimensions, the capital gains scenario was rated as highly complex. In one dimension, capital gains was perceived as moderately complex; and, in one dimension, capital gains was of average complexity.

In phase two of the study, Milliron used the results of phase one to test the influence of complexity on taxpayer reporting positions. Using four distinct tax cases, she concluded that in each case complexity had a significant effect in increasing aggressive reporting positions of the subjects. According to Milliron, the second phase of the study indicated a link between complexity and tax evasion.

This is the only study located which attempts to measure taxpayer perceptions of tax complexity. The capital gains tax scenario prepared by Milliron appears to be perceived by the subjects as moderately to highly complex.

Long/Swingen

Long and Swingen contacted tax professionals in an attempt to determine tax professionals' perceptions of federal income tax complexity.<sup>43</sup> They surveyed tax accountants, attorneys, tax educators, and employees of commercial tax preparation services.

In a preliminary presentation of results, the researchers stated that for middle income wage-earner returns (\$25,000 to \$50,000 gross income) capital gain and loss provisions were perceived by professionals as the most complex item out of the forty line items included in the survey.

Complexity Research Summary

Research in the tax complexity area is limited and the approach of the researchers is quite varied. The law itself was examined by Schroeder and Karlinsky, the perceptions of taxpayers were analyzed by Milliron, and the perceptions of tax professionals were assessed by Long and Swingen. The findings and conclusions of the various authors indicated substantial complexity in the capital gain and loss provisions of the federal income tax law.

---

<sup>43</sup>Susan B. Long and Judyth A. Swingen, "Tax Professionals' Perceptions of Federal Income Tax Complexity: Some Preliminary Findings," paper presented at the Northeast Regional Meeting of the American Accounting Association, April, 1985.

## Indexation Proposals for Reform

### Waggoner

In 1977, Waggoner discussed the problems of bunching, lock-in, and inflation and suggested elimination of the capital gains provisions. Waggoner proposed indexation of the asset cost to alleviate the problems created by inflation with respect to the taxation of capital gains and losses.<sup>44</sup> He recognized that over short periods of time too little inflation may occur to justify the expense of indexing and suggested that it might be advisable to make inflation corrections only for periods in which a minimum amount of inflation occurs, 3 percent for example.

For inflation correction, Waggoner suggested the use of either the Consumer Price Index or that portion of the Gross National Product Implicit Price Deflator attributable to personal consumption expenditures. He indicated that good indexes to adjust for inflation have been available since the 1940's and that it should be administratively feasible to apply indexation to property acquired as early as the 1940's.

### Feldstein/Slemrod

In their study, published in 1978, Feldstein and Slemrod

---

<sup>44</sup>Waggoner, "Eliminating the Capital Gains Preference, Part I."

concluded that the distorting effect of inflation on the taxation of capital gains should be remedied by adjusting the original cost of assets for the rise in the general price level.<sup>45</sup> They suggested use of the Consumer Price Index for the inflation correction.

The data used in their study was from the Internal Revenue Service sample of tax returns, extended in 1973 to include detailed information of capital asset transactions.<sup>46</sup> The specific sample included information for 30,063 individuals who completed 234,974 stock sales in 1973. For each stock transaction, the authors calculated a price-indexed capital gain by multiplying the acquisition cost of the stock by a ratio of the Consumer Price Index for 1973 divided by the index for the year of acquisition. The price-indexed capital gain was compared to the nominal reported capital gain or loss and the computed tax liability on the real gain was compared to the tax liability on the nominal gain.

It was concluded that the taxation of capital gains is grossly distorted by inflation. The tax paid on the sales of

---

<sup>45</sup>Martin Feldstein and Joel Slemrod, "Inflation and the Excess Taxation of Capital Gains on Corporate Stock," National Tax Journal 31 (June 1978), pp. 107-118.

<sup>46</sup>U.S. Department of the Treasury, Statistics of Income--1973, Sales of Capital Assets (Washington, D.C.: Government Printing Office, 1980).

stock was \$1,138 million, but the computed liability on real capital gains was only \$661 million. Feldstein and Slemrod argued:

The mismeasurement of capital gains does more than raise the effective tax rate on real capital gains. It also introduces an arbitrary randomness in taxing of capital gains. Two individuals with the same real capital gain can pay tax on very different nominal gains.<sup>47</sup>

Combining a 50 percent maximum income tax rate with a 60 percent long-term capital gain deduction results in a maximum 20 percent effective rate on nominal capital gains. Feldstein and Slemrod pointed out that if the real growth rate in stock share prices is 2 percent a year and the inflation rate is 6 percent a year, the tax rate on real capital gains may be as high as 80 percent. If the inflation rate is 8 percent, the tax rate on real capital gains may be as high as 100 percent.

#### AICPA

In 1981, the Federal Taxation Division of the American Institute of Certified Public Accountants issued a statement on tax policy relating to indexation of the tax laws.<sup>48</sup> The taxation division specifically recommended that the basis of assets

---

<sup>47</sup>Feldstein and Slemrod, "Inflation and the Excess Taxation of Capital Gains," p. 110.

<sup>48</sup>AICPA, Statement on Tax Policy No. 9: Implementing Indexation of the Tax Laws.

be indexed in order to correct for the problem of inflation.

The additional complexity that would be introduced if indexation should be adopted was discussed in the statement on tax policy. With regard to complexity created by indexing the following statement was made:

We are convinced that the complexity of indexing basis is usually overstated. It would not be difficult to have the adjusted basis of assets multiplied by an inflation factor. The newly calculated indexed basis would be used for determining gain or loss on disposition, as well as for calculating depreciation. The use of an indexed basis would result in the calculation of gain or loss on the sale of assets that would be consistent with the underlying economic effect.<sup>49</sup>

The taxation division recommended that one readily accepted index be consistently used for the inflation corrections and the selected index be continually monitored and adjusted to reflect changes in the economy. It was stated that the Consumer Price Index is recognized by the general public as the official government indicator of inflation. Although it has some imperfections, the Consumer Price Index appears to be the most acceptable index available.

#### AAA Federal Tax Committee

The 1983-84 Federal Tax Committee of the American Accounting Association issued the report, Indexing the Tax Law

---

<sup>49</sup>Ibid., p. 13.

to Adjust for Inflation.<sup>50</sup> In a comprehensive discussion, the committee explored many of the issues surrounding indexation.

One of the issues examined was the complexity of indexation and potential lack of understanding of indexation by taxpayers. The committee wrote:

Rate structure indexation, as now contained in the tax law [beginning with 1985], should not be complex, especially since only the tax brackets, the zero bracket amount and the deduction for personal and dependency exemptions are indexed. As more items are indexed and/or the tax base is indexed, the system is likely to become more complex.<sup>51</sup>

Although concerned with the complexity inherent in indexation of the tax base, the committee recommended, ". . . serious consideration should be given to the long-run use of tax base indexation."<sup>52</sup> The committee felt that the most persuasive argument for indexing the tax law was the lack of equity associated with a system that does not adjust for inflation. No specific recommendations were made as to the appropriate index to be used for inflation corrections.

---

<sup>50</sup>AAA, Indexing the Tax law to Adjust for Inflation (Sarasota, Florida: 1984).

<sup>51</sup>Ibid., p. 28.

<sup>52</sup>Ibid., pp. 53-54.

### Treasury Proposal

A number of tax reform proposals have been introduced in Congress. Some of the proposals include indexation of the basis of capital assets and some do not. In 1984, the Treasury Department presented to President Reagan a proposal which is probably the most comprehensive proposal made in recent years.<sup>53</sup>

According to the Treasury Proposal:

The present U.S. income tax is complex, it is inequitable, and it interferes with economic choices of households and businesses. It is also widely perceived to be unfair. Because this perception undermines taxpayer morale, it may be as important as the actual defects of the system.<sup>54</sup>

The Treasury outlines 14 specific goals of fundamental tax reform. These goals include revenue neutrality, simplicity, perceived fairness, an inflation-proof tax law, and fairness across income classes.

The Treasury Proposal recommends a wide range of reforms to the present income tax system. Tax base indexation of capital assets sold or otherwise disposed of is recommended as a

---

<sup>53</sup>U.S. Department of the Treasury, Tax Reform for Fairness, Simplicity, and Economic Growth.

<sup>54</sup>Ibid., p. iii.



solution to the complexity and inequity of the present capital gains provisions. A summary of the Treasury Proposal relating to the capital gain and loss provisions is presented in the following paragraphs.<sup>55</sup>

The preferential tax rate for long-term capital gains would be repealed. Gains and losses from sales of property would no longer be classified as either capital gains and losses or ordinary gains and losses. Thus, net capital gain, as defined under current law, would be fully includable in taxable income and subject to tax at regular rates.

Inflation adjustment for realized gains from sales or other dispositions of property would be made by use of adjustment factor tables based on the Consumer Price Index. January 1, 1965 is given as the starting date for inflation adjustment, with all assets acquired prior to that date indexed as if obtained on January 1, 1965.

Losses from sales of investment property would remain subject to limitations. In general, investment property is defined as all nonpersonal use property other than (1) property used in a trade or business; (2) inventory property and property held primarily for sale to customers in the ordinary course of business; (3) a general partnership interest; or (4) an interest in an S corporation in which the holder actively

---

<sup>55</sup>Ibid., Vol. 1, pp. 97-120; Vol. 2, pp. 178-188.

participates in management of the entity. Losses from the sales of investment property would offset gains from such property, with any excess loss deductible up to a maximum of \$3,000 in each taxable year. Investment property losses in excess of this limitation could be carried forward indefinitely.

Taxing all income as ordinary would permit repeal of Section 1245 and Section 1250 recapture provisions for depreciable property acquired after the proposals became fully effective.

The Treasury contends that repealing the preferential capital gains deduction and the depreciation recapture provisions and taxing all inflation-adjusted income at uniform tax rates would eliminate a source of substantial complexity in current law.

#### Political Considerations in Taxation

The political considerations in taxation cannot be ignored. With indexation, the automatic increases in tax receipts due to inflation would not occur and it would be necessary for Congress to specifically propose a tax increase in order to obtain additional funds. Those in favor of indexation view it as a move toward political accountability. Opponents of indexation point out that it would result in a loss of Congressional flexibility.

Taxation is a political process and it is subject to pressures from all areas of the U.S. economy. Wall Street brokers and many investors are enthusiastic in their support of the six-month holding period and long-term capital gain deduction.<sup>56</sup> Tax base indexation benefits long-term holders of capital assets rather than short-term traders. However, as Waggoner argued in 1977:

Having a sword with two edges-- eliminating the preferential taxation of capital gains but allowing a correction for inflation-- is also politically advantageous, because it may divide those now benefiting from capital gains, a formidable opponent of the preference's elimination. While those with substantial gains over relatively short periods will be disadvantaged by these coupled reforms, those whose gains are proportionately smaller or whose holding periods are relatively longer may gain more from the inflation correction than they lose by eliminating capital gains.<sup>57</sup>

Regardless of all the arguments for and against indexation, undoubtedly many politicians would prefer to periodically support a tax rate cut that lessens the impact of inflation. Implementation of structural indexation for 1985 reduces the

---

<sup>56</sup> Paul Blustein and Jeffrey H. Birnbaum, "Treasury Wants Special Tax Break for Some Investors," Wall Street Journal, March 20, 1985, p. 54; and "Top Capital-Gains Rate Is Put at 17.5 Percent in White House Tax-Overhaul Package," Wall Street Journal, May 15, 1985, p. 50.

<sup>57</sup> Waggoner, "Eliminating the Capital Gains Preference. Part I," p. 357.

opportunity for frequent "tax cuts" by Congress. Adoption of tax base indexation would further reduce Congressional flexibility in this area.

#### Economists' Studies

Many economists have thoroughly examined and discussed the issues involved in the preferential tax treatment of capital gains. Some of these issues (bunching, inflation and mobility of capital) were discussed in detail in Chapter 1. Typical of the many studies made by economists is David's 1968 publication, Alternative Approaches to Capital Gains Taxation. This book was the outgrowth of The Brookings Institution's 1966 capital gains taxation conference of lawyers, economists and investment counselors. David listed the following beneficial and adverse effects of the then present tax structure as it pertained to the taxation of capital gains:

1. A reallocation of investment to areas favored by the special situations and treatment of owner-managed enterprises.
2. An increase in investor savings in preferentially taxed areas that is associated with two offsetting movements--a decline in saving for bequests and an increase in saving associated with increased yields available on appreciating assets.
3. A decline in aggregate risk-taking associated with the income effect of reduced taxation of income from investments and more limited loss offsets.

4. A decrease in lifetime turnover of assets associated with increased incentives to defer realization.<sup>58</sup>

In his summary of the 1966 conference, David reported that the conferees could not agree on the probable impact of the capital gains tax structure on investment and economic growth.

#### Summary

The review of the literature has examined the areas of complexity and indexation proposals for reform as related to the capital gain and loss provisions. Although the research approaches to tax complexity are limited and quite varied, authors provided evidence as to the complexity inherent in existing capital gains provisions. The American Institute of Certified Public Accountants' Federal Taxation Division, the American Accounting Association's Federal Tax Committee, the Treasury Department and some authors support indexation of the tax base as a solution to the distortion caused by inflation. However, some authors reported that indexation added complications.<sup>59</sup> In the remaining chapters, complexity that would be introduced by the adoption of indexation is examined.

---

<sup>58</sup>David, *Alternative Approaches to Capital Gains Taxation*, p. 564.

<sup>59</sup>See, for instance, Laurie McGinley, "Indexing Proposals in Treasury's Plan Will Add Complications for Taxpayers," Wall Street Journal, December 3, 1984, p. 2.

## CHAPTER 3

### METHODOLOGY

This chapter describes the methodology of the complexity study. Since complexity has been defined in a variety of ways by researchers, the definition of tax complexity is considered first; the test design and data gathering phase is explained in the intermediate section; and the methodology used to analyze results of the complexity test is discussed in the final section.

#### Tax Complexity

Tax complexity has been defined by different tax researchers in various ways. As discussed in Chapter 2, two previous studies have dealt with perceptions of complexity (taxpayers' as well as tax professionals'). Other researchers analyzed the basic sources of tax law to determine complexity created by capital gain and loss provisions.

The present study differs from earlier ones in that it measures tax complexity as experienced by the taxpayer. Complexity experienced by a taxpayer is defined as a function of the errors made on a tax return and the time required to complete the return. A taxpayer faced with the task of

completing a tax return may make a variety of different errors. These errors range from those which are the result of a lack of understanding of a complex law to errors which are simply the result of mathematical mistakes. The time to complete the return will vary for each taxpayer depending on his tax sophistication and the complexity of the law. The number of errors made could be used as a measure of complexity, or the length of time required could be used as measure of complexity; however, combining the two alternatives provides an even better measure.

A combination of errors made by a taxpayer and time taken by a taxpayer in completing a tax return is a dimension of tax complexity not previously explored by other researchers. The way in which a taxpayer deals with complex laws, forms, and instructions is at the root of his perceptions of tax complexity. The confusion experienced by taxpayers results in the filing of many error-filled tax returns.<sup>60</sup> These are added complexities for the Internal Revenue Service.

#### Data Gathering

In order to examine time and errors as a dimension of tax complexity, a quasi-experimental research study was con-

---

<sup>60</sup>The Treasury Department estimates that 90 percent of taxpayers who itemize their deductions make at least one error in claiming their deductions. Tax Reform for Fairness, Simplicity, and Economic Growth, p. 16.

ducted. The data gathering phase is described in this section.

To compare the complexity which arises under current law with the complexity which would be introduced if all capital asset transactions were indexed, four decision frames were examined. Each frame consisted of a description of the pertinent law and a set of facts for the taxpayer. The taxpayer was required to make appropriate computations and decisions using the facts and referring to the law. Each frame included two sub-sets, the current method and the indexation method. The test instruments for these decision frames were introduced to the 142 taxpayers in a controlled environment. The completed test instruments were then evaluated to arrive at a time score and an error score for each participant. Steps followed in the data gathering phase are discussed in detail below.

#### Development of the Test Instruments

The object of the test instruments was to provide the subjects with the task of applying two different taxation methods to the same set of facts. The manner in which they completed each task provided the opportunity for the researcher to evaluate the performance of the subjects.

#### Design

Originally, it was anticipated that the best test



instrument would be one where the set of facts would include a number of capital gains and losses common to individual taxpayers, such as sale of land, securities sales, and dispositions of depreciable property. The subjects would have computed the amount of capital gain or loss to be included in adjusted gross income. The subjects would have chosen the necessary form or forms from those provided.

However, as an attempt was made to put together such a test, it became apparent that evaluation of errors under such a format would be extremely subjective. For instance, under the existing method, the carry-forward error of a participant incorrectly choosing all short-term and no long-term for the capital asset transactions would have resulted in it never being necessary for him to compute the 60 percent long-term capital gain deduction. Under indexation, if the subject had been unable to use the adjustment factor table, he could not have attempted to complete the forms.

Because of the difficulty and subjectivity in error evaluation with a complex tax problem, a series of smaller problems were developed. Initially, six decision frames were developed for the subjects. Each decision frame included the same set of facts for both the present and the indexing methods, with the instructions and the forms for computations varying based on the method. Because of the length of time

taken by the participants in the pilot test, it was determined that completion of the calculations for six decision frames might be lengthy for the test subjects in the time allotted. Therefore, the six decision frames were reduced to four. The four decision frames used in the complexity test are summarized in Table 1. In addition, Table 1 includes a reference to the page number in Appendix A where the complete forms and instructions appear.

Decision Frame 1. The parallel forms for Decision Frame 1 were designed to include the first decision a taxpayer would have to make when attempting to complete either a Schedule D under the present method or a comparable schedule for the indexation method. The acquisition date and date of sale were provided to the test subjects.

Under the present method, the instructions for determining short-term and long-term holding periods were provided in accordance with current law. The subjects were asked to make a holding-period decision for four capital asset transactions by checking the correct box marked "S/T" or "L/T" for each transaction. Since there were only two choices, the subjects had a 50 percent chance of achieving the correct answer for a transaction even if they failed to correctly interpret the instructions.

TABLE 1  
DECISION FRAMES

	Present Method	Indexation Method
Frame 1	Form PH - Determination of a long-term or a short-term holding period (p. 95).	Form NF - Selection from a table of a cost adjustment factor to index the asset (p. 102).
Frame 2	Form PD1 - Calculation of short-term loss and long-term gain and application of 60% long-term capital gain deduction (p. 98).	Form ND1 - Adjustment to cost of two capital assets, and combination of the resulting gain and loss (p. 104).
Frame 3	Form PD2 - Calculation of short-term and long-term loss and application of capital loss limitations (p. 99).	Form ND2 - Adjustment to cost of two capital assets, combination of the losses, and application of capital loss limitations (p. 105).
Frame 4	Form P4797 - Calculation of gains on sale of residential rental property and business equipment, including depreciation recapture (p. 101).	Form N4797 - Calculation of gains on sale of residential rental property and business equipment (p. 107).

For the indexation method, a parallel test was designated as the selection of cost adjustment factors from a table of such factors based on the date of acquisition and the date of sale. These factors were used to adjust (index) the basis of the asset before determining the gain or loss on sale under indexation. A published table of adjustment factors is presently unavailable. The table of adjustment factors constructed appears as a part of Form NF in Appendix A.

In retrospect, a different approach to constructing the table might have been taken. The table includes four calendar quarters for the sale year (indicated as "Quarter Sold" on the table), as well as quarters for the year of acquisition. Since the acquisition of the assets occurred during a two-year period, eight calendar quarters were included in the table for "Quarter Purchased." The tax experts and pilot study did not reveal any particular problems in understanding the table. However, some of the subjects, interviewed following the test simulation, indicated that they had difficulty in differentiating between the "sold" and "purchased" sides of the table. They felt if the table had included more years under "purchased" and these years had been separated with bold lines (similar to the type-set tax tables provided for Form 1040), the table would have been easier to use.

Under the indexation method, the subjects selected the

correct adjustment factor from 32 factors provided in the table and recorded the factor in the space provided by each of the four asset transactions. There was only a one in 32 chance of guessing correctly. The possibility of a correct guess under the present method was one in two. Therefore, any bias in Decision Frame 1 created by guessing was in favor of the present method.

Decision Frame 2. In Frame 2, the subjects were asked to calculate the amount of capital gain or loss to be included in adjusted gross income. The cost and sales price for each asset sold were pre-recorded in the appropriate space on the forms. The holding-period decision, therefore, was made for the subjects under the present method. Under the indexation method, the cost and sales price for each asset and the adjustment factor were pre-entered on the form. Thus, the subjects were not retested on the material that had previously been introduced in Decision Frame 1.

The present method form, PD1, is a modified Schedule D used under current law. The information provided resulted in a short-term loss and long-term gain if the subjects made the correct calculations. The short-term loss and long-term gain resulted in a net long-term gain subject to application of the 60 percent long-term capital gain deduction in order to arrive at the correct amount to be included in adjusted gross income.

The parallel form for the proposed method, ND1, is similar to the modified Schedule D, but it was adjusted to allow for the different calculations required under indexation. The sales price, cost, and the cost adjustment factor were pre-recorded on the form. The subjects were instructed to multiply the cost times the adjustment factor to arrive at adjusted cost and to use adjusted cost in calculating the gain or loss. The correct calculations and combination of the resulting gain and loss led to the net gain to be included in adjusted gross income.

Decision Frame 3. The forms used for computations in the third decision frame are similar to those used in the second frame. Cost, sales price, holding-period, and cost adjustment factors were provided to the subjects as described above. However, different amounts were used so as to avoid the subjects' confusing the Decision Frame 3 calculations with previous Frame 2 calculations.

Under the current method, the correct computations led to a short-term loss and a long-term loss. The deductible loss was limited by the capital loss limitation provisions.

The calculation of adjusted cost was again required under the indexation method. The proper treatment of sales price and adjusted cost resulted in two losses which were to be combined into a net loss. This net loss was limited by capital

loss provisions, as under the present method.

Decision Frame 4. The sale of business property and equipment were addressed in the fourth decision frame. Due to Section 1245 and Section 1250 depreciation recapture requirements, the sale of depreciable property is generally agreed to be one of the most complex areas of tax law. The form used for the present method, P4797, is a modified Schedule 4797, currently used by sellers of business property. The indexation method form, N4797, is somewhat similar, but modified further to incorporate indexation requirements.

The greatest difficulty in designing this decision frame was the explanation of the law relevant to the sale of depreciable business property. The explanation needed to be understandable by the average individual taxpayer, but detailed enough to provide the information necessary to complete the calculations. In order to simplify the preparation of the forms for both methods, complete calculations were provided to the subjects. Totals and subtotals were provided in the same format as the specific information requested on the forms. For both methods, the subjects were asked to make computations for the sale of residential rental property subject to depreciation and the sale of a forklift subject to depreciation.

Under the present method, the subjects were required to differentiate between Section 1250 property (the residential

rental property) and Section 1245 property (the forklift). For each asset, information as to cost, sales price, depreciation allowed, adjusted basis, and gain on sale was provided. Since the 1250 property had been depreciated by an accelerated method, information as to both accelerated and straight line depreciation was provided. The subjects needed to transfer the detailed information to the form and to complete the calculations. They followed instructions to arrive at the correct ordinary income and long-term capital gain amounts.

Under the indexation method, a brief explanation of indexation was given. Additionally, details of sales price, unrecovered adjusted cost at date of sale, and gain on sale were given for the residential rental property and forklift. It was not necessary for the subjects to differentiate between 1245 and 1250 property because depreciation recapture provisions would be eliminated under indexation. The subjects entered the information on the form and completed calculations, following instructions to arrive at a total gain.

Other Considerations. There were many different transactions that could have been included in the decision frames. Others that were considered were the sale of a personal residence, casualty losses, and a nonbusiness bad debt loss. It was determined that the four decision frames actually employed encompass capital asset transactions common to an individual



taxpayer. Because of time limitations, it was necessary to limit the test instruments to be completed by the subjects and other transactions were not included.

In order to determine the amount of time used by the subjects for completion of each form, an instruction "Record time \_\_\_\_\_" was placed at the bottom of each form. The forms were sorted into indexation method sets and present method sets so that the subjects could complete all decision frames first under one method and then under the other method. Because participants were not required to switch back and forth from one method to another, their confusion was minimized.

#### Tax Experts' Evaluation

After the forms and instructions were developed, as described above, they were submitted to six experts in tax and/or forms design for evaluation. These experts included:

1. An attorney, CPA, specializing in tax services.
2. An industrial engineer with expertise in forms design.
3. A CPA specializing in taxes associated with a local CPA firm.
4. A CPA, formerly with a big-eight firm, with a variety of tax experience.
5. A graduate student in the University of Nebraska at Omaha Master of Professional Accounting program with a tax specialization.
6. A CPA with prior experience in government forms design.

These experts were asked to complete all the test instruments. Three of them completed the present method first followed by the indexation method, while the other three did the indexation method before the present method. After completing the forms, they provided written comments on the forms and on the instruction sheets. Their comments were evaluated; their forms were scored for errors, if any; and personal interviews were conducted with each expert. As a result of their input, several modifications were made in the instructions and the forms prior to their use.

#### Pilot Study

After the modifications suggested by the tax experts were made to the forms and instructions, a pilot study was conducted using ten taxpayers. One-half of the pilot group was given test instruments that required completion of the present method forms first and the other half of the group completed the indexation method forms first. The participants were requested to record their time, by reference to a wall clock, on the bottom of each form. They were also advised not to ask questions about the instructions or the forms as it was necessary for all participants to be operating with the same information. The pilot study participants completed test instruments for six decision frames.

Following the testing, the errors were evaluated and the time was computed for each form. The errors made by the participants varied, but the errors did not reveal any gross inaccuracies in either the instructions or the forms. Therefore, no changes were made to the contents of the test instruments as a result of the pilot study. However, three of the participants took more than 35 minutes to complete the entire test. Since the final subjects would only have 45 minutes available to complete the test, it was decided to omit two of the decision frames, leaving four.

#### The Simulation

The test instruments were introduced to 79 introductory accounting students on April 24, 1985, and to 63 University of Nebraska at Omaha faculty and staff members during the week of April 29, 1985. The test was administered in the classroom for the students and in a conference room with tables for the faculty and staff members.

The test instruments were controlled by a numbering sequence to ascertain that one-half of each small group completed the indexation method first; whereas, the other half did the present method first. The test was distributed and the subjects were instructed to complete each page in order, recording the time at the bottom of each page as it was

completed. They were instructed not to ask any questions about the forms or instructions. An assistant recorded the time on the blackboard at the front of the room so that there would be no confusion in interpreting the minutes on the wall clock.

Demographic information regarding age, education, and income was requested of the subjects. A chi-square goodness-of-fit test was performed. Based on the demographic information collected, the test subjects were found not to be representative of the residents of the Omaha Standard Metropolitan Statistical Area.<sup>61</sup> Information needed to compare the subject group to the typical Omaha or U.S. taxpayer is not available.

Motivation of the test subjects was one area of concern in this study. The student subjects were asked to participate in the study by their instructor. The participation of the faculty and staff group was coordinated by the University of Nebraska at Omaha Staff Advisory Council. The subjects received no reward or direct benefit for their participation. All subjects appeared to work through the test carefully and methodically, but there is no way to judge how seriously they approached the testing situation. It is presumed that if they treated one method lightly, they did the same with the other

---

<sup>61</sup>U.S. Department of Commerce, 1980 Census of Population - General Social and Economic Characteristics, Nebraska (Washington D.C.: Government Printing Office, 1983), pp. 102, 110, and 120.

method. Thus, the overall outcome of the study should not have been biased by those subjects who were not motivated strongly.

#### Data Gathering Summary

The data gathering phase of the complexity test began with the development of the test instruments. These instruments were designed to include parallel tests under the existing method and the indexation method for capital asset transactions typical to the individual taxpayer. These parallel tests were designated as Decision Frames 1, 2, 3, and 4. The test instruments were evaluated by six experts and pre-tested in a pilot study. After evaluation and pre-testing the test instruments were introduced to 142 subjects, consisting of University of Nebraska at Omaha faculty, staff, and students.

#### Data Analysis Methodology

Complexity for the taxpayer is defined as the errors made by a taxpayer in combination with the time required by a taxpayer to complete a tax schedule or return. The relative complexity of two methods is measured by participants' scores of time and errors on the test instruments. Complexity of the two methods is compared using an index measure and using a ranking test.

### An Index Measure

Price and quantity indexes have been used as tools in economic analysis since the early 1900's. The Consumer Price Index is probably the best known and most commonly used index. It influences everything from salary and social security increases to adjustments in apartment rents charged. Index number are typically used in economics. As pointed out by Allen, indexes are also often used in various other areas such as demographics (birth and death-rate indexes) and agriculture (crop-yield indexes). Although the theory is best developed in economics, Allen said there is little difficulty in extending the index-number technique to other fields.<sup>62</sup> He quotes a classical definition of an index number:

...a number adapted by its variations to indicate the increase or decrease of a magnitude not susceptible of accurate measurement.<sup>63</sup>

According to Allen, an index number is limited to the measure of changes in magnitude from one situation to another. The two situations which are to be compared are not restricted. They may be two time periods (e.g., two years), two spatial situations (e.g., two regions of a country), or two groups of

---

<sup>62</sup>R.G.D. Allen, Index Numbers in Theory and Practice (London: The MacMillan Press, Ltd., 1975), p. 1.

<sup>63</sup>F.Y. Edgeworth, Papers Relating to Political Economy, Vol. I (London, 1925), p. 375, quoted in Allen, Index Numbers in Theory and Practice, p. 2.

individuals (e.g, single and two-parent families). In the present study, the magnitude to be measured by index numbers is complexity, defined as the combination of time and errors, and the two situations are the present and the indexation methods of taxing capital gains.

#### Construction of an Index

The choice of a proper method to construct an index number is a difficult one.

One school of thought on index numbers believes that there may be such a thing as a perfect index number formula, and that such a formula can be recognized by its ability to meet certain mathematical tests of consistency. . . . Not only can an index be considered "ideal" if it meets these tests, according to this theory, but other indexes that do not meet them can be graded according to how closely they approximate them in actual practice.<sup>64</sup>

The two mathematical tests of consistency considered important are (1) the time reversal test and (2) the factor reversal test. Given that:

$p_0$  = price of an item or items--old

$q_0$  = quantity of an item or items--old

$p_n$  = price of an item or items--new

$q_n$  = quantity of an item or items--new

---

<sup>64</sup>Frederick E. Croxton and Dolly J. Cowder, Applied General Statistics, 2nd ed., (Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1960), p. 426.

(1) The time reversal test can be stated as: If the time subscripts ("o" and "n") of a price index number formula are interchanged, the resulting formula should be the reciprocal of the original formula. The product of two formulas should equal one. A typical index formula, known as Laspeyres', is:

$$\frac{\sum P_n Q_o}{\sum P_o Q_o}$$

If the time subscripts are interchanged, the resulting formula is:

$$\frac{\sum P_o Q_n}{\sum P_n Q_n}$$

However,  $\frac{\sum P_n Q_o}{\sum P_o Q_o} \times \frac{\sum P_o Q_n}{\sum P_n Q_n}$  does not equal 1

Thus, with the Laspeyres' index, the time reversal test is not met.

(2) The factor reversal test can be stated as: If the "p" and "q" factors of an price (or quantity) index number formula are interchanged so that a quantity (or price) index formula is obtained, the product of the two indexes should give the true value ratio, which is:

$$\frac{\sum P_n Q_n}{\sum P_o Q_o}$$



Again, the Laspeyres' index formula is:

$$\frac{\sum P_n Q_0}{\sum P_0 Q_0}$$

If the "p" and "q" factors are interchanged, the result is:

$$\frac{\sum Q_n P_0}{\sum Q_0 P_0}$$

This is now a quantity index, however:

$$\frac{\sum P_n Q_0}{\sum P_0 Q_0} \times \frac{\sum Q_n P_0}{\sum Q_0 P_0} \text{ is not equal to } \frac{\sum P_n Q_n}{\sum P_0 Q_0}$$

The factor reversal test, therefore, is not met with the Laspeyres' index formula.

Fisher's "Ideal" Index

Both the time reversal test and the factor reversal test are met by Fisher's "ideal" index formula<sup>65</sup> as follows: A portion of the Fisher index formula is:

$$\sqrt{\frac{\sum P_n Q_0}{\sum P_0 Q_0} \times \frac{\sum P_n Q_n}{\sum P_0 Q_n}}$$

---

<sup>65</sup>Irving Fisher, The Making of Index Numbers (Boston: Houghton Mifflin Co., 1922; reprint ed., New York: Augustus M. Kelley, 1967), pp. 220-225.

If the time subscripts are interchanged, the resulting formula is:

$$\sqrt{\frac{\sum P_0 Q_n}{\sum P_n Q_n} \times \frac{\sum P_0 Q_0}{\sum P_n Q_0}}$$

And:

$$\sqrt{\frac{\sum P_n Q_0}{\sum P_0 Q_0} \times \frac{\sum P_n Q_n}{\sum P_0 Q_n}} \times \sqrt{\frac{\sum P_0 Q_n}{\sum P_n Q_n} \times \frac{\sum P_0 Q_0}{\sum P_n Q_0}} = 1$$

The time reversal test is met.

Fisher's "ideal" index formula meets the factor reversal test as follows:

A portion of the Fisher index is:

$$\sqrt{\frac{\sum P_n Q_0}{\sum P_0 Q_0} \times \frac{\sum P_n Q_n}{\sum P_0 Q_n}}$$

If the "p" and "q" factors are interchanged, the result is:

$$\sqrt{\frac{\sum Q_n P_0}{\sum Q_0 P_0} \times \frac{\sum Q_n P_n}{\sum Q_0 P_n}}$$

The product of the two is:

$$\sqrt{\frac{\sum P_n Q_0}{\sum P_0 Q_0} \times \frac{\sum P_n Q_n}{\sum P_0 Q_n}} \times \sqrt{\frac{\sum Q_n P_0}{\sum Q_0 P_0} \times \frac{\sum Q_n P_n}{\sum Q_0 P_n}} = \frac{\sum P_n Q_n}{\sum P_0 Q_0}$$

Thus, the factor reversal test is met by the Fisher formula.

### Time/Error Complexity Index

In order to analyze the results of the complexity test administered to the participants, an index number technique similar to the Fisher "ideal" indexes was derived.

Given that:

$e_0$  = errors under present method

$t_0$  = time in minutes under present method

$e_n$  = errors under indexation method

$t_n$  = time in minutes under indexation method

$$\sqrt{\frac{\sum e_n t_0}{\sum e_0 t_0} \times \frac{\sum e_n t_n}{\sum e_0 t_n}} \times \sqrt{\frac{\sum t_n e_0}{\sum t_0 e_0} \times \frac{\sum t_n e_n}{\sum t_0 e_n}} = \frac{\sum e_n t_n}{\sum e_0 t_0}$$

( $I_e$ )
( $I_t$ )
(I)

The index, "I," provided by the above formula is a geometric average that expresses the relationship of the present method to the indexation method weighted for both time and errors. The " $I_e$ " index is that portion of the geometric average attributable to the errors made, while the index, " $I_t$ ," gives the portion of the geometric average attributable to the time taken on the tests.

The relative complexity of the present method and indexation method in each decision frame were measured using the Time/Error Complexity Index.

### Ranking Test

No assumption of a normal distribution of the population from which the participants were drawn for this study can be made. Hence, parametric tests could not be applied to the data. Non-parametric tests are distribution free and do not require normal distribution assumptions. Non-parametric methods of hypothesis testing frequently used in the behavioral sciences are uniquely suited to the analysis of time and errors in this complexity test.

### Wilcoxon Ranked-Sum Test

The Wilcoxon, as well as many other non-parametric tests, is a ranking test. A ranking test results in some loss of the available data. This study attempts to determine if one method is more complex than the other. Thus, the power lost through non-use of some of the available data is not important if the hypothesis testing provides a convincing answer.

Blair and Higgins,<sup>66</sup> in their recent research on the Wilcoxon test, concluded that the Wilcoxon statistic held a

---

<sup>66</sup>Three articles by R. Clifford Blair and J.J. Higgins include: "A Note on the Asymptotic Relative Efficiency of the Wilcoxon Rank Sum Test," British Journal of Mathematical and Statistical Psychology 34, (1981), pp. 124-28; and "The Power of t and Wilcoxon Statistics," Evaluation Review, October, 1980, pp. 645-656; and "A Comparison of the Power of Wilcoxon's Rank-Sum Statistic to That of Student's t Statistic Under Various Nonnormal Distributions," Journal of Educational Statistics, Winter, 1980, pp. 290-335.

large power advantage over the "two independent means t test." The parametric t test is used frequently by researchers for paired data where population normality can be assumed. Blair and Higgins found the power of the Wilcoxon statistic to be greater than the t test regardless of the normality of the distribution. They used computer generated Monte Carlo simulations to assess the relative power of the two techniques under various distributions.

In his classic work on nonparametric methods, Siegel rated the power and efficiency of the Wilcoxon test quite close to the parametric t test. However, he felt that if all the assumptions required for a parametric test could be met then it should always be used, as a parametric test can be expected to be the most likely to reject  $H_0$  when  $H_0$  is false.<sup>67</sup>

#### Test Application

The Wilcoxon matched-pairs ranked-sum test is ideally suited to the data collected. Each participant completed the computations under the present method and under the indexation

---

<sup>67</sup>A statistical test is a good one if it has a small probability of rejecting  $H_0$  when  $H_0$  is true, but a large probability of rejecting  $H_0$  when  $H_0$  is false, Sidney Siegel, Nonparametric Statistics for the Behavioral Sciences (New York: McGraw-Hill Book Company, Inc., 1956) pp. 18 and 83.

method resulting in a matched pair where each participant acted as his own counterpart. The Wilcoxon test can be used if a researcher is able to determine the difference in direction and absolute size in the performance of any pair.

The Wilcoxon test for matched pairs  $(X_i, Y_i)$  is based on the differences between pairs,<sup>68</sup> where the score achieved by the subject in the frame under the indexation method is  $X_i$ . The subject's score in the frame under the present method is  $Y_i$ . The score  $(X_i$  or  $Y_i)$  is the product of the time taken to complete a given frame and the errors made in the frame. The mathematical notation is:

$$D_i = Y_i - X_i$$

The focus in the test is on the median of the population differences, denoted by  $\eta_D$ .

When the  $Y_i$ 's tend to be larger than the  $X_i$ 's. . . , the  $D_i$ 's tend to be positive and  $\eta_D$  is positive. Similarly, when the  $Y_i$ 's tend to be smaller than the  $X_i$ 's, the  $D_i$ 's tend to be negative and  $\eta_D$  is negative. Finally, if the X and Y distributions do not differ in location, the  $D_i$ 's typically tend to be positive and negative with approximately equal frequency and  $\eta_D$  is near zero. Thus,  $\eta_D$ , may be thought of as a parameter which measures how far apart X and Y distributions are.<sup>69</sup>

---

<sup>68</sup>The description of the test design relies quite heavily on the procedures used by John Neter, William Wasserman, and G.A. Whitmore, Applied Statistics (Boston: Allyn and Bacon, Inc., 1978), pp. 376-382.

<sup>69</sup>Neter, Wasserman, and Whitmore, Applied Statistics, p. 376.

In order to use the Wilcoxon test, it is necessary to assume that the population of differences,  $D_i$ , is continuous and symmetrical. According to Neter, this assumption can be made in experimental settings when the matched subjects are assigned randomly to two different treatments, as well as where each subject acts as his own control (the perfect matched pair) and receives both treatments.<sup>70</sup>

The Wilcoxon test statistic,  $T$ , is derived by calculating the absolute difference,  $D_i$ , between  $X_i$  and  $Y_i$ . If any of the  $D_i$ 's are zero, they are discarded and the sample size ( $N$ ) reduced by the number of  $D_i$ 's discarded. Absolute differences ( $D_i$ ) are ranked. If any of the  $D_i$ 's are the same value, the  $D_i$ 's are assigned the average value of the corresponding ranks. The final step is to attach a minus sign to the ranks of all negative  $D_i$ 's. The test statistic,  $T$ , is the sum of the values for all the ranks.

For a large sample, the sampling distribution of  $T$  is approximately normal.<sup>71</sup> Given the approximate normality of the  $T$  distribution, the decision rule is constructed as illustrated in Figure 2 for a one-tailed test where the alternatives are:

---

<sup>70</sup>Ibid., p. 379.

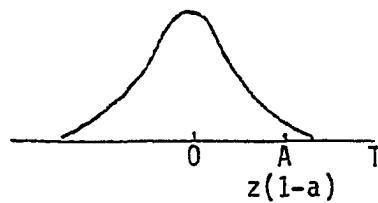
<sup>71</sup>A large sample is defined as ten or more in Neter, Wasserman, and Whitmore, Applied Statistics, p. 380.

$H_0$ :  $n_D$  is less than or equal to 0

$H_1$ :  $n_D$  is greater than 0

FIGURE 2  
WILCOXON TEST ACTION LIMIT

Action  
Limit:



Distribution of  $T$  is  
approximately normal  
and  $n_D = 0$

$a = \text{alpha} = .01$

where  $A = 0 + z(1-a)$

$$\sqrt{\frac{N(N+1)(2N+1)}{6}}$$

Decision rule:

If  $T$  is less than or equal to  $A$ , conclude  $H_0$

If  $T$  is greater than  $A$ , conclude  $H_1$



### Summary

Taxpayer complexity is defined as a function of the errors made by a taxpayer and the time required by the taxpayer to complete a tax return. Data which includes measures of time and errors was gathered from 142 participants who completed four decision frames. The decision frames are composed of parallel test instruments which include the same set of facts for both the present method and the indexation method. The Time/Error Complexity Index was derived and the applicability of the Wilcoxon test was discussed. The index measure and the Wilcoxon test are used to analyze the test data in Chapter 4.

## CHAPTER 4

### DATA ANALYSIS

The analysis of the data collected in the complexity study is presented in this chapter. First, the raw data is combined and means, medians, and ranges are calculated. A Time/Error Complexity index is constructed to analyze the data; and the Wilcoxon test is applied.

#### Data

As indicated in Chapter 3, the participants in the study were obtained from two different sources. The means, medians, and ranges of both time and errors for each of the two groups were calculated separately and compared. There were no apparent differences between the groups in these measures.

An explanation of this lack of difference between the two groups can be made. Most of the students at the University of Nebraska at Omaha are employed full or part-time. Their occupations were requested as part of the demographics collected in the study and only 15 percent (12 out of 79) listed "student" or "none" as their occupation. After completing the test, many of the student participants stated that they worked full or part-time and were enrolled for only

one or two courses. All but four participants in the student group indicated that they had filed a 1984 tax return.

Many of the staff members at the University of Nebraska at Omaha are enrolled as students. In fact, 10 percent (6 out of 63) of the staff members listed "student" as their occupation. Other staff members that were interviewed indicated they were working on undergraduate or graduate degrees while being employed full or part-time at the university.

Because of the difficulty in differentiating between student and staff member, the two groups were combined. Thus, the results of the complexity test are analyzed using one group of 142 participants.

Complete data for all participants is provided in Appendix B. A summary of the means, medians, and ranges for time in minutes under both the present method and the indexation method for all frames combined and for Decision Frames 1 through 4 is presented in Table 2.

TABLE 2  
PRELIMINARY ANALYSIS OF TIME (MINUTES)

Decision Frame	PRESENT METHOD			INDEXATION METHOD		
	Mean	Median	Range	Mean	Median	Range
Combined	19.32	19	11--31	8.68	8	4--19
Frame 1	1.98	2	1--6	2.61	2	1--14
Frame 2	4.51	4	2--12	3.37	3	1--7
Frame 3	2.96	3	1--7	2.18	2	1--7
Frame 4	9.87	9	3--20	3.88	3	1--9

Raw data is provided in Appendix B, Columns (3) and (6).

A review of the data in Table 2 reveals that for all frames combined and for Frames 2, 3, and 4, the means, medians, and ranges for time are less under indexation than under the present method. However, for Frame 1, the mean and range are less under the present method than under the indexation method. The medians are the same for both methods.

TABLE 3  
PRELIMINARY ANALYSIS OF ERRORS

Decision Frame	PRESENT METHOD			INDEXATION METHOD		
	Mean	Median	Range	Mean	Median	Range
Combined	8.70	7	0--38	2.90	2	0--17
Frame 1	0.76	1	0--4	1.04	0	0--4
Frame 2	1.22	1	0--7	0.63	0	0--6
Frame 3	1.22	1	0--16	0.61	0	0--6
Frame 4	5.50	5	0--23	0.63	0	0--7

Raw data is provided in Appendix B, Columns (2) and (5).

The data on errors located in Table 3 indicates that for all frames combined and for Frames 2, 3, and 4 the means, medians, and ranges are greater under the existing method than under the indexing method. Again, the results are different for Frame 1. In Frame 1, the mean under the present method is less than the mean under the indexation method; the median under indexation is less than the median under the present method; but the ranges are the same for both methods.

TABLE 4

## PRELIMINARY ANALYSIS OF TIME AND ERRORS COMBINED

Decision Frame	PRESENT METHOD			INDEXATION METHOD		
	Mean	Median	Range	Mean	Median	Range
Combined	185.72	154	12--620	36.03	21	5--204
Frame 1	3.36	3	1--15	5.80	3	1--70
Frame 2	10.94	6	2--84	5.73	4	1--25
Frame 3	6.65	4	1--55	3.55	2	1--16
Frame 4	59.75	55	5--208	6.64	4	1--56

Raw data is provided in Appendix B, Columns (4) and (7).

As shown in Table 4, for time and errors combined the means, medians, and ranges for all frames combined and for Frames 2, 3, and 4 are greater under the current method than under the indexation method. In Frame 1, the mean and range under indexation are greater than under the existing method; the medians for both methods are the same.

In Frame 1, under the present method, subjects needed to differentiate between long-term and short-term holding periods for capital assets sold. Under the indexation method, subjects had to select the correct adjustment factors from a table in order to adjust the original cost of an asset. In Frame 1, the indexation method appears to be more complex than

the current method. It may be that the subjects had some understanding of long-term and short-term holding periods because they are terms that have been used for many years in association with capital asset transactions. In contrast, the concept of adjustment factors may have been new to the participants. Although the preliminary results indicate some additional complexity in this frame under indexation, after exposure to the concept of indexation and with the availability of a type-set tables (as discussed in Chapter 3), taxpayers might find it less complex or at least no more complex than the present method.

Preliminary analysis of all frames combined and Frames 2, 3, and 4 indicate less complexity under the indexation method of taxing capital gains than under the existing method. Frames 2, 3 and 4 involve a variety of computations relating to the taxation of capital gains. Under the present method, necessary computations include the combination of short-term and long-term capital gains, application of the long-term capital gain deduction, application of capital loss limitations, and determination of the character of the gain on the sale of business property. For the indexing method, the necessary computations include adjusting the asset cost by the adjustment factor, combining capital gains and losses, applying the capital loss limitations, and calculating gains on the sale of business property.

The means, medians, and ranges have provided some insight into the complexity of the two methods. The data will next be analyzed by the Time/Error Complexity index.

#### Time/Error Complexity Index

The Time/Error Complexity index, developed in Chapter 3, measures the relative complexity of two alternative methods. The index formulas for the error index, the time index, and the total index are:

$$I_e = \sqrt{\frac{\sum e_n t_0}{\sum e_0 t_0} \times \frac{\sum e_n t_n}{\sum e_0 t_n}}$$

$$I_t = \sqrt{\frac{\sum t_n e_0}{\sum t_0 e_0} \times \frac{\sum t_n e_n}{\sum t_0 e_n}}$$

$$I = I_e \times I_t = \frac{\sum e_n t_n}{\sum e_0 t_0}$$

The results of the analysis of test data using the Time/Error Complexity index are given in Table 5. The calculations are located in Appendix B. An index "I" equal to 1.0 indicates that the complexity (the product of time in minutes and errors) under both the present and indexation methods are the same. "I" values of greater than 1.0 indicate that indexation is more complex than the existing method. "I"



values less than 1.0 reveal less complexity under indexation than under the present method.

TABLE 5

## TIME/ERROR COMPLEXITY INDEXES

Decision Frame	$I_e$	$I_t$	I
Combined	.41	.47	.19
Frame 1	1.22	1.42	1.73
Frame 2	.71	.73	.52
Frame 3	.73	.73	.53
Frame 4	.25	.44	.11

For all frames combined, "I" equal to .19, the indexation method is less complex than the present method. Time and errors contributed about equally to the complexity (" $I_e$ " equal to .41 and " $I_t$ " equal to .47).

In Frame 1, "I" equal to 1.73, the indexation method is more complex than the existing method. An " $I_e$ " equal to 1.22 and an " $I_t$ " equal to 1.42 indicate that time factor contributed to the total complexity more than errors did. Frame 1 involves a comparison of determining short-term or long-term holding periods (present method) and selecting adjustment factors (indexation method). Frame 1 and its implications for complexity under indexation have been discussed above.

In Frames 2 and 3, "I" equal to .52 and .53, respectively, the indexing method is less complex than the existing method. Errors ("I<sub>e</sub>" equal to .71 and .73) and time ("I<sub>t</sub>," both .73) contribute about equally to the complexity. Frames 2 and 3 involve the combination of long-term and short-term capital gains, the use of the long-term capital gain deduction, and the application of capital loss limitations under the present method. Under the indexing method, these frames include indexation of the asset cost, the combination of capital gains, and the application of the capital loss limitations.

Data for Frame 4 results in the smallest "I" (the largest decrease in complexity from the present method to the indexation method). Frame 4 has an "I" of .11. The "I<sub>t</sub>" of .44 and "I<sub>e</sub>" of .25 shows that time had a greater impact than errors. Frame 4 provides the greatest difference in complexity of all the frames. Since this frame includes the depreciation recapture provisions for Section 1245 and Section 1250 property under the present method, the result is not surprising.

The Time/Error Complexity index analysis indicates that for all frames combined and for Frames 2, 3, and 4 the indexation method is relatively less complex than the present method. In Frame 1, the Time/Error Complexity index analysis suggests that the indexing method is relatively more complex than the present method.

### Wilcoxon Test

The Wilcoxon matched-pairs ranked-sum test is used for hypothesis testing. The test statistic,  $T$ , is derived by calculating the absolute difference,  $D_i$ , between  $X_i$  and  $Y_i$ . As outlined in Chapter 3:

$X_i$  = participant's score--indexation method

$Y_i$  = participant's score--present method

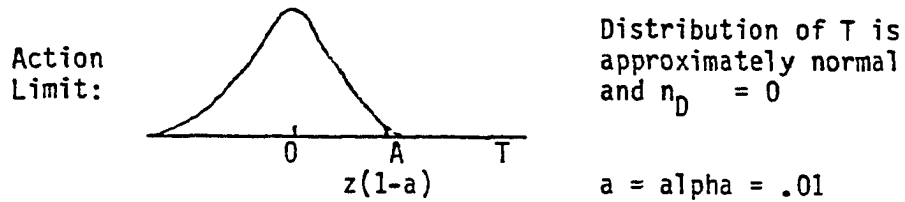
where the score is the product of the time (in minutes) taken to complete each frame and the errors made in completing the required calculations. If any of the  $D_i$ 's are zero, they are discarded and the sample size ( $N$ ) reduced by the number of  $D_i$ 's discarded. Absolute differences ( $D_i$ ) are then ranked. In the case of ties, the  $D_i$ 's are assigned the average value of the corresponding ranks. A minus sign is attached to the ranks of all negative  $D_i$ 's. The test statistic,  $T$ , is the sum of the values for all the ranks. Appendix C includes the calculations of  $T$  and  $N$  for all frames combined and the four decision frames. The alternative hypotheses are:

$H_0$ :  $n_D$  is less than or equal to 0

$H_1$ :  $n_D$  is greater than 0

FIGURE 3

## WILCOXON TEST ACTION LIMIT



where  $A = 0 + z(1-a) \sqrt{\frac{N(N+1)(2N+1)}{6}}$

## Decision Rule:

If T is less than or equal to A, conclude  $H_0$

If T is greater than A, conclude  $H_1$

The calculation of A, the action limit, is illustrated in Figure 3. The detailed calculations of A for each frame and for all frames combined are included in Appendix C.

Controlling alpha ( $\alpha$ ) risk at .01, the sample size, N; the test statistic, T; and the action limit, A, are presented in Table 6.

TABLE 6

## WILCOXON TEST RESULTS

Decision Frame	N	T	A
Combined	142	10028	2196
Frame 1	117	(2867)	1710
Frame 2	124	4761	1866
Frame 3	119	4803	1754
Frame 4	141	10011	2260

T is greater than A for all frames combined and for Frames 2, 3, and 4, and  $H_1$  is concluded when controlling alpha risk at 01. Complexity in these frames under the present method is significantly greater than under the indexation method. In Frame 1, at alpha risk of .01, T is less than A and  $H_0$  is concluded. In Frame 1, the present method is not as complex as the indexation method, as could be expected from the results of the Time/Error Complexity index analysis.

## Summary

The means, medians, and ranges of time, errors, and time and errors combined are greater under the present method than under indexation for all frames combined and for Frames 2, 3, and 4. Under the present method, participants took more time and made more errors in completing three out of the four

decision frames and in completing all frames combined. The results were mixed for Frame 1. The measures appear to indicate that in Frame 1 the participants took less time and made less errors under the present method than under the indexation method.

The findings using the Time/Error Complexity index reveal that relatively more complexity was experienced by participants under the present method for all frames combined and for Frames 2, 3, and 4. However, they experienced relatively less complexity under the present method in Frame 1.

Application of the Wilcoxon test results in 99 percent certainty that there is a statistically significant difference in the two methods: the present method is more complex than the indexation method in three out of the four decision frames, as well as for all frames combined.

## CHAPTER 5

### SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

This chapter presents a summary of the study including its limitations and conclusions. Finally, recommendations for future research are offered.

#### Summary

Since 1921, when special treatment for capital gains and losses was added to the tax law, provisions relating to the taxation of capital gains and losses have been subject to continuous changes and modifications.

The rationale behind special treatment given to capital gains has been explained in a variety of ways at different times. The rationales include:

1. Bunching - Taxing in one year of a capital gain, which occurs over many years, results in higher tax because of progressive tax rates. The long-term capital gain deduction provides a rough form of income averaging. If this is the intent, however, an averaging provision tied to an actual asset holding period would be more appropriate.

2. Inflationary gain - When property is held for several years its apparent increase in value may be partially or

totally due to inflation. Therefore, the capital gain deduction can be an approximate correction for inflation. However, the same treatment is available whether an asset is held one day more than six months or more than forty years; and the capital gain deduction is not related to the inflation rate.

3. Mobility of capital - Another justification for preferential treatment of capital gains is that it encourages taxpayers to make investments in new industries and keep the economy of the country growing. If there were no long-term capital gain deduction, investors might hold appreciated assets rather than sell them and the availability of venture capital to new industries would dry up. If the long-term capital gain deduction is to be used to encourage conversion of investments into venture capital, perhaps only investors who actually provide venture capital should be allowed the deduction.

Regardless of explanations offered, special capital gains provisions cause differences in the tax paid by different taxpayers with the same amount of real income and special capital gains provisions add complexity to tax law. Thus, the problems created by special treatment of capital gains center around the issues of equity and complexity.

Combining the 50 percent maximum income tax rate with a 60 percent long-term capital gain deduction results in a maximum rate of 20 percent for tax paid on long-term capital



gain income. On ordinary income, such as salaries and wages, the maximum tax rate is 50 percent. This difference in maximum rates appears to be inequitable.

The current complexities in tax law reflect responses by Congress to dissatisfied taxpayers, as well as to other special interest groups. Taxation is a political process and special tax benefits are sought by a variety of pressure groups within the economy. Over the years, astute taxpayers and their tax advisors have continually discovered ways to convert ordinary income into capital gains and Congress has continually attempted to restrict use of these ways. The complexities created by Congressional responses have resulted in a tax law that has become an intolerable burden to the average taxpayer.

Although research in the tax complexity area is limited, four studies were examined in Chapter 2. The findings and conclusions of the various authors indicated substantial complexity in the capital gain and loss provisions of the federal income tax law.

Indexing has been advocated by a number of authors as a solution for the tax problems caused by inflation. Indexation of the basis of assets, combined with the elimination of the existing capital gains provisions, is supported by the American Institute of Certified Public Accountants' Federal Taxation Division, the American Accounting Association's Federal Tax

Committee, and the Treasury Department. However, indexation might add complications for the taxpayers. Regardless of all the arguments for and against indexation, undoubtedly many politicians would prefer to periodically support a tax rate cut that lessens the impact of inflation rather than adopt tax base indexation which would reduce Congressional flexibility.

The purpose of this study is to compare the complexity that arises under current law with the complexity that would be introduced if a full form of indexation were provided for all capital gains and losses. The present study differs from earlier ones in that it measures tax complexity as experienced by the taxpayer. Complexity experienced by a taxpayer is defined as a function of the errors made on a tax return and the time required to complete the return. The way in which a taxpayer deals with complex forms and instructions is at the root of his perceptions of tax complexity.

#### Test Instruments

In order to examine time and errors as a dimension of tax complexity, a quasi-experimental research study was conducted. The present study compares the complexity that arises under current law with the complexity that would be introduced if all capital asset transactions were indexed. In order to facilitate scoring of the results, four separate decision

frames are examined. Each frame consists of a description of the pertinent law and a set of facts for the taxpayer. The taxpayer was required to make computations and decisions applying the law to the facts. Each frame included two sub-sets, the current method and the indexation method. A separate test instrument was developed for each sub-set. Thus, there are four test instruments for the present method and four test instruments for the indexation method.

The instruments were evaluated by six experts in tax and/or forms design. As a result of the experts' input, several modifications were made in the test instruments. A pre-test was conducted using a group of ten taxpayers. Following evaluation and pre-testing, the test instruments for the four decision frames were introduced to 142 taxpayer subjects, consisting of University of Nebraska at Omaha faculty, staff, and students.

In Decision Frame 1, the subjects were asked to make a short-term or long-term holding period decision for four capital asset transactions under the present method. Under the indexation method, a parallel test was designated as the selection of cost adjustment factors from a table of such factors based on the date of acquisition and date of sale of four capital assets.

In Decision Frames 2 and 3, the subjects were asked to

calculate the amount of capital gain or loss to be included in adjusted gross income. Under the present method, the holding period decision was made for the subjects and the cost and sales price for two capital asset transactions were pre-recorded on the test instruments. Under the indexation method, the cost, sales price, and cost adjustment factor for each asset were pre-recorded on the test instrument. In Decision Frame 2, under the present method, correct calculations led to a net long-term gain that was subject to application of the 60 percent long-term capital gain deduction. Under the indexation method in Decision Frame 2, the correct computations led to a net gain. In Decision Frame 3, under both methods, correct calculations resulted in a deductible loss which was limited by the capital loss limitation provisions.

The sale of business property and equipment was addressed by Decision Frame 4. The subjects were asked to make computations for the sale of residential rental property and the sale of a forklift, both subject to depreciation. Under the present method, the subjects were required to differentiate between Section 1250 property (the residential rental property) and Section 1245 property (the forklift) and to complete the required calculations to arrive at ordinary income and long-term capital gain amounts. Under the indexation method, it was not necessary for the subjects to differentiate between Section

1245 and Section 1250 property because depreciation recapture provisions would be eliminated under indexation. A brief explanation of depreciable property indexation was given and the subjects were required to complete the computations.

Following completion of the test instruments by the subjects, each test instrument was evaluated to determine the participant's time score and error score for each sub-set within each decision frame.

### Methodology

A Time/Error Complexity index, was used to measure the relative complexity of the two alternative methods. The index formula expresses the relationship of the present method to the indexation method weighted for both time and error:

$$I = \frac{\sum e_n t_n}{\sum e_o t_o}$$

Where:

$e_o$  = errors under present method

$t_o$  = time in minutes under the present method

$e_n$  = errors under the indexation method

$t_n$  = time under the indexation method

In order to test hypotheses, the Wilcoxon matched-pairs ranked-sum test was employed to analyze the complexity test data. No assumption of a normal distribution of the population

from which the participants were drawn for this study can be made. However, non-parametric tests, such as the Wilcoxon, are distribution free and do not require normal distribution assumptions. The Wilcoxon test is ideally suited to the data collected in the complexity test. Each participant completed computations under the present method and under the indexation method. This resulted in the perfect matched pair (i.e., each subject acted as his own control).

#### Limitations

The study is limited to the taxation of gain or loss on the disposition of capital assets as specified in the four decision frames. The test subjects were all individuals and the results of this study cannot be generalized to partnerships or corporations. The Consumer Price Index is used for indexation calculations. There have been proposals for reform that recommend revising income averaging as a partial solution for the bunching problem; the study does not address income averaging provisions. The realization concept, as opposed to the accretion concept, is utilized in the study. The limitations are discussed in detail in Chapter 1.

#### Conclusions

The complete results of the Time/Error Complexity index are presented in Chapter 4. In general, more relative

complexity was experienced by participants under the present method for all four frames combined and for Decision Frames 2, 3, and 4. However, they experienced less relative complexity under the present method in Decision Frame 1.

Complete details of the Wilcoxon test results are given in Chapter 4. In general, the findings are that at a 99 percent confidence level there is a statistically significant difference in the two methods: the present method is more complex than the indexation method for all frames combined and for Decision Frames 2, 3, and 4. For Decision Frame 1, the present method is less complex than the indexation method. Although the results for Decision Frame 1 indicate some additional complexity under indexation, after exposure to the concept of indexation, taxpayers might find it less complex or at least no more complex to select adjustment factors from a table than to make a holding period decision.

Based on the findings and with the limitations of this study, the complexity found in current law with regard to capital gain and loss provisions is greater than the complexity introduced if an indexation method was adopted for taxation of capital gains and losses.

### Recommendations

Using the framework of this study, it would be possible to test the complexity of proposed taxation changes prior to adoption. Additional research should be undertaken in areas other than capital gains and losses to determine the complexity created for individual taxpayers. Potential areas for research of this type include employee business expenses, moving expenses, and contributions.

An averaging method that is tied to the asset holding period has been recommended as a solution to the bunching problem. Future research is recommended to analyze taxpayer complexity inherent in such an averaging method.

It has been suggested that complexity in taxation creates the propensity for tax evasion. Since tax evasion creates a loss of tax revenues as well as higher taxes for those who do not evade, additional research is recommended to determine the relationship between tax complexity and tax evasion.



APPENDIX A

TEST INSTRUMENTS

FORM PH

P \_\_\_\_\_

## SHORT-TERM OR LONG-TERM

Capital gains and losses must be separated according to how long you hold or own the property. The holding period for determining long-term capital gains and losses is more than one year (6 months for acquisitions after June 22, 1984). When you figure the length of the period you held property, begin counting on the day after you got the property and include the day you disposed of it.

For the transactions listed below, determine which are short-term and which are long-term. Check the box labeled S/T if the transaction is short-term or the box labeled L/T if it is long-term.

	Sold	Purchased	S/T	L/T
100 shares of IBM stock	Feb 2, 1984	Apr 18, 1983	<input type="checkbox"/>	<input type="checkbox"/>
City of New York Bond	May 18, 1984	Mar 25, 1983	<input type="checkbox"/>	<input type="checkbox"/>
Diamond ring	Nov 5, 1984	Jan 3, 1984	<input type="checkbox"/>	<input type="checkbox"/>
100 shares of Conagra stock	Dec 27, 1984	June 24, 1984	<input type="checkbox"/>	<input type="checkbox"/>

Record Time \_\_\_\_\_

FORM PID

P \_\_\_\_\_

## INSTRUCTIONS FOR THE FOLLOWING TWO PAGES:

Some information regarding a taxpayer's capital asset transactions is provided in appropriate places in the forms on the following two pages. Proceed through the forms line-by-line following the instructions. Complete each page before going on to the next page.

FORM PDI

P \_\_\_\_\_

START WITH LINE 1. COMPLETE EITHER COLUMN D OR COLUMN E AND PROCEED THROUGH THE FORM LINE-BY-LINE FOLLOWING THE INSTRUCTIONS.

PART I SHORT-TERM CAPITAL GAINS AND LOSSES

	A Items Sold	B Cost	C Sales Price	D LOSS If B is more than C, subtract C from B	E GAIN If C is more than B, subtract B from C
1.	<u>Land</u>	<u>10,000</u>	<u>9,500</u>	_____	_____
2.	_____	_____	_____	_____	_____
3.	Add lines 1 and 2 in columns B and E . . . . .			( )	_____
4.	Enter amount from line 3 column B . . . . .			_____	( )
5.	Combine amount on line 4 with amount on line 3, Column E. This is your net short-term gain or (loss)			_____	_____

PART II LONG-TERM CAPITAL GAINS AND LOSSES

6.	<u>Stock</u>	<u>1,000</u>	<u>9,900</u>	_____	_____
7.	_____	_____	_____	_____	_____
8.	Add lines 6 and 7 in columns B and E . . . . .			( )	_____
9.	Enter amount from line 8 column B . . . . .			_____	( )
10.	Combine amount on line 9 with amount on line 8, Column E. This is your net long-term gain or (loss)			_____	_____
11.	Combine lines 5 and 10 and enter net gain or (loss) here . . . . .			_____	_____

Note: If line 11 is a loss, skip lines 12 through 14 and complete lines 15 and 16.  
If line 11 is a gain, complete lines 12 through 14 and skip lines 15 and 16.

12.	If line 11 shows a gain, enter the smaller of line 10 or 11. If there is a loss or no entry on line 11, enter zero.			_____	_____
13.	Enter 60% of line 12 . . . . .			_____	_____
14.	Subtract line 13 from line 11 and enter here . . . . .			_____	_____
15.	If line 11 shows a loss, enter one of the following amounts: a. If line 5 is zero or a net gain, enter 50% of line 11; b. If line 10 is zero or a net gain, enter line 11; or c. If line 5 and line 10 are net losses, enter amount on line 5 added to 50% of the amount on line 10			_____	_____
16.	Enter here the smallest of: a. The amount on line 15; b. \$3,000; or c. Taxable income as adjusted \$ <u>17,300</u>			_____	_____

Record Time \_\_\_\_\_

FORM PD2

P \_\_\_\_\_

START WITH LINE 1. COMPLETE EITHER COLUMN D OR COLUMN E AND PROCEED THROUGH THE FORM LINE-BY-LINE FOLLOWING THE INSTRUCTIONS.

PART I SHORT-TERM CAPITAL GAINS AND LOSSES

	A Item Sold	B Cost	C Sales Price	D LOSS If B is more than C, subtract C from B	E GAIN If C is more than B, subtract B from C
1.	<u>Stock</u>	<u>1,000</u>	<u>600</u>	_____	_____
2.	_____	_____	_____	_____	_____
3.	Add lines 1 and 2 in columns B and E . . . . .			(_____)	_____
4.	Enter amount from line 3 column B . . . . .			_____	(_____)
5.	Combine amount on line 4 with amount on line 3, Column E. This is your net short-term gain or (loss)			_____	_____

PART II LONG-TERM CAPITAL GAINS AND LOSSES

6.	<u>Bond</u>	<u>10,000</u>	<u>8,400</u>	_____	_____
7.	_____	_____	_____	_____	_____
8.	Add lines 6 and 7 in columns B and E . . . . .			(_____)	_____
9.	Enter amount from line 8 column B . . . . .			_____	(_____)
10.	Combine amount on line 9 with amount on line 8, Column E. This is your net long-term gain or (loss)			_____	_____
11.	Combine lines 5 and 10 and enter net gain or (loss) here . . . . .			_____	_____

Note: If line 11 is a loss, skip lines 12 through 14 and complete lines 15 and 16.  
If line 11 is a gain, complete lines 12 through 14 and skip lines 15 and 16.

- 12. If line 11 shows a gain, enter the smaller of line 10 or 11.  
If there is a loss or no entry on line 11, enter zero. \_\_\_\_\_
- 13. Enter 60% of line 12 . . . . . \_\_\_\_\_
- 14. Subtract line 13 from line 11 and enter here . . . . . \_\_\_\_\_
- 15. If line 11 shows a loss, enter one of the following amounts:
  - a. If line 5 is zero or a net gain, enter 50% of line 11;
  - b. If line 10 is zero or a net gain, enter line 11; or
  - c. If line 5 and line 10 are net losses, enter amount on line 5 added to 50% of the amount on line 10 \_\_\_\_\_
- 16. Enter here the smallest of:
  - a. The amount on line 15;
  - b. \$1,000; or
  - c. Taxable income as adjusted \$14,800 \_\_\_\_\_

Record Time \_\_\_\_\_

FORM PI4797

P \_\_\_\_\_

**BRIEF EXPLANATION OF TAX LAW RELEVANT TO SALE OF BUSINESS PROPERTY:**

**Section 1245 Property** - includes most personal property subject to depreciation and 15-year real commercial property subject to ACRS deductions.

When Section 1245 property is sold at gain, the gain is ordinary income to the extent of all depreciation allowed or allowable since 1-1-62.

**Section 1250 Property** - includes residential rental real property subject to depreciation.

When Section 1250 property is sold at a gain, the gain is ordinary income to the extent of 100% of the excess depreciation since 1-1-76. Excess depreciation (additional depreciation) is the depreciation actually taken minus what straight line depreciation would have been.

The following properties subject to recapture were sold in 1984:

1. Residential rental property (held as an investment) was sold on December 31, 1984. The property had been purchased January 1, 1978. Information concerning the rental property is as follows:

Sales Price . . . . .		\$180,000
Adjusted Basis of Asset:		
Cost . . . . .	\$100,000	
Less depreciation allowed:		
1978 . . . . .	\$ 5,000	
1979 . . . . .	4,750	
1980 . . . . .	4,513	
1981 . . . . .	4,287	
1982 . . . . .	4,073	
1983 . . . . .	3,869	
1984 . . . . .	<u>3,675</u>	<u>30,167</u>
Adjusted Basis . . . . .		<u>69,833</u>
Gain on Sale . . . . .		<u>\$110,167</u>

Straight line depreciation would have been \$2,500 per year.  
(7 years @ \$2,500 per year = \$17,500)

2. A forklift used in a business was sold on December 1, 1984. Information concerning the sale is as follows:

Sales Price . . . . .		\$ 22,000
Cost (Purchased June 2, 1981) . . . . .	\$ 20,000	
Less Depreciation allowed:		
1981 . . . . .	\$3,000	
1982 . . . . .	4,400	
1983 . . . . .	4,200	
1984 . . . . .	<u>4,200</u>	<u>15,800</u>
Adjusted Basis . . . . .		<u>4,200</u>
Gain on Sale . . . . .		<u>\$ 17,800</u>

Using the above information, complete the form on the next page.

Record Time \_\_\_\_\_

FORM P4797

P \_\_\_\_\_

COMPLETE LINES 1-5 FOR BOTH PROPERTIES. THEN, AS APPLICABLE, COMPLETE EITHER LINES 6(a) AND 6(b) OR LINES 7(a), 7(b), AND 7(c) IN EACH COLUMN. THEN, COMPLETE LINES 8, 9, AND 10:

	(1) <u>Forklift</u>	(2) <u>Rental Property</u>
1. Gross sales price . . . . .	_____	_____
2. Cost or other basis . . . . .	_____	_____
3. Depreciation allowed or allowable . . . . .	_____	_____
4. Adjusted basis, subtract line 3 from line 2 . . . . .	_____	_____
5. Total gain, subtract line 4 from line 1 . . . . .	_____	_____
6. If section 1245 property:		
(a) Depreciation allowed or allowable . . . . .	_____	_____
(b) Enter smaller of line 5 or line 6(a) . . . . .	_____	_____
7. If section 1250 property:		
(a) Additional depreciation after 12/31/75 . . . . .	_____	_____
(b) Enter applicable percentage. . . . .	_____	_____
(c) Line 7(b) times the smaller of line 5 or line 7(a). . . . .	_____	_____
8. Total gains (add columns 1 and 2, line 5) . . . . .	_____	_____
9. Ordinary Income [add columns 1 and 2, lines 6(b) and 7(c)] . . . . .	_____	_____
10. Long-term Capital Gain [subtract line 9 from line 8] . . . . .	_____	_____

Record Time \_\_\_\_\_

FORM NF

N \_\_\_\_\_

## ADJUSTMENT TO COST

When property is sold, its cost (basis) must be adjusted for inflation using an adjustment factor. The adjustment factor is based on price level changes between the date of purchase and date of sale. Adjustment factors have been computed for you and are given in the table below.

For the transactions listed below, select the correct factor from the table and write it in the space provided following each item.

	<u>Date Sold</u>	<u>Date Purchased</u>	<u>Adjustment Factor</u>
100 shares of IBM stock	Feb 2, 1984	Apr 18, 1983	_____
City of New York Bond	May 18, 1984	Mar 25, 1983	_____
Diamond Ring	Nov 5, 1984	Jan 3, 1984	_____
100 shares of Conagra stock	Dec 27, 1984	June 24, 1984	_____

A D J U S T M E N T   F A C T O R S  
F O R   P R O P E R T Y   S O L D   D U R I N G   1 9 8 4

QUARTER PURCHASED:	Q U A R T E R   S O L D   I N   1 9 8 4			
	Jan., Feb., Mar.	Apr., May, June	July, Aug., Sept.	Oct., Nov., Dec.
1983				
Jan., Feb., Mar.	1.057	1.069	1.073	1.084
Apr., May, June	1.039	1.043	1.061	1.062
July, Aug., Sept.	1.025	1.031	1.044	1.058
Oct., Nov., Dec.	1.012	1.026	1.045	1.046
1984				
Jan., Feb., Mar.	1.000	1.013	1.027	1.032
Apr., May, June	N/A	1.000	1.014	1.028
July, Aug., Sept.	N/A	N/A	1.000	1.001
Oct., Nov., Dec.	N/A	N/A	N/A	1.000

Record Time \_\_\_\_\_



FORM NID

N \_\_\_\_\_

## INSTRUCTIONS FOR THE FOLLOWING TWO PAGES:

Some information regarding a taxpayer's capital asset transactions is provided in appropriate places in the forms on the following two pages. Proceed through the forms line-by-line following the instructions. Complete each page before going on to the next page.

FORM 101

\_\_\_\_\_

START WITH LINE 1 AND COMPLETE COLUMN D. THEN COMPLETE EITHER COLUMN F OR COLUMN G AND PROCEED THROUGH THE FORM LINE BY LINE FOLLOWING THE INSTRUCTIONS.

	A	B	C	D	E	F	G
	Item Sold	Cost	Adjustment Factor	Adjusted Cost C Times B	Sales Price	(LOSS) If D is more than E, subtract E from D	GAIN If E is more than D, subtract D from E
1.	<u>Stock</u>	<u>1,000</u>	<u>1.2</u>	_____	<u>9,900</u>	_____	_____
2.	<u>Land</u>	<u>10,000</u>	<u>1.1</u>	_____	<u>9,500</u>	_____	_____
3.	_____	_____	_____	_____	_____	_____	_____
4.	_____	_____	_____	_____	_____	_____	_____
5.	Add lines 1 through 4 in columns F and G . . . . .					(_____)	_____
6.	Enter amount from line 5 column F . . . . .					(_____)	_____
7.	Combine amount on line 6 with amount on line 5, Column G. This is your net gain or (loss). . . . .					_____	_____

Note: If line 7 is a gain, no further computations are necessary.  
If line 7 is a loss, complete line 8.

8. If line 7 shows a loss, enter the smallest of:

- The amount on line 7;
- \$3,000; or
- Taxable income as adjusted \$ 18,200

Record Time \_\_\_\_\_

FORM 102

R \_\_\_\_\_

START WITH LINE 1 AND COMPLETE COLUMN B. THEN COMPLETE EITHER COLUMN F OR COLUMN G AND PROCEED THROUGH THE FORM LINE BY LINE FOLLOWING THE INSTRUCTIONS.

A	B	C	D	E	F	G
Item Sold	Cost	Adjustment Factor	Adjusted Cost C Times B	Sales Price	(LOSS) If D is more than E, subtract E from D	GAIN If E is more than D, subtract D from E
1. Bond	12,000	1.3	_____	11,300	_____	_____
2. Stock	1,000	1.1	_____	900	_____	_____
3. _____	_____	_____	_____	_____	_____	_____
4. _____	_____	_____	_____	_____	_____	_____
5.	Add lines 1 through 4 in columns F and G . . . . .				(_____)	_____
6.	Enter amount from line 5 column F . . . . .				(_____)	_____
7.	Combine amount on line 6 with amount on line 5, Column G. This is your net gain or (loss). . . . .				_____	_____

Note: If line 7 is a gain, no further computations are necessary.  
If line 7 is a loss, complete line 8.

8. If line 7 shows a loss, enter the smallest of:
- a. The amount on line 7;
  - b. \$3,000; or
  - c. Taxable income as adjusted: 13,400

Record Time \_\_\_\_\_

FORM NI4797

N \_\_\_\_\_

**BRIEF EXPLANATION OF THE PROPOSED TAX LAW RELEVANT TO SALE OF PROPERTY:**

Under the proposed tax law, assets are adjusted for inflation using an adjustment factor provided by the Treasury Department. Depreciation (called real cost recovery under the proposed law) is computed each year on the adjusted unrecovered cost of the asset.

When assets are sold, the gain on the sale is computed by subtracting the remaining adjusted unrecovered cost of the asset from the sales price. The entire gain is taxed as ordinary income.

The following two properties were sold in 1984:

1. Residential rental property (held as an investment) was sold on December 31, 1984. The property had been purchased January 1, 1978. Computation of the unrecovered cost at the date of sale and computation of the gain on the sale is provided for you.

Sales Price . . . . .				\$180,000
Adjusted Unrecovered Cost of the Asset:				
	<u>Unrecovered Cost Beg. of Year</u>		<u>Real Cost</u>	
	<u>Adj. to Beg. of Yr.</u>	<u>Adj. to End of Yr.</u>	<u>Recovery</u>	
1978	100,000	106,902	3,207	
1979	103,695	117,494	3,525	
1980	113,969	128,097	3,843	
1981	124,254	138,362	4,061	
1982	131,301	136,325	4,092	
1983	132,293	137,315	4,119	
1984	133,196	138,462	4,154	
Unrecovered Adjusted Cost Date of Sale . . . . .				<u>134,308</u>
Gain on Sale . . . . .				<u>\$ 45,692</u>

2. A forklift used in a business was sold on December 1, 1984. The lift had been purchased on June 2, 1981. Computation of the unrecovered cost on the date of sale and computation of the gain on the sale is provided for you.

Sales Price . . . . .				\$22,000
Adjusted Unrecovered Cost of the Asset:				
	<u>Unrecovered Cost Beg. of Year</u>		<u>Real Cost</u>	
	<u>Adj. to Beg. of Yr.</u>	<u>Adj. to End of Yr.</u>	<u>Recovery</u>	
1981 June 2 -	20,000	20,752	3,735	
1982	16,265	16,895	3,041	
1983	13,854	14,380	2,588	
1984	11,791	12,257	2,206	
Unrecovered Adjusted Cost Date of Sale . . . . .				<u>10,051</u>
Gain on Sale . . . . .				<u>\$11,949</u>

Using the above information, complete the form on the next page.

Record Time \_\_\_\_\_

FORM N4797

N \_\_\_\_\_

COMPLETE LINES 1-3 FOR BOTH PROPERTIES, THEN COMPLETE LINE 4:

	(1) <u>Forklift</u>	(2) <u>Rental Property</u>
1. Gross sales price . . . . .	_____	_____
2. Unrecovered Adjusted Cost Date of Sale . . . . .	_____	_____
3. Total gain (loss) line 1 minus line 2 . . . . .	_____	_____
4. Total gains (add columns 1 and 2, line 3) . . . . .	_____	_____

Record Time \_\_\_\_\_

FORM NX

N \_\_\_\_\_

1. Age:

Under 20 \_\_\_\_\_

20-24 \_\_\_\_\_

25-29 \_\_\_\_\_

30-34 \_\_\_\_\_

35-39 \_\_\_\_\_

40-44 \_\_\_\_\_

45-49 \_\_\_\_\_

50-54 \_\_\_\_\_

55-59 \_\_\_\_\_

60-64 \_\_\_\_\_

65-69 \_\_\_\_\_

Over 70 \_\_\_\_\_

2. Education:

Less than 12 years \_\_\_\_\_

12 but less than 16 yrs. \_\_\_\_\_

16 years or more \_\_\_\_\_

3. Income of your family unit in 1984:

Less than \$10,000 \_\_\_\_\_

\$10,000 to \$19,999 \_\_\_\_\_

\$20,000 to \$29,999 \_\_\_\_\_

\$30,000 to \$39,999 \_\_\_\_\_

\$40,000 to \$49,999 \_\_\_\_\_

\$50,000 and Over \_\_\_\_\_

4. Please list your job title or occupation. If you have two jobs, please list both of them.

-----

5. How was your 1984 tax return (due 4/15/85) prepared? (Check one)

\_\_\_ I prepared the return.

\_\_\_ My spouse and I prepared the return together.

\_\_\_ My spouse prepared the return.

\_\_\_ Someone else prepared the return (either for pay or as a favor).

6. Have you ever sold a capital asset (such as stocks, bonds, real estate, personal residence) in a year that you were required to file a federal income tax return?

\_\_\_ No

\_\_\_ Yes

If yes, did you prepare your return that year?

Yes \_\_\_\_\_

No \_\_\_\_\_

7. Have you ever sold a capital asset subject to depreciation (such as rental property, farm property, or other business property) in a year that you were required to file a federal income tax return?

\_\_\_ No

\_\_\_ Yes

If yes, did you prepare your return that year?

Yes \_\_\_\_\_

No \_\_\_\_\_

8. Are you using a calculator to complete these forms?

\_\_\_ No

\_\_\_ Yes

APPENDIX B

TIME/ERROR COMPLEXITY INDEX

## T/E COMPLEXITY INDEX CALCULATIONS

Formulas:

$$I_e = \sqrt{\frac{\sum E_n T_o}{\sum E_o T_o} \times \frac{\sum E_n T_n}{\sum E_o T_n}}$$

$$I_t = \sqrt{\frac{\sum T_n E_o}{\sum T_o E_o} \times \frac{\sum T_n E_n}{\sum T_o E_n}}$$

$$I = \frac{\sum E_n T_n}{\sum E_o T_o}$$

All Frames Combined:

$$I_e = \sqrt{\frac{10823}{26372} \times \frac{5116}{12751}} = .41$$

$$I_t = \sqrt{\frac{12751}{26372} \times \frac{5116}{10823}} = .47$$

$$I = \frac{5116}{26372} = .19$$



## T/E COMPLEXITY INDEX CALCULATIONS

Decision Frame 1:

$$I_e = \sqrt{\frac{582}{477} \times \frac{824}{679}} = 1.22$$

$$I_t = \sqrt{\frac{679}{477} \times \frac{824}{582}} = 1.42$$

$$I = \frac{824}{477} = 1.73$$

Decision Frame 2:

$$I_e = \sqrt{\frac{1080}{1553} \times \frac{813}{1119}} = .71$$

$$I_t = \sqrt{\frac{1119}{1553} \times \frac{813}{1080}} = .73$$

$$I = \frac{813}{1553} = .52$$

## T/E COMPLEXITY INDEX CALCULATIONS

Decision Frame 3:

$$I_e = \sqrt{\frac{703}{945} \times \frac{504}{703}} = .73$$

$$I_t = \sqrt{\frac{703}{945} \times \frac{504}{703}} = .73$$

$$I = \frac{504}{945} = .53$$

Decision Frame 4:

$$I_e = \sqrt{\frac{2181}{8485} \times \frac{943}{3862}} = .25$$

$$I_t = \sqrt{\frac{3862}{8485} \times \frac{943}{2181}} = .44$$

$$I = \frac{943}{8485} = .11$$

T/E COMPLEXITY INDEX  
ALL FRAMES COMBINED

(1) PARTICIPANT	(2) To	(3) Eo	(4) ToEo	(5) Tn	(6) En	(7) TnEn	(8) ToEn	(9) TnEo
101	15	12	195	6	5	36	90	78
102	28	15	448	11	8	99	252	176
103	13	15	208	6	6	42	91	96
104	25	1	50	5	2	15	75	10
105	21	12	273	7	5	42	126	91
106	13	10	143	7	2	21	39	77
107	19	16	323	6	5	36	114	102
108	28	7	224	8	7	64	224	64
109	27	4	135	7	2	21	81	35
110	19	11	228	7	2	21	57	84
111	24	16	408	6	0	6	24	102
112	23	19	460	7	8	63	207	140
113	20	3	80	7	0	7	20	28
114	17	13	238	13	1	26	34	182
115	26	11	312	10	1	20	52	120
116	14	3	56	6	0	6	14	24
117	27	4	135	8	0	8	27	40
118	19	19	380	8	2	24	57	160
119	20	2	60	6	2	18	60	18
120	15	10	165	9	0	9	15	99
121	31	19	620	7	3	28	124	140
122	31	10	341	7	2	21	93	77
123	30	17	540	7	8	63	270	126
124	29	7	232	9	0	9	29	72
125	23	13	322	7	9	70	230	98
126	15	4	75	6	3	24	60	30
127	21	21	462	6	17	108	378	132
128	18	6	126	6	3	24	72	42
129	15	10	165	7	1	14	30	77
130	24	15	384	10	4	50	120	160
131	30	13	420	10	10	110	330	140
132	14	10	154	6	0	6	14	66
133	19	17	342	8	0	8	19	144
134	22	3	88	7	0	7	22	28
135	11	38	429	11	17	198	198	429
136	17	7	136	7	3	28	68	56
137	22	17	396	7	7	56	176	126
138	20	13	280	7	0	7	20	98
139	24	6	168	6	0	6	24	42
201	25	0	25	7	0	7	25	7
202	17	25	442	7	1	14	34	182
203	25	12	325	10	5	60	150	130

T/E COMPLEXITY INDEX  
ALL FRAMES COMBINED

(1) PARTICIPANT	(2) To	(3) Eo	(4) ToEo	(5) Tn	(6) En	(7) TnEn	(8) ToEn	(9) TnEo
204	15	15	240	9	5	54	90	144
205	25	0	25	9	1	18	50	9
206	12	3	48	8	1	16	24	32
207	13	2	39	7	0	7	13	21
208	11	26	297	7	6	49	77	189
209	12	0	12	6	0	6	12	6
210	28	2	84	7	12	91	364	21
211	16	2	48	11	0	11	16	33
212	23	4	115	8	0	8	23	40
213	20	1	40	5	0	5	20	10
214	19	4	95	8	5	48	114	40
215	23	1	46	8	0	8	23	16
216	15	10	165	6	4	30	75	66
217	27	10	297	11	1	22	54	121
218	25	5	150	11	2	33	75	66
219	24	23	576	19	9	190	240	456
220	25	17	450	10	4	50	125	180
221	20	2	60	11	0	11	20	33
222	15	14	225	6	4	30	75	90
223	23	3	92	10	1	20	46	40
224	21	6	147	9	0	9	21	63
225	14	10	154	8	0	8	14	88
226	27	7	216	6	0	6	27	48
227	21	6	147	5	5	30	126	35
228	14	2	42	8	0	8	14	24
229	26	1	52	9	0	9	26	18
230	14	3	56	7	1	14	28	28
231	18	1	36	7	1	14	36	14
401	16	9	160	8	0	8	16	80
402	18	10	198	11	1	22	36	121
403	12	19	240	11	6	77	84	220
404	16	2	48	8	1	16	32	24
405	15	2	45	9	0	9	15	27
406	15	18	285	6	2	18	45	114
407	18	11	216	5	4	25	90	60
408	17	2	51	6	4	30	85	18
409	17	7	136	13	4	65	85	104
410	16	3	64	6	2	18	48	24
411	19	8	171	8	2	24	57	72
412	20	13	280	15	4	75	100	210
413	22	5	132	9	4	45	110	54
414	21	2	63	7	1	14	42	21

T/E COMPLEXITY INDEX  
ALL FRAMES COMBINED

(1) PARTICIPANT	(2) To	(3) Eo	(4) ToEo	(5) Tn	(6) En	(7) TnEn	(8) ToEn	(9) TnEo
415	19	3	76	7	3	28	76	28
416	19	15	304	9	3	36	76	144
417	25	10	275	15	0	15	25	165
418	25	6	175	7	2	21	75	49
419	26	1	52	9	1	18	52	18
420	18	6	126	11	0	11	18	77
421	17	12	221	13	8	117	153	169
422	14	35	504	10	4	50	70	360
423	25	13	350	12	3	48	100	168
424	14	13	196	12	1	24	28	168
425	17	3	68	10	0	10	17	40
426	17	16	289	8	4	40	85	136
427	21	0	21	13	4	65	105	13
428	18	3	72	12	3	48	72	48
429	13	26	351	13	8	117	117	351
430	19	3	76	13	3	52	76	52
431	22	4	110	6	0	6	22	30
432	18	8	162	10	2	30	54	90
433	16	1	32	6	2	18	48	12
434	16	3	64	8	0	8	16	32
435	19	1	38	8	1	16	38	16
436	14	17	252	14	9	140	140	252
437	22	7	176	7	2	21	66	56
438	16	12	208	11	0	11	16	143
439	16	1	32	13	2	39	48	26
440	14	11	168	9	1	18	28	108
501	24	17	432	16	6	112	168	288
502	13	2	39	8	1	16	26	24
503	23	10	253	10	2	30	69	110
504	18	17	324	15	7	120	144	270
505	16	0	16	9	2	27	48	9
506	16	3	64	7	1	14	32	28
507	19	8	171	13	0	13	19	117
508	14	3	56	6	0	6	14	24
509	13	2	39	5	1	10	26	15
510	12	1	24	8	1	16	24	16
511	21	3	84	9	1	18	42	36
512	19	0	19	4	1	8	38	4
513	15	2	45	7	0	7	15	21
514	15	1	30	6	0	6	15	12
515	14	1	28	6	0	6	14	12
516	18	33	612	10	10	110	198	340

T/E COMPLEXITY INDEX  
ALL FRAMES COMBINED

(1) PARTICIPANT	(2) To	(3) Eo	(4) ToEo	(5) Tn	(6) En	(7) TnEn	(8) ToEn	(9) TnEo
517	25	12	325	11	6	77	175	143
518	17	6	119	8	1	16	34	56
519	14	28	406	12	16	204	238	348
520	16	22	368	12	6	84	112	276
521	12	8	108	10	7	80	96	90
522	20	0	20	13	0	13	20	13
523	22	9	220	12	3	48	88	120
524	22	8	198	9	6	63	154	81
525	15	0	15	8	1	16	30	8
526	18	2	54	8	4	40	90	24
527	20	3	80	11	6	77	140	44
528	20	0	20	10	0	10	20	10
529	27	6	189	7	0	7	27	49
530	27	12	351	8	3	32	108	104
531	23	8	207	10	5	60	138	90
532	11	1	22	5	1	10	22	10
SUMMATION	2,743	1,235	26,372	1,232	412	5,116	10,823	12,751

T/E COMPLEXITY INDEX  
DECISION FRAME 1

(1) PARTICIPANT	(2) To	(3) Eo	(4) ToEo	(5) Tn	(6) En	(7) TnEn	(8) ToEn	(9) TnEo
101	1	3	4	1	2	3	3	4
102	3	1	6	4	4	20	15	8
103	1	1	2	2	4	10	5	4
104	1	0	1	1	0	1	1	1
105	1	1	2	2	0	2	1	4
106	2	2	6	2	0	2	2	6
107	1	1	2	2	2	6	3	4
108	2	2	6	3	4	15	10	9
109	1	1	2	3	1	6	2	6
110	1	2	3	2	1	4	2	6
111	1	1	2	2	0	2	1	4
112	1	1	2	2	2	6	3	4
113	2	0	2	2	0	2	2	2
114	1	2	3	2	0	2	1	6
115	3	4	15	4	0	4	3	20
116	2	1	4	1	0	1	2	2
117	1	1	2	3	0	3	1	6
118	1	3	4	2	0	2	1	8
119	2	0	2	1	0	1	2	1
120	1	1	2	2	0	2	1	4
121	2	0	2	3	0	3	2	3
122	2	2	6	4	1	8	4	12
123	2	1	4	2	2	6	6	4
124	2	2	6	3	0	3	2	9
125	2	0	2	3	2	9	6	3
126	2	1	4	2	1	4	4	4
127	1	1	2	2	4	10	5	4
128	2	2	6	2	3	8	8	6
129	1	3	4	3	0	3	1	12
130	4	1	8	3	1	6	8	6
131	3	1	6	5	4	25	15	10
132	1	1	2	2	0	2	1	4
133	3	3	12	3	0	3	3	12
134	2	0	2	2	0	2	2	2
135	1	0	1	3	4	15	5	3
136	1	2	3	4	0	4	1	12
137	2	1	4	2	3	8	8	4
138	2	1	4	2	0	2	2	4
139	3	0	3	2	0	2	3	2
201	6	0	6	3	0	3	6	3
202	4	1	8	2	0	2	4	4
203	2	0	2	4	4	20	10	4

T/E COMPLEXITY INDEX  
DECISION FRAME 1

(1) PARTICIPANT	(2) To	(3) Eo	(4) ToEo	(5) Tn	(6) En	(7) TnEn	(8) ToEn	(9) TnEo
204	3	2	9	2	1	4	6	6
205	4	0	4	4	0	4	4	4
206	1	1	2	3	0	3	1	6
207	1	0	1	2	0	2	1	2
208	1	2	3	2	0	2	1	6
209	1	0	1	2	0	2	1	2
210	3	1	6	3	0	3	3	6
211	1	0	1	2	0	2	1	2
212	2	1	4	2	0	2	2	4
213	1	0	1	2	0	2	1	2
214	1	0	1	2	1	4	2	2
215	3	0	3	2	0	2	3	2
216	1	0	1	2	2	6	3	2
217	1	1	2	2	0	2	1	4
218	2	1	4	3	0	3	2	6
219	2	2	6	14	4	70	10	42
220	2	0	2	3	0	3	2	3
221	2	0	2	3	0	3	2	3
222	1	2	3	2	3	8	4	6
223	1	1	2	3	0	3	1	6
224	1	2	3	4	0	4	1	12
225	2	1	4	3	0	3	2	6
226	2	0	2	1	0	1	2	1
227	1	0	1	1	4	5	5	1
228	1	0	1	1	0	1	1	1
229	3	0	3	2	0	2	3	2
230	1	0	1	2	0	2	1	2
231	1	0	1	2	0	2	1	2
401	2	0	2	2	0	2	2	2
402	3	0	3	2	0	2	3	2
403	2	0	2	1	0	1	2	1
404	2	0	2	1	0	1	2	1
405	1	1	2	3	0	3	1	6
406	1	1	2	1	0	1	1	2
407	1	1	2	1	0	1	1	2
408	2	0	2	1	2	3	6	1
409	2	1	4	3	1	6	4	6
410	3	0	3	1	2	3	9	1
411	2	1	4	1	1	2	4	2
412	4	2	12	6	2	18	12	18
413	2	0	2	3	0	3	2	3
414	2	0	2	2	0	2	2	2



T/E COMPLEXITY INDEX  
DECISION FRAME 1

(1) PARTICIPANT	(2) To	(3) Eo	(4) ToEo	(5) Tn	(6) En	(7) TnEn	(8) ToEn	(9) TnEo
415	2	3	8	2	2	6	6	8
416	4	0	4	3	1	6	8	3
417	4	0	4	6	0	6	4	6
418	1	1	2	2	1	4	2	4
419	3	0	3	2	0	2	3	2
420	1	1	2	4	0	4	1	8
421	2	1	4	4	4	20	10	8
422	1	2	3	2	0	2	1	6
423	3	0	3	3	1	6	6	3
424	3	0	3	4	0	4	3	4
425	2	1	4	2	0	2	2	4
426	3	0	3	2	0	2	3	2
427	2	0	2	5	4	25	10	5
428	2	0	2	4	1	8	4	4
429	2	1	4	3	4	15	10	6
430	2	0	2	2	2	6	6	2
431	2	1	4	2	0	2	2	4
432	3	2	9	3	1	6	6	9
433	2	0	2	2	1	4	4	2
434	2	1	4	2	0	2	2	4
435	4	0	4	2	0	2	4	2
436	1	1	2	3	2	9	3	6
437	2	1	4	2	0	2	2	4
438	2	1	4	4	0	4	2	8
439	2	0	2	7	0	7	2	7
440	3	0	3	3	0	3	3	3
501	2	1	4	5	4	25	10	10
502	2	0	2	4	0	4	2	4
503	2	1	4	5	0	5	2	10
504	2	0	2	5	4	25	10	5
505	2	0	2	4	2	12	6	4
506	1	1	2	2	1	4	2	4
507	2	1	4	4	0	4	2	8
508	1	0	1	1	0	1	1	1
509	2	1	4	2	0	2	2	4
510	2	0	2	2	0	2	2	2
511	2	1	4	2	1	4	4	4
512	1	0	1	1	0	1	1	1
513	2	2	6	2	0	2	2	6
514	1	0	1	1	0	1	1	1
515	2	0	2	2	0	2	2	2
516	2	0	2	1	4	5	10	1

T/E COMPLEXITY INDEX  
DECISION FRAME 1

(1) PARTICIPANT	(2) To	(3) Eo	(4) ToEo	(5) Tn	(6) En	(7) TnEn	(8) ToEn	(9) TnEo
517	2	2	6	3	4	15	10	9
518	1	0	1	2	0	2	1	2
519	3	0	3	2	4	10	15	2
520	2	2	6	2	4	10	10	6
521	2	1	4	4	3	16	8	8
522	3	0	3	5	0	5	3	5
523	5	0	5	3	2	9	15	3
524	3	0	3	2	4	10	15	2
525	2	0	2	2	0	2	2	2
526	2	1	4	2	4	10	10	4
527	2	1	4	2	4	10	10	4
528	2	0	2	3	0	3	2	3
529	3	1	6	2	0	2	3	4
530	3	0	3	2	2	6	9	2
531	3	0	3	3	4	15	15	3
532	1	0	1	1	0	1	1	1
SUMMATION	281	108	477	371	147	824	582	679

T/E COMPLEXITY INDEX  
DECISION FRAME 2

(1) PARTICIPANT	(2) To	(3) Eo	(4) ToEo	(5) Tn	(6) En	(7) TnEn	(8) ToEn	(9) TnEo
101	3	1	6	3	1	6	6	6
102	8	2	24	4	3	16	32	12
103	2	3	8	4	1	8	4	16
104	5	0	5	2	0	2	5	2
105	7	0	7	3	3	12	28	3
106	3	1	6	3	0	3	3	6
107	8	6	56	3	0	3	8	21
108	6	0	6	3	0	3	6	3
109	5	1	10	2	1	4	10	4
110	6	0	6	3	1	6	12	3
111	6	7	48	2	0	2	6	16
112	9	7	72	4	1	8	18	32
113	4	1	8	2	0	2	4	4
114	3	0	3	2	0	2	3	2
115	7	1	14	4	0	4	7	8
116	4	0	4	2	0	2	4	2
117	7	1	14	3	0	3	7	6
118	5	2	15	3	1	6	10	9
119	5	1	10	3	0	3	5	6
120	4	2	12	3	0	3	4	9
121	9	2	27	2	1	4	18	6
122	6	1	12	3	0	3	6	6
123	6	4	30	3	3	12	24	15
124	6	1	12	3	0	3	6	6
125	7	0	7	2	1	4	14	2
126	3	0	3	3	0	3	3	3
127	5	4	25	3	3	12	20	15
128	4	1	8	2	0	2	4	4
129	3	0	3	2	0	2	3	2
130	5	3	20	3	0	3	5	12
131	5	0	5	4	0	4	5	4
132	4	2	12	4	0	4	4	12
133	4	3	16	3	0	3	4	12
134	4	0	4	2	0	2	4	2
135	2	7	16	4	4	20	10	32
136	4	0	4	2	0	2	4	2
137	8	7	64	2	2	6	24	16
138	5	0	5	2	0	2	5	2
139	6	0	6	2	0	2	6	2
201	4	0	4	2	0	2	4	2
202	5	0	5	4	0	4	5	4
203	9	1	18	5	0	5	9	10

T/E COMPLEXITY INDEX  
DECISION FRAME 2

(1) PARTICIPANT	(2) To	(3) Eo	(4) ToEo	(5) Tn	(6) En	(7) TnEn	(8) ToEn	(9) TnEo
204	3	3	12	4	2	12	9	16
205	4	0	4	2	0	2	4	2
206	2	1	4	2	0	2	2	4
207	3	1	6	1	0	1	3	2
208	3	1	6	3	0	3	3	6
209	3	0	3	1	0	1	3	1
210	6	0	6	1	6	7	42	1
211	4	0	4	2	0	2	4	2
212	6	2	18	3	0	3	6	9
213	6	0	6	3	0	3	6	3
214	5	3	20	2	1	4	10	8
215	6	1	12	4	0	4	6	8
216	4	1	8	3	1	6	8	6
217	8	1	16	5	0	5	8	10
218	5	1	10	2	1	4	10	4
219	6	3	24	5	0	5	6	20
220	7	2	21	5	2	15	21	15
221	5	1	10	3	0	3	5	6
222	5	1	10	1	1	2	10	2
223	6	0	6	3	0	3	6	3
224	5	1	10	2	0	2	5	4
225	4	0	4	3	0	3	4	3
226	8	2	24	2	0	2	8	6
227	4	3	16	3	1	6	8	12
228	2	0	2	2	0	2	2	2
229	5	0	5	3	0	3	5	3
230	3	1	6	6	1	12	6	12
231	4	0	4	1	0	1	4	1
401	3	1	6	3	0	3	3	6
402	6	0	6	5	1	10	12	5
403	4	2	12	5	4	25	20	15
404	4	0	4	4	1	8	8	4
405	2	0	2	3	0	3	2	3
406	3	3	12	5	1	10	6	20
407	6	1	12	4	3	16	24	8
408	2	0	2	3	0	3	2	3
409	3	0	3	4	0	4	3	4
410	3	1	6	3	0	3	3	6
411	3	0	3	3	0	3	3	3
412	4	0	4	5	1	10	8	5
413	3	2	9	5	3	20	12	15
414	3	0	3	3	1	6	6	3

T/E COMPLEXITY INDEX  
DECISION FRAME 2

(1) PARTICIPANT	(2) To	(3) Eo	(4) ToEo	(5) Tn	(6) En	(7) TnEn	(8) ToEn	(9) TnEo
415	3	0	3	3	1	6	6	3
416	4	2	12	4	0	4	4	12
417	6	0	6	5	0	5	6	5
418	5	0	5	3	1	6	10	3
419	4	0	4	4	0	4	4	4
420	3	1	6	2	0	2	3	4
421	5	2	15	4	1	8	10	12
422	5	2	15	6	1	12	10	18
423	5	2	15	5	1	10	10	15
424	3	2	9	5	0	5	3	15
425	4	1	8	3	0	3	4	6
426	3	4	15	4	0	4	3	20
427	5	0	5	4	0	4	5	4
428	5	2	15	4	0	4	5	12
429	4	7	32	5	2	15	12	40
430	6	0	6	6	0	6	6	6
431	2	0	2	3	0	3	2	3
432	3	1	6	5	0	5	3	10
433	3	1	6	3	1	6	6	6
434	3	0	3	2	0	2	3	2
435	4	0	4	4	0	4	4	4
436	4	3	16	2	2	6	12	8
437	2	0	2	3	0	3	2	3
438	5	2	15	4	0	4	5	12
439	3	0	3	2	0	2	3	2
440	2	1	4	6	1	12	4	12
501	12	6	84	6	1	12	24	42
502	2	0	2	2	0	2	2	2
503	5	1	10	3	2	9	15	6
504	5	0	5	3	0	3	5	3
505	4	0	4	3	0	3	4	3
506	3	0	3	3	0	3	3	3
507	5	0	5	5	0	5	5	5
508	3	0	3	2	0	2	3	2
509	2	1	4	2	1	4	4	4
510	2	1	4	2	0	2	2	4
511	3	1	6	4	0	4	3	8
512	3	0	3	4	1	8	6	4
513	3	0	3	2	0	2	3	2
514	4	0	4	3	0	3	4	3
515	2	0	2	2	0	2	2	2
516	5	7	40	5	3	20	20	40

T/E COMPLEXITY INDEX  
DECISION FRAME 2

(1) PARTICIPANT	(2) To	(3) Eo	(4) ToEo	(5) Tn	(6) En	(7) TnEn	(8) ToEn	(9) TnEo
517	7	2	21	7	1	14	14	21
518	4	0	4	6	0	6	4	6
519	3	0	3	5	3	20	12	5
520	5	4	25	4	1	8	10	20
521	3	0	3	3	1	6	6	3
522	3	0	3	5	0	5	3	5
523	7	0	7	4	1	8	14	4
524	6	1	12	5	1	10	12	10
525	4	0	4	4	1	8	8	4
526	4	1	8	3	0	3	4	6
527	5	1	10	6	2	18	15	12
528	5	0	5	5	0	5	5	5
529	5	1	10	3	0	3	5	6
530	5	1	10	5	1	10	10	10
531	5	1	10	7	1	14	10	14
532	3	0	3	2	0	2	3	2
SUMMATION	640	173	1553	478	89	813	1080	1119

T/E COMPLEXITY INDEX  
DECISION FRAME 3

(1) PARTICIPANT	(2) To	(3) Eo	(4) ToEo	(5) Tn	(6) En	(7) TnEn	(8) ToEn	(9) TnEo
101	2	1	4	1	0	1	2	2
102	4	2	12	2	1	4	8	6
103	3	1	6	1	0	1	3	2
104	3	0	3	1	1	2	6	1
105	4	2	12	2	2	6	12	6
106	2	1	4	2	0	2	2	4
107	2	2	6	1	0	1	2	3
108	4	0	4	2	1	4	8	2
109	6	0	6	1	0	1	6	1
110	2	1	4	2	0	2	2	4
111	4	3	16	2	0	2	4	8
112	4	2	12	2	2	6	12	6
113	3	0	3	2	0	2	3	2
114	2	1	4	2	0	2	2	4
115	4	0	4	3	1	6	8	3
116	2	1	4	2	0	2	2	4
117	3	1	6	2	0	2	3	4
118	4	3	16	2	0	2	4	8
119	4	0	4	2	2	6	12	2
120	3	2	9	1	0	1	3	3
121	4	5	24	3	2	9	12	18
122	3	0	3	1	0	1	3	1
123	7	5	42	1	2	3	21	6
124	3	0	3	2	0	2	3	2
125	5	4	25	2	2	6	15	10
126	2	1	4	1	0	1	2	2
127	4	4	20	2	6	14	28	10
128	2	0	2	1	0	1	2	1
129	3	0	3	1	0	1	3	1
130	3	1	6	3	1	6	6	6
131	5	2	15	1	3	4	20	3
132	1	1	2	1	0	1	1	2
133	3	1	6	2	0	2	3	4
134	3	0	3	2	0	2	3	2
135	5	10	55	1	4	5	25	11
136	3	0	3	2	3	8	12	2
137	3	2	9	2	0	2	3	6
138	3	0	3	2	0	2	3	2
139	2	0	2	1	0	1	2	1
201	3	0	3	1	0	1	3	1
202	3	1	6	2	0	2	3	4
203	1	0	1	2	0	2	1	2

T/E COMPLEXITY INDEX  
DECISION FRAME 3

(1) PARTICIPANT	(2) To	(3) Eo	(4) ToEo	(5) Tn	(6) En	(7) TnEn	(8) ToEn	(9) TnEo
204	2	3	8	2	2	6	6	8
205	3	0	3	1	1	2	6	1
206	2	0	2	2	1	4	4	2
207	1	1	2	3	0	3	1	6
208	3	0	3	2	0	2	3	2
209	3	0	3	1	0	1	3	1
210	3	0	3	1	6	7	21	1
211	3	1	6	7	0	7	3	14
212	4	1	8	1	0	1	4	2
213	3	0	3	2	0	2	3	2
214	3	0	3	2	3	8	12	2
215	4	0	4	1	0	1	4	1
216	3	1	6	1	1	2	6	2
217	5	0	5	4	0	4	5	4
218	4	0	4	4	1	8	8	4
219	7	5	42	3	1	6	14	18
220	3	7	24	4	2	12	9	32
221	6	0	6	1	0	1	6	1
222	3	0	3	2	0	2	3	2
223	4	1	8	2	0	2	4	4
224	3	1	6	2	0	2	3	4
225	3	0	3	2	0	2	3	2
226	4	1	8	2	0	2	4	4
227	4	1	8	2	0	2	4	4
228	3	1	6	1	0	1	3	2
229	3	0	3	2	0	2	3	2
230	3	2	9	2	0	2	3	6
231	2	1	4	1	1	2	4	2
401	3	2	9	2	0	2	3	6
402	4	0	4	4	0	4	4	4
403	2	3	8	2	0	2	2	8
404	2	1	4	4	0	4	2	4
405	2	1	4	1	0	1	2	2
406	1	2	3	2	1	4	2	6
407	1	3	4	2	1	4	2	8
408	2	0	2	2	0	2	2	2
409	3	1	6	3	0	3	3	6
410	1	1	2	1	0	1	1	2
411	2	2	6	3	0	3	2	9
412	2	0	2	2	0	2	2	2
413	2	0	2	2	1	4	4	2
414	2	0	2	2	0	2	2	2



T/E COMPLEXITY INDEX  
DECISION FRAME 3

(1) PARTICIPANT	(2) To	(3) Eo	(4) ToEo	(5) Tn	(6) En	(7) TnEn	(8) ToEn	(9) TnEo
415	2	0	2	2	0	2	2	2
416	2	3	8	2	2	6	6	8
417	4	0	4	3	0	3	4	3
418	4	0	4	2	0	2	4	2
419	3	0	3	3	0	3	3	3
420	1	0	1	2	0	2	1	2
421	3	1	6	4	3	16	12	8
422	1	12	13	3	3	12	4	39
423	3	3	12	3	1	6	6	12
424	3	2	9	3	0	3	3	9
425	2	0	2	3	0	3	2	3
426	3	3	12	2	2	6	9	8
427	4	0	4	3	0	3	4	3
428	2	0	2	2	0	2	2	2
429	3	5	18	2	1	4	6	12
430	3	0	3	2	0	2	3	2
431	3	0	3	2	0	2	3	2
432	2	0	2	3	1	6	4	3
433	2	0	2	2	0	2	2	2
434	3	1	6	2	0	2	3	4
435	2	0	2	2	1	4	4	2
436	3	2	9	6	1	12	6	18
437	5	1	10	2	0	2	5	4
438	3	1	6	2	0	2	3	4
439	2	0	2	2	0	2	2	2
440	1	0	1	1	0	1	1	1
501	3	0	3	7	1	14	6	7
502	2	1	4	2	1	4	4	4
503	3	1	6	3	0	3	3	6
504	4	1	8	3	1	6	8	6
505	2	0	2	2	0	2	2	2
506	3	0	3	1	0	1	3	1
507	4	1	8	4	0	4	4	8
508	2	1	4	2	0	2	2	4
509	2	0	2	1	0	1	2	1
510	2	0	2	2	1	4	4	2
511	2	1	4	2	0	2	2	4
512	4	0	4	1	0	1	4	1
513	2	0	2	2	0	2	2	2
514	2	0	2	2	0	2	2	2
515	1	1	2	2	0	2	1	4
516	0	16	0	2	3	8	0	34

T/E COMPLEXITY INDEX  
DECISION FRAME 3

(1) PARTICIPANT	(2) To	(3) Eo	(4) ToEo	(5) Tn	(6) En	(7) TnEn	(8) ToEn	(9) TnEo
517	4	0	4	4	1	8	8	4
518	4	1	8	3	1	6	8	6
519	2	5	12	3	2	9	6	18
520	4	2	12	4	1	8	8	12
521	3	0	3	3	2	9	9	3
522	5	0	5	4	0	4	5	4
523	4	1	8	2	0	2	4	4
524	4	1	8	3	1	6	8	6
525	2	0	2	2	0	2	2	2
526	2	0	2	2	0	2	2	2
527	3	0	3	3	0	3	3	3
528	4	0	4	2	0	2	4	2
529	4	1	8	3	0	3	4	6
530	3	0	3	3	0	3	3	3
531	5	1	10	2	0	2	5	4
532	2	1	4	1	1	2	4	2
SUMMATION	421	173	945	310	86	504	703	703

T/E COMPLEXITY INDEX  
DECISION FRAME 4

(1) PARTICIPANT	(2) To	(3) Eo	(4) ToEo	(5) Tn	(6) En	(7) TnEn	(8) ToEn	(9) TnEo
101	9	7	72	4	2	12	27	32
102	13	10	143	5	0	5	13	55
103	7	10	77	3	1	6	14	33
104	16	1	32	3	1	6	32	6
105	9	9	90	3	0	3	9	30
106	6	6	42	3	2	9	18	21
107	8	7	64	3	3	12	32	24
108	16	5	96	3	2	9	48	18
109	15	2	45	3	0	3	15	9
110	10	8	90	3	0	3	10	27
111	13	5	78	2	0	2	13	12
112	9	9	90	3	3	12	36	30
113	11	2	33	3	0	3	11	9
114	11	10	121	9	1	18	22	99
115	12	6	84	3		3	12	21
116	6	1	12	3	0	3	6	6
117	16	1	32	3	0	3	16	6
118	9	11	108	4	1	8	18	48
119	9	1	18	3	0	3	9	6
120	7	5	42	6	0	6	7	36
121	16	12	208	1	0	1	16	13
122	20	7	160	2	1	4	40	16
123	15	7	120	4	1	8	30	32
124	18	4	90	4	0	4	18	20
125	9	9	90	2	4	10	45	20
126	8	2	24	3	2	9	24	9
127	11	12	143	2	4	10	55	26
128	10	3	40	3	0	3	10	12
129	8	7	64	3	1	6	16	24
130	12	10	132	4	2	12	36	44
131	17	10	187	4	3	16	68	44
132	8	6	56	3	0	3	8	21
133	9	10	99	3	0	3	9	33
134	13	3	52	3	0	3	13	12
135	3	21	66	7	5	42	18	154
136	9	5	54	1	0	1	9	6
137	9	7	72	3	2	9	27	24
138	10	12	130	3	0	3	10	39
139	13	6	91	3	0	3	13	21
201	12	0	12	3	0	3	12	3
202	5	23	120	3	1	6	10	72
203	13	11	156	4	1	8	26	48

T/E COMPLEXITY INDEX  
DECISION FRAME 4

(1) PARTICIPANT	(2) To	(3) Eo	(4) ToEo	(5) Tn	(6) En	(7) TnEn	(8) ToEn	(9) TnEo
204	7	7	56	5	0	5	7	40
205	14	0	14	4	0	4	14	4
206	7	1	14	3	0	3	7	6
207	8	0	8	2	0	2	8	2
208	4	23	96	3	6	21	28	72
209	5	0	5	3	0	3	5	3
210	16	1	32	3	0	3	16	6
211	8	1	16	2	0	2	8	4
212	11	0	11	5	0	5	11	5
213	10	1	20	1	0	1	10	2
214	10	1	20	4	0	4	10	8
215	10	0	10	5	0	5	10	5
216	7	8	63	3	0	3	7	27
217	13	8	117	5	1	10	26	45
218	14	3	56	4	0	4	14	16
219	9	13	126	2	4	10	45	28
220	13	8	117	3	0	3	13	27
221	7	1	14	7	0	7	7	14
222	6	11	72	2	0	2	6	24
223	12	1	24	5	1	10	24	10
224	12	2	36	3	0	3	12	9
225	5	9	50	3	0	3	5	30
226	13	4	65	3	0	3	13	15
227	12	2	36	2	0	2	12	6
228	8	1	16	6	0	6	8	12
229	15	1	30	5	0	5	15	10
230	7	0	7	3	0	3	7	3
231	11	0	11	4	0	4	11	4
401	8	6	56	4	0	4	8	28
402	5	10	55	5	0	5	5	55
403	4	14	60	8	2	24	12	120
404	8	1	16	3	0	3	8	6
405	10	0	10	5	0	5	10	5
406	10	12	130	3	0	3	10	39
407	10	6	70	2	0	2	10	14
408	11	2	33	3	2	9	33	9
409	9	5	54	7	3	28	36	42
410	9	1	18	4	0	4	9	8
411	12	5	72	4	1	8	24	24
412	10	11	120	7	1	14	20	84
413	15	3	60	4	0	4	15	16
414	14	2	42	3	0	3	14	9

T/E COMPLEXITY INDEX  
DECISION FRAME 4

(1) PARTICIPANT	(2) To	(3) Eo	(4) ToEo	(5) Tn	(6) En	(7) TnEn	(8) ToEn	(9) TnEo
415	12	0	12	3	0	3	12	3
416	9	10	99	4	0	4	9	44
417	11	10	121	6	0	6	11	66
418	15	5	90	3	0	3	15	18
419	16	1	32	4	1	8	32	8
420	13	4	65	5	0	5	13	25
421	7	8	63	5	0	5	7	45
422	7	19	140	5	0	5	7	100
423	14	8	126	6	0	6	14	54
424	5	9	50	5	1	10	10	50
425	9	1	18	5	0	5	9	10
426	8	9	80	4	2	12	24	40
427	10	0	10	5	0	5	10	5
428	9	1	18	6	2	18	27	12
429	4	13	56	8	1	16	8	112
430	8	3	32	9	1	18	16	36
431	15	3	60	2	0	2	15	8
432	10	5	60	4	0	4	10	24
433	9	0	9	2	0	2	9	2
434	8	1	16	4	0	4	8	8
435	9	1	18	4	0	4	9	8
436	6	11	72	5	4	25	30	60
437	13	5	78	3	2	9	39	18
438	6	8	54	5	0	5	6	45
439	9	1	18	4	2	12	27	8
440	8	10	88	5	0	5	8	55
501	7	10	77	4	0	4	7	44
502	7	1	14	2	0	2	7	4
503	13	7	104	2	0	2	13	16
504	7	16	119	7	2	21	21	119
505	8	0	8	3	0	3	8	3
506	9	2	27	4	0	4	9	12
507	8	6	56	5	0	5	8	35
508	8	2	24	3	0	3	8	9
509	7	0	7	2	0	2	7	2
510	6	0	6	4	0	4	6	4
511	14	0	14	5	0	5	14	5
512	11	0	11	2	0	2	11	2
513	8	0	8	3	0	3	8	3
514	8	1	16	3	0	3	8	6
515	9	0	9	2	0	2	9	2
516	11	10	121	7	0	7	11	77

T/E COMPLEXITY INDEX  
DECISION FRAME 4

(1) PARTICIPANT	(2) To	(3) Eo	(4) ToEo	(5) Tn	(6) En	(7) TnEn	(8) ToEn	(9) TnEo
517	12	8	108	4	0	4	12	36
518	8	5	48	3	0	3	8	18
519	6	23	144	7	7	56	48	168
520	5	14	75	6	0	6	5	90
521	4	7	32	3	1	6	8	24
522	9	0	9	4	0	4	9	4
523	6	8	54	7	0	7	6	63
524	9	6	63	4	0	4	9	28
525	7	0	7	4	0	4	7	4
526	10	0	10	4	0	4	10	4
527	10	1	20	6	0	6	10	12
528	9	0	9	5	0	5	9	5
529	15	3	60	2	0	2	15	8
530	16	11	192	3	0	3	16	36
531	10	6	70	5	0	5	10	35
532	5	0	5	3	0	3	5	3
SUMMATION	1401	781	8,485	551	90	943	2,181	3,862

APPENDIX C  
WILCOXON TEST

Formula:

$$A = 0 + z(1-\alpha) \sqrt{\frac{N(N+1)(2N+1)}{6}}$$

where:

$$\alpha = a = .01$$

All Frames Combined:

$$A = 0 + z(.99) \sqrt{\frac{N(N+1)(2N+1)}{6}}$$

$$A = 0 + 2.326 \sqrt{\frac{142(142+1)(2 \times 142+1)}{6}}$$

$$A = 2196$$

====

Decision Frame 1:

$$A = 0 + z(.99) \sqrt{\frac{N(N+1)(2N+1)}{6}}$$

$$A = 0 + 2.326 \sqrt{\frac{117(117+1)(2 \times 117+1)}{6}}$$

$$A = 1710.42$$

=====



Decision Frame 2:

$$A = 0 + z(.99) \sqrt{\frac{N(N+1)(2N+1)}{6}}$$

$$A = 0 + 2.326 \sqrt{\frac{124(124+1)(2 \times 124+1)}{6}}$$

$$A = 1865.52$$

=====

Decision Frame 3:

$$A = 0 + z(.99) \sqrt{\frac{N(N+1)(2N+1)}{6}}$$

$$A = 0 + 2.326 \sqrt{\frac{119(119+1)(2 \times 119+1)}{6}}$$

$$A = 1754.27$$

=====

## WILCOXON TEST CALCULATIONS

Decision Frame 4:

$$A = 0 + z(.99) \sqrt{\frac{N(N+1)(2N+1)}{6}}$$

$$A = 0 + 2.326 \sqrt{\frac{141(141+1)(2 \times 141+1)}{6}}$$

$$A = 2260.38$$

=====

WILCOXON TEST  
ALL FRAMES COMBINED

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
PARTICIPANT	To	EO	Yi ToEO	Tn	En	Xi TnEn	(Yi-Xi) Di	Rank	Signed Rank
101	15	12	195	6	5	36	159	86	86
102	28	15	448	11	8	99	349	131	131
103	13	15	208	6	6	42	166	90	90
104	25	1	50	5	2	15	35	31.5	31.5
105	21	12	273	7	5	42	231	107.5	107.5
106	13	10	143	7	2	21	122	69	69
107	19	16	323	6	5	36	287	121	121
108	28	7	224	8	7	64	160	87	87
109	27	4	135	7	2	21	114	65	65
110	19	11	228	7	2	21	207	102	102
111	24	16	408	6	0	6	402	137	137
112	23	19	460	7	8	63	397	135	135
113	20	3	80	7	0	7	73	55	55
114	17	13	238	13	1	26	212	104	104
115	26	11	312	10	1	20	292	122	122
116	14	3	56	6	0	6	50	47	47
117	27	4	135	8	0	8	127	70	70
118	19	19	380	8	2	24	356	133	133
119	20	2	60	6	2	18	42	37.5	37.5
120	15	10	165	9	0	9	156	84	84
121	31	19	620	7	3	28	592	142	142
122	31	10	341	7	2	21	320	126.5	126.5
123	30	17	540	7	8	63	477	140	140
124	29	7	232	9	0	9	223	105.5	105.5
125	23	13	322	7	9	70	252	113	113
126	15	4	75	6	3	24	51	49	49
127	21	21	462	6	17	108	354	132	132
128	18	6	126	6	3	24	102	58	58
129	15	10	165	7	1	14	151	80	80
130	24	15	384	10	4	50	334	128.5	128.5
131	30	13	420	10	10	110	310	124	124
132	14	10	154	6	0	6	148	78	78
133	19	17	342	8	0	8	334	128.5	128.5
134	22	3	88	7	0	7	81	56	56
135	11	38	429	11	17	198	231	107.5	107.5
136	17	7	136	7	3	28	108	63	63
137	22	17	396	7	7	56	340	130	130
138	20	13	280	7	0	7	273	118	118
139	24	6	168	6	0	6	162	88	88
201	25	0	25	7	0	7	18	15	15
202	17	25	442	7	1	14	428	138	138

WILCOXON TEST  
ALL FRAMES COMBINED

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
PARTICIPANT	To	Et	ToEt	Tn	En	TnEn	(Yi-Xi) Di	Rank	Signed Rank
203	25	12	325	10	5	60	265	115	115
204	15	15	240	9	5	54	186	95	95
205	25	0	25	9	1	18	7	5.5	5.5
206	12	3	48	8	1	16	32	27	27
207	13	2	39	7	0	7	32	27	27
208	11	26	297	7	6	49	248	110.5	110.5
209	12	0	12	6	0	6	6	3	3
210	28	2	84	7	12	91	7	5.5	-5.5
211	16	2	48	11	0	11	37	34	34
212	23	4	115	8	0	8	107	62	62
213	20	1	40	5	0	5	35	31.5	31.5
214	19	4	95	8	5	48	47	42	42
215	23	1	46	8	0	8	38	35.5	35.5
216	15	10	165	6	4	30	135	72.5	72.5
217	27	10	297	11	1	22	275	119	119
218	25	5	150	11	2	33	117	67.5	67.5
219	24	23	576	19	9	190	386	134	134
220	25	17	450	10	4	50	400	136	136
221	20	2	60	11	0	11	49	44.5	44.5
222	15	14	225	6	4	30	195	97	97
223	23	3	92	10	1	20	72	54	54
224	21	6	147	9	0	9	138	74	74
225	14	10	154	8	0	8	146	75	75
226	27	7	216	6	0	6	210	103	103
227	21	6	147	5	5	30	117	67.5	67.5
228	14	2	42	8	0	8	34	29.5	29.5
229	26	1	52	9	0	9	43	39	39
230	14	3	56	7	1	14	42	37.5	37.5
231	18	1	36	7	1	14	22	18	18
401	16	9	160	8	0	8	152	81	81
402	18	10	198	11	1	22	176	93	93
403	12	19	240	11	6	77	163	89	89
404	16	2	48	8	1	16	32	27	27
405	15	2	45	9	0	9	36	33	33
406	15	18	285	6	2	18	267	116	116
407	18	11	216	5	4	25	191	96	96
408	17	2	51	6	4	30	21	16	16
409	17	7	136	13	4	65	71	53	53
410	16	3	64	6	2	18	46	41	41
411	19	8	171	8	2	24	147	76.5	76.5
412	20	13	280	15	4	75	205	101	101

WILCOXON TEST  
ALL FRAMES COMBINED

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
PARTICIPANT	To	Es	Yi ToEs	Tn	En	$\bar{X}_i$ TnEn	(Yi-Xi) Di	Rank	Signed Rank
413	22	5	132	9	4	45	87	57	57
414	21	2	63	7	1	14	49	44.5	44.5
415	19	3	76	7	3	28	48	43	43
416	19	15	304	9	3	36	268	117	117
417	25	10	275	15	0	15	260	114	114
418	25	6	175	7	2	21	154	82	82
419	26	1	52	9	1	18	34	29.5	29.5
420	18	6	126	11	0	11	115	66	66
421	17	12	221	13	8	117	104	60.5	60.5
422	14	35	504	10	4	50	454	139	139
423	25	13	350	12	3	48	302	123	123
424	14	13	196	12	1	24	172	91.5	91.5
425	17	5	68	10	0	10	58	51	51
426	17	16	289	8	4	40	249	112	112
427	21	0	21	13	4	65	44	40	-40
428	18	3	72	12	3	48	24	22	22
429	13	26	351	13	8	117	234	109	109
430	19	3	76	13	3	52	24	22	22
431	22	4	110	6	0	6	104	60.5	60.5
432	18	8	162	10	2	30	132	71	71
433	16	1	32	6	2	18	14	13.5	13.5
434	16	3	64	8	0	8	56	50	50
435	19	1	38	8	1	16	22	18	18
436	14	17	252	14	9	140	112	64	64
437	22	7	176	7	2	21	155	83	83
438	16	12	208	11	0	11	197	98	98
439	16	1	32	13	2	39	7	5.5	-5.5
440	14	11	168	9	1	18	150	79	79
501	24	17	432	16	6	112	320	126.5	126.5
502	13	2	39	8	1	16	23	20	20
503	23	10	253	10	2	30	223	105.5	105.5
504	18	17	324	15	7	120	204	100	100
505	16	0	16	9	2	27	11	10.5	-10.5
506	16	3	64	7	1	14	50	47	47
507	19	8	171	13	0	13	158	85	85
508	14	3	56	6	0	6	50	47	47
509	13	2	39	5	1	10	29	25	25
510	12	1	24	8	1	16	8	8	8
511	21	3	84	9	1	18	66	52	52
512	19	0	19	4	1	8	11	10.5	10.5
513	15	2	45	7	0	7	38	35.5	35.5

WILCOXON TEST  
ALL FRAMES COMBINED

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
PARTICIPANT	To	Eo	Yi ToEo	Tn	En	Xi TnEn	(Yi-Xi) Di	Rank	Signed Rank
514	15	1	30	6	0	6	24	22	22
515	14	1	28	6	0	6	22	18	18
516	18	33	612	10	10	110	502	141	141
517	25	12	325	11	6	77	248	110.5	110.5
518	17	6	119	8	1	16	103	59	59
519	14	28	406	12	16	204	202	99	99
520	16	22	368	12	6	84	284	120	120
521	12	8	108	10	7	80	28	24	24
522	20	0	20	13	0	13	7	5.5	5.5
523	22	9	220	12	3	48	172	91.5	91.5
524	22	8	198	9	6	63	135	72.5	72.5
525	15	0	15	8	1	16	1	1	-1
526	18	2	54	8	4	40	14	13.5	13.5
527	20	3	80	11	6	77	3	2	2
528	20	0	20	10	0	10	10	9	9
529	27	6	189	7	0	7	182	94	94
530	27	12	351	8	3	32	319	125	125
531	23	8	207	10	5	60	147	76.5	76.5
532	11	1	22	5	1	10	12	12	12
SUMMATION	2,743	1,235	26,372	1,232	412	5,116			

Number of ranks (N)

142

Sum of signed ranks (T)

10,028

WILCOXON TEST  
DECISION FRAME 1

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
PARTICIPANT	To	EO	Yi ToEo	Tn	En	Xi TnEn	(Yi-Xi) Di	Rank	Signed Rank
101	1	3	4	1	2	3	1	21	21
102	3	1	6	4	4	20	14	109.5	-109.5
103	1	1	2	2	4	10	8	99.5	-99.5
104	1	0	1	1	0	1	0		
105	1	1	2	2	0	2	0		
106	2	2	6	2	0	2	4	80	80
107	1	1	2	2	2	6	4	80	-80
108	2	2	6	3	4	15	9	102	-102
109	1	1	2	3	1	6	4	80	-80
110	1	2	3	2	1	4	1	21	-21
111	1	1	2	2	0	2	0		
112	1	1	2	2	2	6	4	80	-80
113	2	0	2	2	0	2	0		
114	1	2	3	2	0	2	1	21	21
115	3	4	15	4	0	4	11	105.5	105.5
116	2	1	4	1	0	1	3	70	70
117	1	1	2	3	0	3	1	21	-21
118	1	3	4	2	0	2	2	53.5	53.5
119	2	0	2	1	0	1	1	21	21
120	1	1	2	2	0	2	0		
121	2	0	2	3	0	3	1	21	-21
122	2	2	6	4	1	8	2	53.5	-53.5
123	2	1	4	2	2	6	2	53.5	-53.5
124	2	2	6	3	0	3	3	70	70
125	2	0	2	3	2	9	7	96.5	-96.5
126	2	1	4	2	1	4	0		
127	1	1	2	2	4	10	8	99.5	-99.5
128	2	2	6	2	3	8	2	53.5	-53.5
129	1	3	4	3	0	3	1	21	21
130	4	1	8	3	1	6	2	53.5	53.5
131	3	1	6	5	4	25	19	113	-113
132	1	1	2	2	0	2	0		
133	3	3	12	3	0	3	9	102	102
134	2	0	2	2	0	2	0		
135	1	0	1	3	4	15	14	109.5	-109.5
136	1	2	3	4	0	4	1	21	-21
137	2	1	4	2	3	8	4	80	-80
138	2	1	4	2	0	2	2	53.5	53.5
139	3	0	3	2	0	2	1	21	21
201	6	0	6	3	0	3	3	70	70
202	4	1	8	2	0	2	6	92	92

WILCOXON TEST  
DECISION FRAME 1

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
PARTICIPANT	$T_0$	$E_0$	$Y_i$ $T_0 E_0$	$T_n$	$E_n$	$T_n E_n$	$X_i$ $(Y_i - X_i)$ $D_i$	Rank	Signed Rank
203	2	0	2	4	4	20	18	112	-112
204	3	2	9	2	1	4	5	87.5	87.5
205	4	0	4	4	0	4	0		
206	1	1	2	3	0	3	1	21	-21
207	1	0	1	2	0	2	1	21	-21
208	1	2	3	2	0	2	1	21	21
209	1	0	1	2	0	2	1	21	-21
210	3	1	6	3	0	3	3	70	70
211	1	0	1	2	0	2	1	21	-21
212	2	1	4	2	0	2	2	53.5	53.5
213	1	0	1	2	0	2	1	21	-21
214	1	0	1	2	1	4	3	70	-70
215	3	0	3	2	0	2	1	21	21
216	1	0	1	2	2	6	5	87.5	-87.5
217	1	1	2	2	0	2	0		
218	2	1	4	3	0	3	1	21	21
219	2	2	6	14	4	70	64	117	-117
220	2	0	2	3	0	3	1	21	-21
221	2	0	2	3	0	3	1	21	-21
222	1	2	3	2	3	8	5	87.5	-87.5
223	1	1	2	3	0	3	1	21	-21
224	1	2	3	4	0	4	1	21	-21
225	2	1	4	3	0	3	1	21	21
226	2	0	2	1	0	1	1	21	21
227	1	0	1	1	4	5	4	80	-80
228	1	0	1	1	0	1	0		
229	3	0	3	2	0	2	1	21	21
230	1	0	1	2	0	2	1	21	-21
231	1	0	1	2	0	2	1	21	-21
401	2	0	2	2	0	2	0		
402	3	0	3	2	0	2	1	21	21
403	2	0	2	1	0	1	1	21	21
404	2	0	2	1	0	1	1	21	21
405	1	1	2	3	0	3	1	21	-21
406	1	1	2	1	0	1	1	21	21
407	1	1	2	1	0	1	1	21	21
408	2	0	2	1	2	3	1	21	-21
409	2	1	4	3	1	6	2	53.5	-53.5
410	3	0	3	1	2	3	0		
411	2	1	4	1	1	2	2	53.5	53.5
412	4	2	12	6	2	18	6	92	-92



WILCOXON TEST  
DECISION FRAME 1

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
PARTICIPANT	To	Eo	Yi ToEo	Tn	En	Xi TnEn	(Yi-Xi) Di	Rank	Signed Rank
413	2	0	2	3	0	3	1	21	-21
414	2	0	2	2	0	2	0		
415	2	3	8	2	2	6	2	53.5	53.5
416	4	0	4	3	1	6	2	53.5	-53.5
417	4	0	4	6	0	6	2	53.5	-53.5
418	1	1	2	2	1	4	2	53.5	-53.5
419	3	0	3	2	0	2	1	21	21
420	1	1	2	4	0	4	2	53.5	-53.5
421	2	1	4	4	4	20	16	111	-111
422	1	2	3	2	0	2	1	21	21
423	3	0	3	3	1	6	3	70	-70
424	3	0	3	4	0	4	1	21	-21
425	2	1	4	2	0	2	2	53.5	53.5
426	3	0	3	2	0	2	1	21	21
427	2	0	2	5	4	25	23	115.5	-115.5
428	2	0	2	4	1	8	6	92	-92
429	2	1	4	3	4	15	11	105.5	-105.5
430	2	0	2	2	2	6	4	80	-80
431	2	1	4	2	0	2	2	53.5	53.5
432	3	2	9	3	1	6	3	70	70
433	2	0	2	2	1	4	2	53.5	-53.5
434	2	1	4	2	0	2	2	53.5	53.5
435	4	0	4	2	0	2	2	53.5	53.5
436	1	1	2	3	2	9	7	96.5	-96.5
437	2	1	4	2	0	2	2	53.5	53.5
438	2	1	4	4	0	4	0		
439	2	0	2	7	0	7	5	87.5	-87.5
440	3	0	3	3	0	3	0		
501	2	1	4	5	4	25	21	114	-114
502	2	0	2	4	0	4	2	53.5	-53.5
503	2	1	4	5	0	5	1	21	-21
504	2	0	2	5	4	25	23	115.5	-115.5
505	2	0	2	4	2	12	10	104	-104
506	1	1	2	2	1	4	2	53.5	-53.5
507	2	1	4	4	0	4	0		
508	1	0	1	1	0	1	0		
509	2	1	4	2	0	2	2	53.5	53.5
510	2	0	2	2	0	2	0		
511	2	1	4	2	1	4	0		
512	1	0	1	1	0	1	0		
513	2	2	6	2	0	2	4	80	80

WILCOXON TEST  
DECISION FRAME 1

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
PARTICIPANT	To	EO	Yi ToEo	Tn	En	Xi TnEn	(Yi-Xi) Di	Rank	Signed Rank
514	1	0	1	1	0	1	0		
515	2	0	2	2	0	2	0		
516	2	0	2	1	4	5	3	70	-70
517	2	2	6	3	4	15	9	102	-102
518	1	0	1	2	0	2	1	21	-21
519	3	0	3	2	4	10	7	96.5	-96.5
520	2	2	6	2	4	10	4	80	-80
521	2	1	4	4	3	16	12	107.5	-107.5
522	3	0	3	5	0	5	2	53.5	-53.5
523	5	0	5	3	2	9	4	80	-80
524	3	0	3	2	4	10	7	96.5	-96.5
525	2	0	2	2	0	2	0		
526	2	1	4	2	4	10	6	92	-92
527	2	1	4	2	4	10	6	92	-92
528	2	0	2	3	0	3	1	21	-21
529	3	1	6	2	0	2	4	80	80
530	3	0	3	2	2	6	3	70	-70
531	3	0	3	3	4	15	12	107.5	-107.5
532	1	0	1	1	0	1	0		
SUMMATION	281	108	477	371	147	824			

Number of ranks (N)            117  
\*\*\*\*\*

Sum of signed ranks (T)            (2,867)  
\*\*\*\*\*

WILCOXON TEST  
DECISION FRAME 2

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
PARTICIPANT	To	EO	Yi ToEo	Tn	En	Xi TnEn	(Yi-Xi) Di	Rank	Signed Rank
101	3	1	6	3	1	6	0		
102	8	2	24	4	3	16	8	87.5	87.5
103	2	3	8	4	1	8	0		
104	5	0	5	2	0	2	3	49	49
105	7	0	7	3	3	12	5	68.5	-68.5
106	3	1	6	3	0	3	3	49	49
107	8	6	56	3	0	3	53	121	121
108	6	0	6	3	0	3	3	49	49
109	5	1	10	2	1	4	6	75	75
110	6	0	6	3	1	6	0		
111	6	7	48	2	0	2	46	120	120
112	9	7	72	4	1	8	64	123	123
113	4	1	8	2	0	2	6	75	75
114	3	0	3	2	0	2	1	12.5	12.5
115	7	1	14	4	0	4	10	97	97
116	4	0	4	2	0	2	2	33	33
117	7	1	14	3	0	3	11	101.5	101.5
118	5	2	15	3	1	6	9	93.5	93.5
119	5	1	10	3	0	3	7	81	81
120	4	2	12	3	0	3	9	93.5	93.5
121	9	2	27	2	1	4	23	119	119
122	6	1	12	3	0	3	9	93.5	93.5
123	6	4	30	3	3	12	18	115	115
124	6	1	12	3	0	3	9	93.5	93.5
125	7	0	7	2	1	4	3	49	49
126	3	0	3	3	0	3	0		
127	5	4	25	3	3	12	13	106.5	106.5
128	4	1	8	2	0	2	6	75	75
129	3	0	3	2	0	2	1	12.5	12.5
130	5	3	20	3	0	3	17	112.5	112.5
131	5	0	5	4	0	4	1	12.5	12.5
132	4	2	12	4	0	4	8	87.5	87.5
133	4	3	16	3	0	3	13	106.5	106.5
134	4	0	4	2	0	2	2	33	33
135	2	7	16	4	4	20	4	61	-61
136	4	0	4	2	0	2	2	33	33
137	8	7	64	2	2	6	58	122	122
138	5	0	5	2	0	2	3	49	49
139	6	0	6	2	0	2	4	61	61
201	4	0	4	2	0	2	2	33	33
202	5	0	5	4	0	4	1	12.5	12.5

WILCOXON TEST  
DECISION FRAME 2

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
PARTICIPANT	To	Es	Yi ToEs	Tn	En	Xi TnEn	(Yi-Xi) Di	Rank	Signed Rank
203	9	1	16	5	0	5	13	106.5	106.5
204	3	3	12	4	2	12	0		
205	4	0	4	2	0	2	2	33	33
206	2	1	4	2	0	2	2	33	33
207	3	1	6	1	0	1	5	68.5	68.5
208	3	1	6	3	0	3	3	49	49
209	3	0	3	1	0	1	2	33	33
210	6	0	6	1	6	7	1	12.5	-12.5
211	4	0	4	2	0	2	2	33	33
212	6	2	18	3	0	3	15	109	109
213	6	0	6	3	0	3	3	49	49
214	5	3	20	2	1	4	16	110	110
215	6	1	12	4	0	4	8	87.5	87.5
216	4	1	8	3	1	6	2	33	-33
217	8	1	16	5	0	5	11	101.5	101.5
218	5	1	10	2	1	4	6	75	75
219	6	3	24	5	0	5	19	116	116
220	7	2	21	5	2	15	6	75	75
221	5	1	10	3	0	3	7	81	81
222	5	1	10	1	1	2	8	87.5	87.5
223	6	0	6	3	0	3	3	49	49
224	5	1	10	2	0	2	8	87.5	87.5
225	4	0	4	3	0	3	1	12.5	12.5
226	8	2	24	2	0	2	22	118	118
227	4	3	16	3	1	6	10	97	97
228	2	0	2	2	0	2	0		
229	5	0	5	3	0	3	2	33	33
230	3	1	6	6	1	12	6	75	-75
231	4	0	4	1	0	1	3	49	49
401	3	1	6	3	0	3	3	49	49
402	6	0	6	5	1	10	4	61	-61
403	4	2	12	5	4	25	13	106.5	-106.5
404	4	0	4	4	1	8	4	61	-61
405	2	0	2	3	0	3	1	12.5	-12.5
406	3	3	12	5	1	10	2	33	33
407	6	1	12	4	3	16	4	61	-61
408	2	0	2	3	0	3	1	12.5	-12.5
409	3	0	3	4	0	4	1	12.5	-12.5
410	3	1	6	3	0	3	3	49	49
411	3	0	3	3	0	3	0		
412	4	0	4	5	1	10	6	75	-75

WILCOXON TEST  
DECISION FRAME 2

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
PARTICIPANT	To	EO	Yi ToEo	Tn	En	Xi TnEn	(Yi-Xi) Di	Rank	Signed Rank
413	3	2	9	5	3	20	11	101.5	-101.5
414	3	0	3	3	1	6	3	49	-49
415	3	0	3	3	1	6	3	49	-49
416	4	2	12	4	0	4	8	87.5	87.5
417	6	0	6	5	0	5	1	12.5	12.5
418	5	0	5	3	1	6	1	12.5	-12.5
419	4	0	4	4	0	4	0		
420	3	1	6	2	0	2	4	61	61
421	5	2	15	4	1	8	7	81	81
422	5	2	15	6	1	12	3	49	49
423	5	2	15	5	1	10	5	68.5	68.5
424	3	2	9	5	0	5	4	61	61
425	4	1	8	3	0	3	5	68.5	68.5
426	3	4	15	4	0	4	11	101.5	101.5
427	5	0	5	4	0	4	1	12.5	12.5
428	5	2	15	4	0	4	11	101.5	101.5
429	4	7	32	5	2	15	17	112.5	112.5
430	6	0	6	6	0	6	0		
431	2	0	2	3	0	3	1	12.5	-12.5
432	3	1	6	5	0	5	1	12.5	12.5
433	3	1	6	3	1	6	0		
434	3	0	3	2	0	2	1	12.5	12.5
435	4	0	4	4	0	4	0		
436	4	3	16	2	2	6	10	97	97
437	2	0	2	3	0	3	1	12.5	-12.5
438	5	2	15	4	0	4	11	101.5	101.5
439	3	0	3	2	0	2	1	12.5	12.5
440	2	1	4	6	1	12	8	87.5	-87.5
501	12	6	84	6	1	12	72	124	124
502	2	0	2	2	0	2	0		
503	5	1	10	3	2	9	1	12.5	12.5
504	5	0	5	3	0	3	2	33	33
505	4	0	4	3	0	3	1	12.5	12.5
506	3	0	3	3	0	3	0		
507	5	0	5	5	0	5	0		
508	3	0	3	2	0	2	1	12.5	12.5
509	2	1	4	2	1	4	0		
510	2	1	4	2	0	2	2	33	33
511	3	1	6	4	0	4	2	33	33
512	3	0	3	4	1	8	5	68.5	-68.5
513	3	0	3	2	0	2	1	12.5	12.5

WILCOXON TEST  
DECISION FRAME 2

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
PARTICIPANT	To	EO	Yi ToEo	Tn	En	Xi TnEn	(Yi-Xi) Di	Rank	Signed Rank
514	4	0	4	3	0	3	1	12.5	12.5
515	2	0	2	2	0	2	0		
516	5	7	40	5	3	20	20	117	117
517	7	2	21	7	1	14	7	81	81
518	4	0	4	6	0	6	2	33	-33
519	3	0	3	5	3	20	17	112.5	-112.5
520	5	4	25	4	1	8	17	112.5	112.5
521	3	0	3	3	1	6	3	49	-49
522	3	0	3	5	0	5	2	33	-33
523	7	0	7	4	1	8	1	12.5	-12.5
524	6	1	12	5	1	10	2	33	33
525	4	0	4	4	1	8	4	61	-61
526	4	1	8	3	0	3	5	68.5	68.5
527	5	1	10	6	2	18	8	87.5	-87.5
528	5	0	5	5	0	5	0		
529	5	1	10	3	0	3	7	81	81
530	5	1	10	5	1	10	0		
531	5	1	10	7	1	14	4	61	-61
532	3	0	3	2	0	2	1	12.5	12.5
SUMMATION	640	173	1553	478	89	813			

Number of ranks (N)                      124  
=====

Sum of signed ranks (T)                      4761  
=====

WILCOXON TEST  
DECISION FRAME 3

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
PARTICIPANT	To	Es	Yi ToEs	Tn	En	Xi TnEn	(Yi-Xi) Di	Rank	Signed Rank
101	2	1	4	1	0	1	3	60.5	60.5
102	4	2	12	2	1	4	8	104.5	104.5
103	3	1	6	1	0	1	5	82.5	82.5
104	3	0	3	1	1	2	1	15	15
105	4	2	12	2	2	6	6	92.5	92.5
106	2	1	4	2	0	2	2	42.5	42.5
107	2	2	6	1	0	1	5	82.5	82.5
108	4	0	4	2	1	4	0		
109	6	0	6	1	0	1	5	82.5	82.5
110	2	1	4	2	0	2	2	42.5	42.5
111	4	3	16	2	0	2	14	113	113
112	4	2	12	2	2	6	6	92.5	92.5
113	3	0	3	2	0	2	1	15	15
114	2	1	4	2	0	2	2	42.5	42.5
115	4	0	4	3	1	6	2	42.5	-42.5
116	2	1	4	2	0	2	2	42.5	42.5
117	3	1	6	2	0	2	4	72	72
118	4	3	16	2	0	2	14	113	113
119	4	0	4	2	2	6	2	42.5	-42.5
120	3	2	9	1	0	1	8	104.5	104.5
121	4	5	24	3	2	9	15	115	115
122	3	0	3	1	0	1	2	42.5	42.5
123	7	5	42	1	2	3	39	118	118
124	3	0	3	2	0	2	1	15	15
125	5	4	25	2	2	6	19	116	116
126	2	1	4	1	0	1	3	60.5	60.5
127	4	4	20	2	6	14	6	92.5	92.5
128	2	0	2	1	0	1	1	15	15
129	3	0	3	1	0	1	2	42.5	42.5
130	3	1	6	3	1	6	0		
131	5	2	15	1	3	4	11	109.5	109.5
132	1	1	2	1	0	1	1	15	15
133	3	1	6	2	0	2	4	72	72
134	3	0	3	2	0	2	1	15	15
135	5	10	55	1	4	5	50	119	119
136	3	0	3	2	3	8	5	82.5	-82.5
137	3	2	9	2	0	2	7	100.5	100.5
138	3	0	3	2	0	2	1	15	15
139	2	0	2	1	0	1	1	15	15
201	3	0	3	1	0	1	2	42.5	42.5
202	3	1	6	2	0	2	4	72	72

WILCOXON TEST  
DECISION FRAME 3

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
PARTICIPANT	To	EO	Yi ToEo	Tn	En	Xi TnEn	(Yi-Xi) Di	Rank	Signed Rank
203	1	0	1	2	0	2	1	15	-15
204	2	3	8	2	2	6	2	42.5	42.5
205	3	0	3	1	1	2	1	15	15
206	2	0	2	2	1	4	2	42.5	-42.5
207	1	1	2	3	0	3	1	15	-15
208	3	0	3	2	0	2	1	15	15
209	3	0	3	1	0	1	2	42.5	42.5
210	3	0	3	1	6	7	4	72	-72
211	3	1	6	7	0	7	1	15	-15
212	4	1	8	1	0	1	7	100.5	100.5
213	3	0	3	2	0	2	1	15	15
214	3	0	3	2	3	8	5	82.5	-82.5
215	4	0	4	1	0	1	3	60.5	60.5
216	3	1	6	1	1	2	4	72	72
217	5	0	5	4	0	4	1	15	15
218	4	0	4	4	1	8	4	72	-72
219	7	5	42	3	1	6	36	117	117
220	3	7	24	4	2	12	12	111	111
221	6	0	6	1	0	1	5	82.5	82.5
222	3	0	3	2	0	2	1	15	15
223	4	1	8	2	0	2	6	92.5	92.5
224	3	1	6	2	0	2	4	72	72
225	3	0	3	2	0	2	1	15	15
226	4	1	8	2	0	2	6	92.5	92.5
227	4	1	8	2	0	2	6	92.5	92.5
228	3	1	6	1	0	1	5	82.5	82.5
229	3	0	3	2	0	2	1	15	15
230	3	2	9	2	0	2	7	100.5	100.5
231	2	1	4	1	1	2	2	42.5	42.5
401	3	2	9	2	0	2	7	100.5	100.5
402	4	0	4	4	0	4	0		
403	2	3	8	2	0	2	6	92.5	92.5
404	2	1	4	4	0	4	0		
405	2	1	4	1	0	1	3	60.5	60.5
406	1	2	3	2	1	4	1	15	-15
407	1	3	4	2	1	4	0		
408	2	0	2	2	0	2	0		
409	3	1	6	3	0	3	3	60.5	60.5
410	1	1	2	1	0	1	1	15	15
411	2	2	6	3	0	3	3	60.5	60.5
412	2	0	2	2	0	2	0		



WILCOXON TEST  
DECISION FRAME 3

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
PARTICIPANT	T <sub>a</sub>	E <sub>o</sub>	Y <sub>i</sub> T <sub>o</sub> E <sub>o</sub>	T <sub>n</sub>	E <sub>n</sub>	X <sub>i</sub> T <sub>n</sub> E <sub>n</sub>	(Y <sub>i</sub> -X <sub>i</sub> ) D <sub>i</sub>	Rank	Signed Rank
413	2	0	2	2	1	4	2	42.5	-42.5
414	2	0	2	2	0	2	0		
415	2	0	2	2	0	2	0		
416	2	3	8	2	2	6	2	42.5	42.5
417	4	0	4	3	0	3	1	15	15
418	4	0	4	2	0	2	2	42.5	42.5
419	3	0	3	3	0	3	0		
420	1	0	1	2	0	2	1	15	-15
421	3	1	6	4	3	16	10	108	-108
422	1	12	13	3	3	12	1	15	15
423	3	3	12	3	1	6	6	92.5	92.5
424	3	2	9	3	0	3	6	92.5	92.5
425	2	0	2	3	0	3	1	15	-15
426	3	3	12	2	2	6	6	92.5	92.5
427	4	0	4	3	0	3	1	15	15
428	2	0	2	2	0	2	0		
429	3	5	18	2	1	4	14	113	113
430	3	0	3	2	0	2	1	15	15
431	3	0	3	2	0	2	1	15	15
432	2	0	2	3	1	6	4	72	-72
433	2	0	2	2	0	2	0		
434	3	1	6	2	0	2	4	72	72
435	2	0	2	2	1	4	2	42.5	-42.5
436	3	2	9	6	1	12	3	60.5	-60.5
437	5	1	10	2	0	2	8	104.5	104.5
438	3	1	6	2	0	2	4	72	72
439	2	0	2	2	0	2	0		
440	1	0	1	1	0	1	0		
501	3	0	3	7	1	14	11	109.5	-109.5
502	2	1	4	2	1	4	0		
503	3	1	6	3	0	3	3	60.5	60.5
504	4	1	8	3	1	6	2	42.5	42.5
505	2	0	2	2	0	2	0		
506	3	0	3	1	0	1	2	42.5	42.5
507	4	1	8	4	0	4	4	72	72
508	2	1	4	2	0	2	2	42.5	42.5
509	2	0	2	1	0	1	1	15	15
510	2	0	2	2	1	4	2	42.5	-42.5
511	2	1	4	2	0	2	2	42.5	42.5
512	4	0	4	1	0	1	3	60.5	60.5
513	2	0	2	2	0	2	0		

WILCOXON TEST  
DECISION FRAME 3

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
PARTICIPANT	To	EO	Yi ToEo	Tn	En	Xi TnEn	(Yi-Xi) Di	Rank	Signed Rank
514	2	0	2	2	0	2	0		
515	1	1	2	2	0	2	0		
516	0	16	0	2	3	8	9	107	107
517	4	0	4	4	1	8	4	72	-72
518	4	1	8	3	1	6	2	42.5	42.5
519	2	5	12	3	2	9	3	60.5	60.5
520	4	2	12	4	1	8	4	72	72
521	3	0	3	3	2	9	6	92.5	-92.5
522	5	0	5	4	0	4	1	15	15
523	4	1	8	2	0	2	6	92.5	92.5
524	4	1	8	3	1	6	2	42.5	42.5
525	2	0	2	2	0	2	0		
526	2	0	2	2	0	2	0		
527	3	0	3	3	0	3	0		
528	4	0	4	2	0	2	2	42.5	42.5
529	4	1	8	3	0	3	5	82.5	82.5
530	3	0	3	3	0	3	0		
531	5	1	10	2	0	2	8	104.5	104.5
532	2	1	4	1	1	2	2	42.5	42.5
SUMMATION	421	173	928	310	86	504			

Number of ranks (N)            119  
=====

Sum of signed ranks (T)            4803  
=====

WILCOXON TEST  
DECISION FRAME 4

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
PARTICIPANT	To	EO	Yi ToEo	Tn	En	Ki TnEn	(Yi-Ki) Di	Rank	Signed Rank
101	9	7	72	4	2	12	60	89	89
102	13	10	143	5	0	5	138	136	136
103	7	10	77	3	1	6	71	100	100
104	16	1	32	3	1	6	26	52	52
105	9	9	90	3	0	3	87	110.5	110.5
106	6	6	42	3	2	9	33	57.5	57.5
107	8	7	64	3	3	12	52	77	77
108	16	5	96	3	2	9	87	110.5	110.5
109	15	2	45	3	0	3	42	66	66
110	10	8	90	3	0	3	87	110.5	110.5
111	13	5	78	2	0	2	76	103	103
112	9	9	90	3	3	12	78	104	104
113	11	2	33	3	0	3	30	56	56
114	11	10	121	9	1	18	103	120	120
115	12	6	84	3	0	3	81	106	106
116	6	1	12	3	0	3	9	24	24
117	16	1	32	3	0	3	29	54.5	54.5
118	9	11	108	4	1	8	100	118	118
119	9	1	18	3	0	3	15	41.5	41.5
120	7	5	42	6	0	6	36	60.5	60.5
121	16	12	208	1	0	1	207	141	141
122	20	7	160	2	1	4	156	138	138
123	15	7	120	4	1	8	112	124	124
124	18	4	90	4	0	4	86	108	108
125	9	9	90	2	4	10	80	105	105
126	8	2	24	3	2	9	15	41.5	41.5
127	11	12	143	2	4	10	133	134	134
128	10	3	40	3	0	3	37	62	62
129	8	7	64	3	1	6	58	84.5	84.5
130	12	10	132	4	2	12	120	130.5	130.5
131	17	10	187	4	3	16	171	139	139
132	8	6	56	3	0	3	53	79.5	79.5
133	9	10	99	3	0	3	96	116	116
134	13	3	52	3	0	3	49	71.5	71.5
135	3	21	66	7	5	42	24	48	48
136	9	5	54	1	0	1	53	79.5	79.5
137	9	7	72	3	2	9	63	92	92
138	10	12	130	3	0	3	127	132.5	132.5
139	13	6	91	3	0	3	88	113.5	113.5
201	12	0	12	3	0	3	9	24	24
202	5	23	120	3	1	6	114	126	126

WILCOXON TEST  
DECISION FRAME 4

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
PARTICIPANT	To	Es	Yi ToEs	Tn	En	Xi TnEn	(Yi-Xi) Di	Rank	Signed Rank
203	13	11	156	4	1	8	148	137	137
204	7	7	56	5	0	5	51	74.5	74.5
205	14	0	14	4	0	4	10	27.5	27.5
206	7	1	14	3	0	3	11	29	29
207	8	0	8	2	0	2	6	15.5	15.5
208	4	23	96	3	6	21	75	102	102
209	5	0	5	3	0	3	2	2	2
210	16	1	32	3	0	3	29	54.5	54.5
211	8	1	16	2	0	2	14	37.5	37.5
212	11	0	11	5	0	5	6	15.5	15.5
213	10	1	20	1	0	1	19	44	44
214	10	1	20	4	0	4	16	43	43
215	10	0	10	5	0	5	5	10	10
216	7	8	63	3	0	3	60	89	89
217	13	8	117	5	1	10	107	123	123
218	14	3	56	4	0	4	52	77	77
219	9	13	126	2	4	10	116	129	129
220	13	8	117	3	0	3	114	126	126
221	7	1	14	7	0	7	7	19.5	19.5
222	6	11	72	2	0	2	70	99	99
223	12	1	24	5	1	10	14	37.5	37.5
224	12	2	36	3	0	3	33	57.5	57.5
225	5	9	50	3	0	3	47	69	69
226	13	4	65	3	0	3	62	91	91
227	12	2	36	2	0	2	34	59	59
228	8	1	16	6	0	6	10	27.5	27.5
229	15	1	30	5	0	5	25	50	50
230	7	0	7	3	0	3	4	5.5	5.5
231	11	0	11	4	0	4	7	19.5	19.5
401	8	6	56	4	0	4	52	77	77
402	5	10	55	5	0	5	50	73	73
403	4	14	60	8	2	24	36	60.5	60.5
404	8	1	16	3	0	3	13	33	33
405	10	0	10	5	0	5	5	10	10
406	10	12	130	3	0	3	127	132.5	132.5
407	10	6	70	2	0	2	68	95.5	95.5
408	11	2	33	3	2	9	24	48	48
409	9	5	54	7	3	28	26	52	52
410	9	1	18	4	0	4	14	37.5	37.5
411	12	5	72	4	1	8	64	93	93
412	10	11	120	7	1	14	106	122	122

WILCOXON TEST  
DECISION FRAME 4

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
PARTICIPANT	To	EO	Yi ToEo	Tn	En	Xi TnEn	(Yi-Xi) Di	Rank	Signed Rank
413	15	3	60	4	0	4	56	81.5	81.5
414	14	2	42	3	0	3	39	63	63
415	12	0	12	3	0	3	9	24	24
416	9	10	99	4	0	4	95	115	115
417	11	10	121	6	0	6	115	128	128
418	15	5	90	3	0	3	87	110.5	110.5
419	16	1	32	4	1	8	24	48	48
420	13	4	65	5	0	5	60	89	89
421	7	8	63	5	0	5	58	84.5	84.5
422	7	19	140	5	0	5	135	135	135
423	14	8	126	6	0	6	120	130.5	130.5
424	5	9	50	5	1	10	40	64.5	64.5
425	9	1	18	5	0	5	13	33	33
426	8	9	80	4	2	12	68	95.5	95.5
427	10	0	10	5	0	5	5	10	10
428	9	1	18	6	2	18	0		
429	4	13	56	8	1	16	40	64.5	64.5
430	8	3	32	9	1	18	14	37.5	37.5
431	15	3	60	2	0	2	58	84.5	84.5
432	10	5	60	4	0	4	56	81.5	81.5
433	9	0	9	2	0	2	7	19.5	19.5
434	8	1	16	4	0	4	12	30.5	30.5
435	9	1	18	4	0	4	14	37.5	37.5
436	6	11	72	5	4	25	47	69	69
437	13	5	78	3	2	9	69	97.5	97.5
438	6	8	54	5	0	5	49	71.5	71.5
439	9	1	18	4	2	12	6	15.5	15.5
440	8	10	88	5	0	5	83	107	107
501	7	10	77	4	0	4	73	101	101
502	7	1	14	2	0	2	12	30.5	30.5
503	13	7	104	2	0	2	102	119	119
504	7	16	119	7	2	21	98	117	117
505	8	0	8	3	0	3	5	10	10
506	9	2	27	4	0	4	23	46	46
507	8	6	56	5	0	5	51	74.5	74.5
508	8	2	24	3	0	3	21	45	45
509	7	0	7	2	0	2	5	10	10
510	6	0	6	4	0	4	2	2	2
511	14	0	14	5	0	5	9	24	24
512	11	0	11	2	0	2	9	24	24
513	8	0	8	3	0	3	5	10	10

WILCOXON TEST  
DECISION FRAME 4

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
PARTICIPANT	To	Eo	Yi ToEo	Tn	En	TnEn	(Yi-Xi) Di	Rank	Signed Rank
514	8	1	16	3	0	3	13	33	33
515	9	0	9	2	0	2	7	19.5	19.5
516	11	10	121	7	0	7	114	126	126
517	12	8	108	4	0	4	104	121	121
518	8	5	48	3	0	3	45	67	67
519	6	23	144	7	7	56	88	113.5	113.5
520	5	14	75	6	0	6	69	97.5	97.5
521	4	7	32	3	1	6	26	52	52
522	9	0	9	4	0	4	5	10	10
523	6	8	54	7	0	7	47	69	69
524	9	6	63	4	0	4	59	87	87
525	7	0	7	4	0	4	3	4	4
526	10	0	10	4	0	4	6	15.5	15.5
527	10	1	20	6	0	6	14	37.5	37.5
528	9	0	9	5	0	5	4	5.5	5.5
529	15	3	60	2	0	2	58	84.5	84.5
530	16	11	192	3	0	3	189	140	140
531	10	6	70	5	0	5	65	94	94
532	5	0	5	3	0	3	2	2	2
SUMMATION	1401	781	8,485	551	90	943			

Number of ranks (N)      141  
\*\*\*\*\*

Sum of signed ranks (T)      10,011  
\*\*\*\*\*

## BIBLIOGRAPHY

- Aaron, Henry J., ed. Inflation and the Income Tax. Washington, D.C.: The Brookings Institution, 1976.
- Allen, R.G.D. Index Numbers in Theory and Practice. London: The MacMillan Press, Ltd., 1975.
- American Accounting Association. Indexing the Tax Law to Adjust for Inflation. Sarasota, Florida: 1984.
- American Institute of Certified Public Accountants. Statement of Tax Policy No. 1: Taxation of Capital Gains. New York: 1974.
- American Institute of Certified Public Accountants. Statement of Tax Policy No. 9: Implementing Indexation of the Tax Laws. New York: 1981.
- Becker, Charles, and Fullerton, Don. "Income Tax Incentives to Promote Saving." National Tax Journal XXXIII (September 1980), pp. 331-351.
- Bhatia, Kul B. "Capital Gains, The Distribution of Income, and Taxation." National Tax Journal XXVIII (June 1974), pp. 319-334.
- Blair, Clifford, and Higgins, J.J. "The Power of t and Wilcoxon Statistics." Evaluation Review, October 1980, pp. 645-656.
- Blair, Clifford, and Higgins, J.J. "A Comparison of the Power of Wilcoxon's Rank-Sum Statistic to That of Student's t Statistic Under Various Nonnormal Distributions." Journal of Educational Statistics, Winter 1980, pp. 290-335.
- Blair, Clifford, and Higgins, J.J. "A Note on the Asymptotic Relative Efficiency of the Wilcoxon Rank Sum Test." British Journal of Mathematical and Statistical Psychology 34 (1981), pp. 124-128.

- Blum, Walter J. "A Handy Summary of the Capital Gains Arguments." Taxes - The Tax Magazine 35 (April, 1957), pp. 247-266.
- \_\_\_\_\_. "Taxation of Capital Gains in the Light of Recent Economic Developments -- Some Observations." National Tax Journal XVIII (December 1965), pp. 430-436.
- Blustein, Paul, and Birnbaum, Jeffrey H. "Treasury Wants Special Tax Break for Some Investors." Wall Street Journal, 20 March 1985, p. 54.
- Blustein, Paul, and Birnbaum, Jeffrey H. "Top Capital-Gains Rate is Put at 17.5 Percent in White House Tax-Overhaul Package." Wall Street Journal, 15 May 1985, p. 50.
- Brinner, Roger. "Inflation, Deferral and The Neutral Taxation of Capital Gains." National Tax Journal XXVI (December 1973), pp. 565-573.
- Browning, Edgar K., and Browning, Jacqueline M. Public Finance and the Price System. New York: Macmillan Publishing Co., Inc., 1979.
- Cairns, Scott N. "An Empirical Investigation into the Effects of Tax Equity of Selected Alternative Methods of Taxing Capital Gains and Losses." Ph.D. dissertation, University of Illinois at Urbana-Champaign, 1983.
- Coopers and Lybrand. "A Heavy Burden for the 1985 Economy?" Executive Alert Newsletter, Dec. 1984 - Jan. 1985, pp. 3-7.
- Corbin, Donald A. "New Proposals For Capital Gains Taxation." Taxes - The Tax Magazine, October 1956, pp. 663-686.
- Croxtan, Frederick E., and Cowder, Dolly J. Applied General Statistics. 2nd ed. Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1960.
- David, Martin. Alternative Approaches to Capital Gains Taxation. Washington, D.C.: The Brookings Institution, 1968.
- Eisenstein, Louis. The Ideologies of Taxation. New York: The Ronald Press Company, 1961.



- Ellentuck, Albert B. "Statements in Quotes." Journal of Accountancy, October 1984, pp. 124-136.
- Feldstein, Martin. "On the Theory of Tax Reform." Journal of Public Economics 6 (1976), pp. 77-104.
- \_\_\_\_\_. "Taxes, Inflation and Capital Formation." National Tax Journal XXXII (September 1979), pp. 346-349.
- \_\_\_\_\_. "The Welfare Cost of Permanent Inflation and Optimal Short-Run Economic Policy." Journal of Political Economy 87 (1979), pp. 749-768.
- Feldstein, Martin, and Slemrod, Joel. "Inflation and the Excess Taxation of Capital Gains on Corporate Stock." National Tax Journal 31 (June 1978), pp. 107-118.
- Feldstein, Martin, and Summers, Lawrence. "Inflation, Tax Rules, and the Long-Term Interest Rate." Brookings Papers on Economic Activity 1 (1978), pp. 61-109.
- Feldstein, Martin, and Summers, Lawrence. "Inflation and the Taxation of Capital Income In The Corporate Sector." National Tax Journal XXXII (December 1979), pp. 445-471.
- Fischer, Stanley. "Indexing and Inflation." Journal of Monetary Economics 12 (1983), pp. 519-541.
- Fisher, Irving. The Making of Index Numbers. Boston: Houghton Mifflin Co., 1922; reprint ed., New York: Augustus M. Kelley, 1967.
- Friedland, Eric J.; Gray, John A.; and Sunley, Emil M., Jr. "The Six Month Holding Period for Capital Gains: An Empirical Analysis of its Effect on the Timing of Gains." National Tax Journal XXI (December 1968), pp. 467-478.
- Friedman, Charles S. "The Adverse Consequences of the United States Tax Structure During Inflationary Times." Journal of Contemporary Business 10 (1981), pp. 77-95.
- Fuglister, Jayne. "Indexation: Is It Equitable?" The Woman CPA, April 1984, pp. 4-8.
- Gravelle, Jane G. "Inflation and the Taxation of Capital Income in the Corporate Sector: A Comment." National Tax Journal XXXIII (December 1980), pp. 473-488.

- Harriss, Lowell C. "Capital Gains Taxes. . . Are a Punishment of Capital." Across the Board, November 1978, pp. 44-51.
- Herman, Tom. "Tax Tomes - A Guide to the Guides." The Wall Street Journal, 4 March 1985, sec. 1, p. 24.
- Karlinsky, Stewart S. "Complexity in the Federal Income Tax Law Attributable to the Capital Gain and Loss Preference: A Measurement Model." Ph.D. dissertation, New York University, 1981.
- Kelley, William A., Jr.; Hall, John H.; Aronsohn, Alan J.B.; and Hickman, Frederick W. "Indexing For Inflation." Tax Lawyer 31 (1977), pp. 17-35.
- Long, Susan B., and Swingen, Judyth A. "Tax Professionals' Perceptions of Federal Income Tax Complexity: Some Preliminary Findings." Paper presented at the Northeast Regional Meeting of the American Accounting Association, April, 1985.
- Mauch, James E., and Birch, John W. Guide to the Successful Thesis and Dissertation. New York: Marcel Dekker, Inc., 1983.
- McGinley, Laurie. "Indexing Proposals in Treasury's Plan Will Add Complications for Taxpayers." Wall Street Journal, 3 December 1984, p. 2.
- Miller, Peter. "Capital Gains Taxation of the Fruits of Personal Effort: Before and Under the 1954 Code." The Yale Law Journal 64 (November 1954), pp. 1-83.
- Milliron, Valerie C. "Taxpayer Perceptions of Complexity and the Effect of Complexity on Reporting Positions." Ph.D. dissertation, University of Southern California, 1984.
- Morse, Amyas. "Indexation of Capital Gains." The Accountants Magazine, October 1982, pp. 368-371.
- Nelson, Oscar S. "Capital Gains From Price Level Increases." The Accounting Review, January 1951, pp. 31-32.
- Neter, John; Wasserman, William; and Whitman, G. A. Applied Statistics. Boston: Allyn and Bacon, Inc., 1978.
- Nielsen, Niels Christian. "Inflation and Taxation." Journal of Monetary Economics 7 (1981), pp. 261-271.

- Nutter, Jack D., and Pieler, George A. "Tax Indexing: A Profound and Needed Change." The Tax Adviser, July 1983, pp. 394-403.
- Palmon, Dan, and Yaari, Uzi. "Share Values, Inflation, and Escalating Tax Rates." Journal of Banking and Finance 5 (1981), pp. 397-403.
- Pearlman, Ronald A. "Statement in Quotes." Journal of Accountancy, February 1985, pp. 84-94.
- Phillips, Lawrence C. "Tax Implications of Accounting for Inflation." The Tax Adviser, August 1976, pp. 465-470.
- Schroeder, Jack D. "Potential Simplification of the Federal Income Tax Law by Eliminating Special Treatment of Capital Gains and Losses." Ph.D. dissertation, Michigan State University, 1975.
- Seltzer, Lawrence H. "Tax Structure and Private Enterprise." American Economic Review, May 1950, pp. 371-378.
- \_\_\_\_\_. The Nature and Tax Treatment of Capital Gains and Losses. New York: National Bureau of Economic Research, Inc., 1951.
- Siegel, Sidney. Nonparametric Statistics for the Behavioral Sciences. New York: McGraw-Hill Book Company, Inc., 1956.
- Sommerfeld, Ray M.; Anderson, Hershel M.; and Brock, Horace R. An Introduction to Taxation. 10th ed. New York: Harcourt Brace Jovanovich, 1984.
- Sunley, Emil M. "Indexing the Income Tax for Inflation." National Tax Journal 3 (September 1977), pp. 328-333.
- Tax Foundation, Inc. Flatter Taxes and Fatter Bases. Washington, D.C.: 1985.
- Tse, Joseph. "Indexed Security Investment Plan." Cost and Management, March-April 1984, pp. 44-48.
- U.S. Department of Commerce. 1980 Census of Population - General Social and Economic Characteristics, Nebraska. Washington D.C.: Government Printing Office, 1983.

- U.S. Department of the Treasury. Statistics of Income--1973, Sales of Capital Assets. Washington, D.C.: Government Printing Office, 1980.
- U.S. Department of the Treasury. Tax Reform for Fairness, Simplicity, and Economic Growth. 2 vols. Washington, D.C.: Government Printing Office, 1984.
- U.S. Treasury Department Tax Advisory Staff. Federal Income Tax Treatment of Capital Gains and Losses. Washington, D.C.: Government Printing Office, 1951.
- Uhr, Carl G. "Implications of New Proposals for Capital Gains Taxation." Taxes - The Tax Magazine, April 1957, pp. 267-306.
- Waggoner, Michael J. "Eliminating the Capital Gains Preference. Part I: The Problems of Inflation, Bunching and Lock-In." University of Colorado Law Review 48 (1977) pp. 313-398.
- \_\_\_\_\_. "Eliminating the Capital Gains Preference. Part II: The Problem of Corporate Taxation." University of Colorado Law Review 49 (1977), pp. 10-63.
- Wells, Anita. "Legislative History of Treatment of Capital Gains Under the Federal Income Tax, 1913-1948." National Tax Journal 2 (March, 1949), pp. 12-32.
- Whalley, John. "Capital Gains Taxation and Interest Rate Changes: An Extension of Paish's Argument." National Tax Journal XXXII (March 1979), pp. 87-91.
- Wiener, Leonard, and Morse, Robert J. "Tax Indexing: Who Gets the Most Out of It." U.S. News & World Report, 5 November 1984, pp. 89-90.
- Wormser, Rene A. "Soak the Rich Legislation." Trusts & Estates, September 1977, pp. 576-578 and 633-635.