AN INVESTIGATION OF GROUP VS INDIVIDUAL

PROCESSING OF ACCOUNTING

INFORMATION

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Saving the best for last, I also thank my wife and life partner, Susan, for her undaunted support and belief in me. When events went wrong she was there to console, and when events went right she was there to celebrate.

May the glory be to God through His Son Jesus Christ.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER I

INTRODUCTION

Research Question

The past twenty years have produced a wealth of
research examining user responses to accounting data. Gen-
erally, such studies have taken one of two tactics. These
two research avenues can be thought of as endpoints on a
continuum of accounting data user aggregation. On the one
end are studies examining individual user reactions to
accounting variables, with the opposite end comprising
research investigating aggregate market reactions to
accounting data (generally, the broad class of capital mar-
ket impact studies). Although both these endpoints have
been examined intensively, there appears to be a lack of
research pursuit between the endpoint aggregation levels.
As such, a study examining group responses to accounting
data should be of interest. Specifically, the proposed
research will address the general issue of whether groups
are more sophisticated in the use of accounting data than
are individuals.

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Justification of the Research Question

Since this research study intends to explicate the relationship between groups and individuals in their use of accounting data, it becomes desirable to delineate the rationale behind a study of groups. First, the use of accounting data by groups is interesting in and of itself. There are many decisions made at a group level of aggregation that have yet to be submitted to empirical investigation. Examples abound, including capital budgeting decisions, pricing decisions, performance evaluations, loan decisions, and decisions regarding audit opinions. Many of these decisions have been investigated at the individual decision maker level; however, it is questionable whether this is the proper mode of investigation given that these decisions are rarely made by individuals.[1] There is ample evidence (see Kelley and Thibaut [39] for a review) indicating that the behavior of groups is vastly different than that of individuals. Likewise, in a risk taking environment Libby and Fishburn's (43) review indicated that individual and group risk taking models will differ due to aggregate phenomena. This is, of course, relevant to accounting policy decisions because the information processing characteristics of groups may be entirely different than the information processing characteristics of individuals.

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[1]Studies on individual decision making include decision contexts as materiality decisions (11), auditor decisions (6) (37), loan decisions (42), and pricing decisions (5).

However, one group level of aggregation, specifically capital market behavior, has been submitted to considerable empirical investigation. One of the results derived from these studies is the apparent efficiency of the captial markets (at least in the semi-strong form [29]). Capital market efficiency suggests that stock prices reflect currently available information, which further implies that the capital market is sophisticated in the use of accounting data (31). These conclusions are diametrically opposed to the conclusions of individual behavioral research. Individuals have been found to be far from sophisticated in their use of accounting data. Unsophisticated data use has been identified in the psychological literature as information overload effects (50), risk preference reversals (55), functional fixation (20), primacy and recency effects (51), and conservative probability revision relative to Baye's Rule (26).

A summary of the above results suggest the aggregate market is sophisticated in its use of accounting data, while individuals may be bounded in their optimal data use. Therefore, an investigation of some middle ground is suggested. The second rationale behind this study becomes apparent--to provide a bridge or possibly an explanation of these contrasting conclusions. In other words, the research question is, does a small aggregation of users experience the same difficulties as do individuals, or do they approach the sophistication of the capital markets in data use?

A third rationale behind the investigation of group decision making processing is closely related to the previous discussion. Beaver (10) provided convincing arguments for the abandonment of extant FASB policy objectives, based on capital market evidence. Beaver concluded that many of the debated reporting issues become trivial if there are no cost differences between reporting alternatives, and if there is no user cost to convert from one reporting method to another. As a result, disclosure becomes the paramount issue. The report of an economic event under one accounting alternative, and disclosure of enough information to convert to any other, are sufficient conditions to allow market efficiency in the use of such data. This implies that reporting issues such as investment credit, interperiod tax allocation, full cost versus successful efforts, EPS computations, and capitalization of interest costs are trivial issues, given footnote disclosure. The question then arises, why are such issues still controversial, particularly among practitioners? One answer may be that these types of questions are important in settings other than at the market level. There are different markets and different aggregation levels in economic decision making besides the long-term equity markets. As indicated earlier, there exist information markets and group level decision making for such

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²The usefulness of such a study is also espoused by Einhorn (27, p. 198).

decisions as product pricing, loan granting, capital budgeting, and bond pricing. It is possible that present policy objectives of the FASB and SEC, which do not appear to be those suggested by Beaver, are relevant to the demands of such markets.

The present study will attempt to bridge the findings of the experimental literature on individual decision making with the empirical results of the capital market literature with respect to user processing sophistication. With Beaver's thoughts in mind, sophistication will be narrowly defined as the user's ability to perceive the economic equality between hypothetical firms, given different long-term liability disclosures. Or alternatively the question becomes, do users arranged as either individuals or groups distinguish between identical firms depending upon whether a liability is recorded on the face of the balance sheet or as an appended footnote?

The basic question was answered by testing two hypotheses on the risk perceptions of commercial loan officers. For the individual and group phase of the experiment the null hypothesis can be stated as follows:

> Ho(1): the risk perceptions of an individual or group over simultaneous evaluations of two identical firms will be equal despite different liability disclosures.

If the subjects are efficient information processors, one would expect the null hypothesis not to be rejected. The

presence of significant effects would suggest that the subjects are unable to equate statement versus footnote presentation of an economic event as it bears upon risk perceptions. Based on prior evidence and a pilot study (Appendix C), a priori one would expect Ho(1) to be rejected in the individual phase and not to be rejected in the group phase.

After the individual and group phase were analyzed separately the results were compared. A priori, one would expect more processing inefficiencies in the individuals than in the groups. Therefore, the second hypothesis to be tested can be stated in the null form as follows:

Ho(2): Groups and individuals will exhibit an equal degree of processing efficiency (or inefficiency).

alternatively,

Ha (2): individuals will exhibit a greater degree of processing inefficieny than will groups.

CHAPTER II

LITERATURE REVIEW

Closely related to the present research is the broad array of studies examining user reactions to accounting procedure changes that alter accounting numbers, but not the underlying economic structure of the firm.[1] Such studies can be easily dichotomized into the individual user and aggregate market type research.

Individual Decision Makers

Among the individual user research in this area, the early work consists of studies by Bruns (12) and Dyckman (21) (22). Bruns investigated whether students would evaluate simulated firm data prepared under LIFO versus FIFO cost flow assumptions (suppressing tax effects) differently on several managerial tasks; such as production, advertising expenditure, and pricing decisions. Results indicated that the students' decisions were unaffected by the reporting differences.

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[1]Many of these studies hypothesize the existence of user "functional fixation" on accounting variables; i.e. the inability of users to see through reporting differences to any substantive economic differences in the firm. See Ijiri, Jaedicke, and Knight (35) for an explanation of functional fixation as related to accounting numbers.

In a similar study Dyckman (22) solicited intermediate accounting students to evaluate two report sets, one constructed under a FIFO inventory cost flow assumption and the other under a LIFO assumption. These report set evaluations were separated by a 2 1/2 month span. As in Brun's study the dependent variables were several managerial decisions including unit production, R and D expenditure, marketing expenditure, unit price, and dividend declaration evaluations. Dyckman investigated for effects on three treatment variables: firm size, earnings trend, and inventory cost flow assumption. The results supported Bruns in exhibiting no subject response variability due to the inventory cost flow assumption (except on the advertising variable).

Dyckman (21) continued his examination of subject responses to accounting number changes by altering the experimental task. Again, students were used as surrogates for statement users. However, instead of managerial decisions, this study emphasized reporting change effects on the investment decision. As in the previous studies the FIFO versus LIFO reporting change, exclusive of tax effects, was used as the treatment variable. The dependent variable was the assignment of a market price per share for the given security. Even though reconciling information between report sets were given, the students evaluated the firms differently. Dyckman concluded that the "average investor" may be unable to differentiate between accounting changes

and economic changes in the consideration of equity investments.

Jensen (36) modified upon past efforts by employing a 2x2x2x2 completely randomized factorial experiment on sophisticated subjects. The experiment consisted of presenting financial analysts with the financial statements of two different companies. The financial statements consisted of either a FIFO or LIFO inventory valuation and either straight line or accelerated depreciation. Within a single company all information remained the same except for the inventory and depreciation accounting methods (again tax effects were excluded). The financial analysts were asked to allocate a percentage of fixed available funds to each company and to determine a price per share for each company. On each of these dependent variables an ANOVA procedure was utilized. Results indicated significant main effects on the four treatment conditions for both dependent variables on each company. The depreciation and inventory reporting methods significantly influenced the analysts's evaluations of the two companies.

Dyckman (23) expanded upon his earlier work by broadening his subject participation and examining additional effects. Students and middle management businessmen were asked to evaluate two simulated firms whose only differences were inventory policy (FIFO versus LIFO), and an arbitrary size factor adjustment. The inventory policy causes rela-

tive differences between the two report sets, while the size factor only produces an absolute difference in the report set numbers. The evaluations between firms were made under three earnings trend conditions: increasing, decreasing, and constant. The lone dependent variable in this study was the subject assignment of a dollar value to the two purchase opportunities (firms). Dyckman concluded that there was no size effect on the dependent variable, but there was a simultaneous effect from earnings trend and inventory policy. Again, Dyckman supported individual inefficiencies in processing accounting data.

Dyckman (24) continued his interest in this area by completing SAR #1. Dyckman artificially constructed two firms whose income differences would switch signs depending if the two income numbers were constructed under conventional or price adjusted formats.* Investment analysts were given prospectuses of the two firms under the following report set conditions: conventional reports, conventional reports with supplementary price adjusted statements, and price adjusted reports. Each analyst was assigned one of these report sets, after which the analyst selected the firm perceived to have a higher price offering and the price range within which the equity offer should be made. One

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*This was accomplished by constructing essentially identical firms except for the fixed asset age at the decision point in time.

would expect that in the presence of accurate human information processing there would be a difference perceived between the two firms, because of the asset age. However, this difference would be homogeneous across the report sets irregardless of the unique income evaluations for the two firms within the report sets. Contrary to this expectation, Dyckman discovered nonhomogeneous differences across the report sets, indicating possible subject fixation upon the income numbers.

Barrett (8) concluded from his review of the literature that previous studies failed on two points. They failed to utilize subjects sufficiently sophisticated for the given tasks, and they failed to provide the subjects sufficient reconciling information within the task. As a result, Barrett found conclusions supporting differential effects due to accounting number changes premature. Barrett constructed two hypothetical oil companies whose prospectuses were sent to financial analysts, including specialists in the oil industry (48%). Experimental classes were designed to abstract any effects due to accounting policy changes and effects due to the amount of footnote reconciling information. The two reporting alternatives utilized in the study were the cost and equity method of recording intercorporate investments. The oil industry experts were asked to provide a price per share evaluation. The results on these dependent variables indicated a significant information effect

(disclosure effect), but an insignificant effect on the equity versus cost reports at a high information level. This conclusion is, of course, opposite to many of the previous studies in this area.

A classroom experiment by Dopuch and Ronen (19) again investigated the LIFO versus FIFO controversy, but with the inclusion of tax effects (real effects). Their experiment consisted of subject evaluation of two actual retail firms with each firm alternatively employing FIFO or LIFO. This resulted in four treatment combinations of FIFO vs. LIFO firms. Subjects were asked to allocate fixed available funds between the two firms in all four treatment classes. Optimal behavior would have resulted in more capital allocation to the LIFO report of a firm than to the FIFO report, holding the other firm report fixed at either FIFO or LIFO.[a] There was partial support of this optimal expectation in that 54% of the responses indicated no effects and 23% incidated LIFO effects in their fund allocations over two comparisons. Dopuch and Ronen inflated the FIFO versus LIFO income differences by 10% and 15%. This manipulation had pronounced effects on the subjects' allocations. FIFO effects increased to 33% and 51% of the total responses for the 10% and 15% conditions respectively.

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[a]This is, of course, true because of the real tax benefit LIFO reporting will afford over FIFO reporting.

McIntyre (45) obtained student responses to historical cost versus reconstructed current cost statements of actual firms. The students were asked to price the stock and choose which of two companies would have a maximal rate of return. McIntyre found no disparity between the subject responses for the two reporting methods. However, as McIntyre suggests, the absence of an effect may be due to a "shock effect" of the unfamiliar current cost statements. It is entirely possible the students ignored the current cost statements and relied upon the more familiar in making evaluations.

The above studies have mostly examined accounting reporting alternatives (LIFO versus FIFO, cost versus equity method, conventional versus GPL restatement, etcetera) and their effects upon subject decision variables. Ortman (48) follows a similar approach, but instead examines a format change envolving segment data disclosure. The presence or absence of segment data is more a question of disclosure than it is of alternative accounting procedures that communicate the same economic event. Canadian financial analysts were arranged in a control group design, and were requested to estimate a price per share for two firms across two industries. One set of the two firms included segmented data while the control set did not include segmented data. From the associated financial ratios the analysts made their evaluations. The results indicated that the experimental

group (with segmented data) had a lower response variance (i.e. higher consensus), than did the control group (without segmented data). The presence of segmented data had an effect on subject responses.

All of the previous studies have examined individual data processing ability pursuant to methodological changes in calculating data input (e.g. FIFO versus LIFO). Chang and Birnberg (13) identified a different type of setting where subjects do not face a change in method, but a change in calculation. Specifically, MBA students were asked to make probability estimates of process control under a change in cost standard. The change was announced to the subjects in the form of a correction to a previously inaccurate standard. Processing fixity would predict no change in the probability estimates provided by the students before and after the announcement. The results indicated a significant response shift after the announcement, thereby opposing a processing fixity argument. In addition, the after-announcement responses were compared to an unaffected control group. Surprisingly, the mean responses between the after-announcement control and experimental groups were different, indicating an unexplained inefficiency resulting from the announcement.

A convincing study by Abdel-khalik and Keller (1) provided strong evidence supporting individual subject inefficiencies in processing accounting data. In a controlled

experiment 61 sophisticated users were requested to rank six

stocks in descending order of anticipated return, allocate a

fixed sum among the six stocks, and make predictions of

expected selling price at three liklihoods (optimistic, most

likely, and pessimistic). In a design constructed for

within subject and within firm control the subjects provided

responses for a LIFO versus FIFO accounting change setting.

After using parametric and nonparametric analyses the

authors concluded,

> participants in the sample were greatly influenced
> by reported earnings and negatively influenced by
> the impact of the switch to LIFO on reported earn-
> ings even when they were told and were shown the
> postive impact of the switch decision on net cash
> inflows. To this end, the resluts show that par-
> ticipants appear to be functionally fixated on
> using reported earnings to form expectations, even
> if such reported numbers are artificially
> depressed in a significant way (p.47).

Individual Processing Summary

A summary of the above review is offered in Table I

(Appendix D).* It is apparent that the conclusions to be

drawn would have to be qualified in the face of such mixed

results. There is, however, evidence of individual subject

inaccuracy in the evaluation of alternative accounting pro-

cedure. Unfortunately, it is difficult to make generalized

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*Other studies addressing this question include Living-
stone (44), Mlynarczyk (46), Gonedes (32), Summers (52),
Elias (28), and Ashton (5).

statements as to when such a result could be anticipated experimentally. The differential effect does not appear to be systematic with subject type, accounting procedure treatments, or dependent variables. The only evident consistency appears in the early Bruns (12) and Dyckman (22) studies. Both studies utilized similar subjects, task environments, and dependent variables, resulting in identical conclusions.

Probably the strongest disconfirmation of any alleged individual processing limitations would be the Barrett study. Utilizing sophisticated subjects he furnished evidence supporting no differential effects, provided there existed enough reconciling information. However, this study is not generalizable to all accounting procedure alternatives, because the two Dyckman studies (21) (23) and the Abdel-khalik and Keller study (1) provided FIFO/LIFO reconciling information, and still found differential subject responses. It is possible that the Barrett prospectuses and 10 year supplemental research reports for both oil companies were so complex that it was impossible for the subjects to glean the one piece of information relevant to this study. If this was indeed the case, then tests across experimental classes may very well show statistically insignificant differences. Also, the prospectuses were constructed to provide for a 10% income difference between the cost and equity method reports. This difference may not have been large enough to allow differential responses. In the Dopuch and

Ronen (19) study a 10% income effect was just beginning to cause unequal responses. Clearly, the debate questioning individual statement user ability to distinguish accounting variable changes from real economic changes still remains unresolved.

Aggregate Users in the Capital Markets

The efficiency of the capital markets in assessing accounting changes was challenged in the early 1970's, but has now reached a point of general acceptability after the supportive conclusions of numerous capital market impact studies.

Two early studies by Archibald (4) and Kaplan and Roll (38) were somewhat disturbing in light of the evidence supporting capital market efficiency. Archibald, in examining depreciation switchbacks, used the market model with a constant risk (Beta) assumption to assess market price reactions to the accounting change. Archibald discovered that the average abnormal returns were negative before the accounting change and positive for approximately 24 months thereafter. This systematic effect was unexpected in light of capital market efficiency, because the accounting change should not have caused a market reaction. Likewise, Kaplan and Roll (38) found short run market inefficiencies for depreciation changes (accelerated to straight line) and for investment credit changes (deferral to flowthrough). Again,

Kaplan and Roll used the market model with a stationary Beta assumption in isolating the abnormal return.

Ball (7) was critical of the methodologies employed by the studies above, and provided strong arguments for an alternative approach. Instead of utilizing a constant risk market model to remove market wide variation, Ball employed a variable risk cross-sectional model. In analyzing market reactions to six different accounting changes Ball discovered small average errors across firms at the information release point and a weak market behavior pattern over time. Therefore, Ball concluded that market adjustments were not associated with accounting changes.

Further evidence of market efficiencies in light of accounting changes was provided by Sunder (53) (54). Sunder (53) examined average abnormal returns across firms that switched inventory valuation methods from FIFO to LIFO. In real terms such a change would be beneficial to the firm because of a reduced tax liability, even though the actual reported income number would be less than under FIFO (for most industries). In the absence of concomitant information signals emanating from a change from FIFO to LIFO, other than the tax effect, one would expect no negative market reaction to the decreased income number and possibly a positive market effect. Indeed, such a positive price effect was discovered by Sunder for those firms that switched from FIFO to LIFO. Sunder (54) replicated his original study

with a variable risk model, and observed results consistent with his previous conclusions.

Differential market reactions were discovered by Harrison (33) when accounting changes were grouped into discretionary and nondiscretionary changes. Such a result was not to say that the market was inefficient in responding to accounting changes. On the contrary, the discretionary/nondiscretionary information datum was evidently perceived as important to the market, hence the differential market reaction between the two groups of firms. Market reaction to such an intervening variable would still support market efficiency.

The reaction of the aggregate capital markets to accounting alternatives is evidently consistent with the efficient market hypothesis.[*] The aggregate equity market is not fooled by accounting number changes. Such a strong affirmation as to the rationality of the aggregate cannot be made for individuals. Given these empirical results, a study of small group reactions to accounting alternatives is of interest. In particular, do the inefficiencies of individuals dissipate when decisions using accounting variables are made in small groups?

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[*]Other capital market impact studies supporting market efficiencies include Patz and Boatsman (49), Abdel-khalik and McKeown (2), Dyckman and Smith (25), Collins and Dent (15), and Hong, Mandelker, and Kaplan (34).

CHAPTER III

METHODOLOGY

Subjects and Lending Environment

The subjects chosen for this study were bank loan offi-
cers. The data was collected in a field setting at the sub-
ject's place of employment. Before collecting the field
data, the researcher first interviewed many lending officers
and senior personnel within the banking community. The
interviews revealed a high degree of similarity between the
large banks (over 1 billion in assets) in lending and per-
sonnel policies.

Lending Policies

Generally, loan applications are initiated at the indi-
vidual loan officer level. The loan officer has the dual
function of generating loan business and screening unwanted
business. In conducting these functions, the loan officer
will review and analyze a loan application. The result of
his personal review will be a written report indicating his
recommendation for acceptance or rejection. Each officer
operates within a loan authority. This authority allows him
to make acceptance and pricing decisions, without consulta-

tion, up to a specified loan limit. This limit is based upon rank and experience. Loan applications that require funds above the officer's authority require either the approval of a senior officer whose lending authority covers the funding needs or the approval of a loan committee. Generally, there are several committees available to accomodate different sized loans. The size of the committees can range from two to six or more individuals with the initiating officer reserved membership. Applications that require a committee approval undergo a formal credit analysis, usually performed by individuals in a service department. The credit analysis involves trend, ratio, cash flow, and qualitative analyses from public and private data. The credit analysis also includes a recommendation for committee consideration. The committee then votes on the loan disposition as well as determining the interest rate, and other terms.

Personnel Policies

Within the large banks, the loan officers are highly trained degreed personnel. In many instances the officers possess a Master of Business Administration degree. Besides formal education, loan officers undergo specialized "in house" training. Included in this training are courses and cases designed to develop the officers' statement analysis skills. After this period of training the loan officers

begin to apply their skills in the credit analysis area.
The service department doubles as a training ground for
potential loan officers, besides its normal service func-
tion. It is rare to find an individual aspiring to remain
within the credit analysis area, almost all expect to be
loan officers eventually.

Two points relevant to this study should be high-
lighted. First, loan officers routinely make decisions as
either individuals or as a member of a group. Many times, a
single decision is made sequentially as an individual, then
as a group member (or visa versa). Second, loan officers
are not naive decision makers. They are aware, and have
been formally trained in statement analysis.

Procedure

As mentioned, the experiment utilized bank loan offi-
cers as subjects in a loan evaluation task. These loan
officers were recruited through the senior banking offi-
cials. The experiment was conducted during a prearranged
one hour session at the subject's place of employment. Gen-
erally, several sessions during a single day at a particular
bank were arranged. The subjects responded to the experi-
mental instruments in pairs. It was not unusual for the
bank to provide a secluded area to conduct the experiment,
so as to minimize the normal distractions attending commer-
cial lending. Prior to the experiment each subject pair was

introduced to the researcher and told the general purpose of the experiment. The subjects were told the purpose of the experiment was to determine the ability of professional statement users in interpreting financial statements. Furthermore, they were informed that the experiment would be conducted in two phases, an individual and group phase. The researcher also defended the simplicity of the task relative to an actual lending task by explaining to each subject the role of internal and external validity. This introduction also included a statement as to the assumptions under which they were to operate. A list of these assumptions were provided for each subject, and is reproduced in Appendix A. The loan officers were asked to provide risk perception responses to an artificially generated set of financial statements and accompanying ratios. In addition, each subject was informed that the hypothetical firms were small oil refining operations. This made the footnotes more reasonable, since they are common agreements in oil refining, and eliminated the need for a oil reserve study necessary for any type of exploration or drilling loan. Furthermore, each subject was told the close similarity between the firms was due to purposed construction by the researcher, thereby reducing suspicion as to the equivalence of the two firms. After providing responses as individuals, the subjects were asked to assemble into dyad groups for a similar analysis on a different artificial case. The researcher allowed the

subjects to respond in privacy during the group phase. In this way the subjects would not be inhibited by the researcher's presence. During the individual phase the researcher remained present to eliminate any conversation between the two participants.

The experiment was constructed so as to highlight any subject risk perception differences for two types of off balance sheet versus on balance sheet financing arrangements. The two financing arrangements are the advance production payment and the "throughput or deficiency" agreement (see Kelley [40] for a discussion on off-balance sheet financing methods). In order to determine risk perception differences, each individual and group made evaluations across two artificial cases (the cases are reproduced in Appendix A). The two cases were similar within each group or individual phase, except for different liability disclosures. One case included the liability in the face of the statement, while the other disclosed the liability in footnote form. The two cases were different between each individual and group phase. Therefore, each subject made four statement evaluations, a matched pair as an individual and a different matched pair as a member of a two person group. The two matched pairs were different as to relative account balances, and the liability used for on versus off statement comparisons. As discussed below the advance production payment and the "throughput or deficiency" agreement are simi-

lar in economic substance.[1] [2]   After providing responses to
the financial statements (Appendix B), each subject answered
a post experimental questionnaire.

Experimental Environment

Advance production payments are common in the energy
related industries.   In form, a company in need of funds
will contract to provide a set amount of production output
to a second firm in return for a lump sum advance.   In sub-
stance, the contracting firm is receiving a loan by guaran-
teeing periodic principle and interest amortization in the
form of production output. The bank provides the second firm
financing wholly on the contractual arrangement that exists
for debt service.   Figure 1 illustrates the transaction.
Present disclosure requirements for A allow either footnote
and/or balance sheet presentation of the arrangement.

The "throughput and deficiency" agreement is commonly
used for pipeline construction.   Under this arrangement the
taker guarantees to accept sufficient output to service the
debt of the pipeline project, which is carried by a joint
venture.   In substance, the risks and rewards of ownership

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[1]A pilot study incorporating the above design was
applied to students before proceeding to the field.

[2]One half of the individuals received a matched pair of
statements with the throughput liability and the other half
received statements with the production payment.   The group
phase received the opposite of what each member analyzed
individually.

```
                          provides product
    Provider   ──────────────────────────────────►   Taker
               ◄──────────────────────────────
                          guarantees payments
        ▲
        │   loan made
        │   on basis
        │   of agreement
        │
        │
    Bank
```
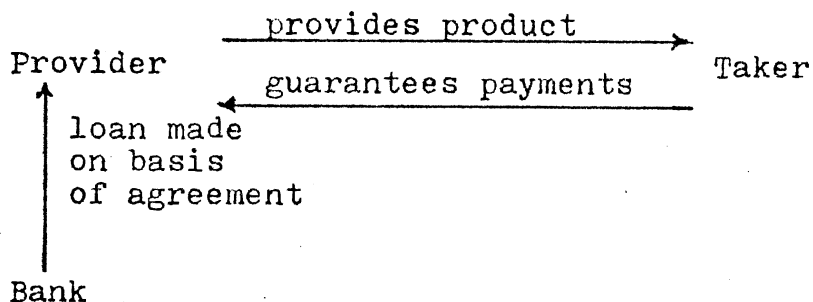
Figure 1. Advance Production Payment

belong to the taker, even though the asset and related liability are kept off of the taker's books. Figure 2 illustrates the transactions envolved. Presently most throughput or deficiency agreements are disclosed in the footnotes as a contingency.[a]

Risk evaluation in the commercial loan decision was chosen as the event of interest because of the presence of individual and small group decision making in the external environment, and because of the reliance upon accounting numbers in such a decision. The investment decision is a less appealing avenue of investigation because investor welfare changes are a direct result of equity market changes.

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[a]A recent FASB Exposure Draft (30) has admitted to alternative treatments of throughput agreements. Disclosing these types of agreements as assets and liabilities or in the footnotes as contingencies will be resolved after the conceptual framework project is completed. Until that time the FASB endorses footnote disclosure.

As such, investigation at the aggregate would appear to be the only fruitful position when attempting to make tangible conclusions with respect to accounting policy. Such a condition does not exist with creditor institutions; therefore conclusions with respect to accounting information effects upon small groups would appear substantive.

guarantees output

A   B

advances a lump sum

loan made on
basis of agree-
ment

Bank
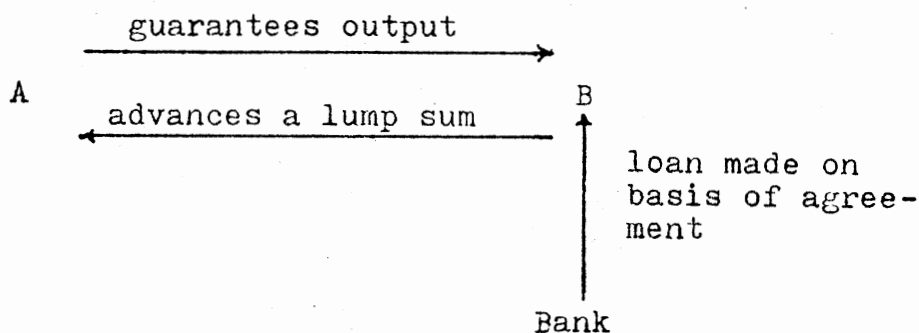
Figure 2. Throughput Agreement

Many previous studies have supported the relevance of financial data in loan evaluation. Altman (3), Beaver (9), Deakin (18), and Kennedy (41) have provided strong evidence as to the environmental validity of certain financial ratios in the prediciton of bankruptcy. Apparently this signifi-cant predictive ability has not gone unnoticed by loan offi-cers. Kennedy found evaluation of financial ratios to con-stitute 35% of the financial analysis. Although ratio data

are not the only source of information utilized by loan officers, they do represent a significant portion of the analysis (14). Furthermore, Oliver's (47) survey of bankers revealed a 65% reliance on financial statements for loan evaluation.

Description of the Subjects

A post-experimental questionnnaire was completed by each of the 28 participants in the experiment (see Appendix B for a reproduction of the questionnaire). From this, Table II (Appendix D) provides some background information on the commercial loan officers.

Responses were obtained from commercial loan officers in either the metropolitan or energy divisions of the commercial loan department. The energy division is generally composed of two or three officers, while the metropolitan division is considered the largest with anywhere from 10 to 20 loan officers. As such, it was not possible to require all the loan officers to possess energy related experience. There would be not enough subjects for the experiment if such a restriction were made. This is not of major concern, however, because the two off-balance sheet financing methods presented in the experiment are prevalent outside the energy field. Indeed, close to half of the subjects were familiar with these types of agreements. For those unfamiliar with these financing agreements it was assumed the text of the

footnotes would provide sufficient information as to the nature of the contract.

Notice also that the subjects had extensive experience in loan evaluation (13 yr. average), including associations with oil related loans.

Methodology

The methodology was designed to control for both subject and firm variability. Each subject evaluated two statements that were identical in all respects except for an arbitrary size adjustment, and the liability disclosure. The size adjustment is an absolute change in the account balances, but is not a relative change. In other words, since all the accounts are altered by the same percentage, there will be no change in the relative financial positions of the two hypothetical firms. Conversely, the liability disclosure will have an effect on specific accounts only, therefore the account numbers will change relatively across the two cases.

The arbitrary size adjustment camouflages the similarity between the two firms, since it is imperative the subjects remain unaware of the equality of the two firms.* The names of the firms were also disguised for the same purpose. Appendix A provides the statements used in the analysis.

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*Given two comparisons, say A and B, the size adjustment is counter-balanced such that A=.8B for one half fo the subjects, and B=.8A for the other half of the subjects.

Each subject made simultaneous risk evaluations over
the two firms (see Appendix B for the questionnaire). Inef-
ficiency was defined as any subject response discrepencies
between the two firms. In testing for the equality of risk
perceptions over the two firms, subject variability and firm
variability were controlled. Each subject acted as his own
control over the two evaluations. This has the advantage of
controlling for decision model differences between subjects.
As a result, the decision model need not be estimated or
specified, allowing appropriate use of the final judgements
in the analysis. The only substantive difference between
the two firms is the liability disclosure, therefore any
identified risk perception differences can be attributed to
subject processing inefficiency with respect to the liabil-
ity disclosure. Firm differences and subject differences
could not explain such a result.

This approach was used for both the individual and
group phases of the experiment. In the group phase individ-
uals were assigned to two man groups to make risk evalua-
tions on the two identical firms. The group consensus was
used as the dependent variable in the analysis.

Recall that each pair of statements are not only dif-
ferent due to the disclosure format, but due also to an
arbitrary size adjustment. Past studies (23) (1) have
incorporated the size variable as a treatment of interest.
These studies found an unappreciable effect due to the size

variable. This result was also confirmed by the pilot
study. As such, the size effect was not submitted to a
priori analysis.

Order of Presentation

Each subject made decisions in sequence as an individ-
ual and as a member of a group. One could argue that the
order of the individual-group sequence could have a marked
effect on the processing ability comparisons between the two
phases (namely, order effects on Ho(2)). If the group phase
was administered first, information learned from the group
phase could be utilized in the individual phase. If the
individual phase was administered first, then learning gen-
erated in that stage could be later applied in the group.
In either case there is potential for pollution of the sec-
ond phase from the first.

To control and test for such effects, one half of the
subjects analyzed the matched pair statements as groups
first, then analyzed a different matched set as an individ-
ual. The other half of the subjects responded in an oppo-
site order. If pollution effects are equal for either order
or non existent, then comparisons between the two order
sequences would be similar. If effects do exist, then one
would expect to find dissimilarities between the two order
sequences. Such was the case in the pilot study (see Appen-
dix C). Order effects will be tested by analyzing Ho(1) and

Ho(2) for each order partition. Differential results for each partition would be evidence of an order effect.

Statistics

Both parametric and nonparametric statistics were used to test the Ho(1) hypotheses for Q1, Q2, and Q4 (questions 1, 2, and 4, Appendix B). Thirty-two commercial loan loan officers made two simultaneous risk evaluations on identical firms. The dependent nature of this design allows for the use of a parametric paired t test. The paired t test is preferred over a two independent sample mean comparison, when the variance of the paired differences (σ_D^2) is sufficiently less than the variance of the individuals ($2\sigma^2$). This is necessary to compensate for the lost degrees of freedom from pairing. σ_D^2 will be less than $2\sigma^2$ when members of a pair are more similar than with members of different pairs. An estimate of σ_D^2 can be computed as:

$$S_D^2 = S^2 + S^2 - 2COV(variable1, variable2) \qquad (1)$$

where S^2 denotes the estimated variance. Thus, high covariance (similarity within pairs) reduces the estimate of the difference variance. The use of this test eliminates the extraneous variance that exists within the subject pair, and therefore increases the ability of the test to detect small differences between the two samples. A nonparametric equivalent utilizing the sign (Sign Test) of the differences was also applied to the dependent samples to test Ho(1).

differences obtained in the group phase of the experiment is based upon a different financial statement pair than under the individual phase. Even though there is subject dependency across the two experimental phases, the change in the financials would appear substantive enough to warrant independent treatment of the means. Therefore, Ho(2) was tested via an independent sample t test on the relevant dependent variables.[6]

Dependent Variables

A major concern of commercial loan officers is loan risk. The analysis of risk can be thought of as occurring at two levels. At the first level the loan officer is interested in making a simple discrimination between acceptable and unacceptable loan opportunities. This is probably the loan officer's primary goal, to discriminate between poor and favorable loan risks. A loan officer's failure in this area eventually will lead to career failure. Once loan acceptability is determined the loan officer will next attempt to price the loan so as to maximize the bank's yield at minimal risk. Herein lies the second level, to incorporate risk assessment along with other relevant variables in recommending an interest rate for the loan. Failure here is not as critical as failure at the first level.

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[6]Cronbach and Furby (17) suggest an alternative statistical approach utilizing covariance analysis.

The dependent variables attempted to capture the lending environment by requiring the lending officers to evaluate loan opportunities with respect to risk. Beyond this, variables were chosen to determine the relative perceived favorability of one firm over the other in the matched pair evaluations. The same variables were used in both the individual and group phases.

The first variable is an interest rate assignment on the loan. It was assumed in all cases that the loan would be granted.

PRICE: An interest rate recommendation as a percentage of the prime rate.

This variable was requested as a percentage of prime so as to facilitate comparison and aggregation. Even if the loan officers are operating under different prime rates an interest rate recommendation as a percent of prime provides a relative measure. It is further assumed that this variable is somewhat sensitive to risk perceptions. Supposedly, the higher the perceived risk the higher the interest rate response will be.

The second variable attempted to discover the perceived riskiness of the loan apart from other pricing variables.

DEFAULT: The probability of loan default as perceived by the subject for the firm.

One would expect an unfavorable financial position to elicite responses of higher default probability than more favorable financial positions.

The third variable forces the subject to choose between the two firms.

CHOICE: The choice of only one of the two competing loan applications in the matched pair.

If the subjects systematically perceive one firm to be favored over another then one would expect that preference to be indicated by a high frequency of responses for that firm in this variable. If both firms are perceived as equivalent opportunities, then the CHOICE variable should not selectively favor one firm over another.

The fourth variable sets up a rather contrived condition whereby each subject must allocate a fixed amount of available funds between the two loan opportunities in the matched set.

ALLOCATE: A percentage allocation of fixed available funds to the two companies. Both allocations must add to 100%.

If both firms are perceived as equivalents then equal allocations between the two firms would be expected. In contrast, if one firm was preferred over another firm, then one would expect an unequal allocation with a greater share accruing to the favored firm.

All four dependent variables attempt to determine if one loan opportunity appears more attractive than another. The first two variables request independent assessments on the two firms, while the second two variables force direct comparisons between the two firms. Recall once more that the two firms are equivalent except for liability format disclosures, so that any differences in the responses to these variables for the two firms is an indication of processing inefficiency. It will be these differences between PRICE, DEFAULT, and ALLOCATE across the two firms that will form the dependent variables in the analyses to follow.

Methodological Conclusions

The experiment described above was applied at an individual and group level of aggregation. The instruments were designed in such a way so as to present accounting policy changes without concurrent economic changes. As such, complete processing of the accounting data would suggest reactions to only underlying informational qualities of the accounting reports rather than simple format changes. However, given price evidence, one would expect some inefficiencies to result at the individual level.

The analysis of group behavior advances a step beyond the scope of most of the prior behavioral research. If accounting processing efficiencies do indeed increase with user aggregation then one would expect to observe increased

group awareness of the underlying economic realities, and therefore, smaller disparities in risk assessment for on versus off-balance sheet presentations.

The conclusions of an investigation on group responses to accounting format changes should hopefully be of interest to accounting policy makers. Presently, policy makers rely on individual processing research, and to some degree capital market research. Neither of these research pursuits provide evidence on the information processing capabilities of groups. Since there is pervasive use of accounting data by groups, the following evidence into group processing capabilities would appear useful.

CHAPTER IV

RESULTS

Two Avenues of Analysis

The interpretation of this experiment can be approached from two avenues. One can think of these two approaches in terms of either considering or not considering the sign of the differences.

Sign Considered

An argument could be made that any inefficiercies discovered in the subjects' processing can be a priori specified as to direction. Specifically, if the processing of accounting information is inefficient then one could expect the loan opportunity with the footnote liability presentation to be favored over the firm with the balance sheet presentation of the liability. The argument suggests the loan officers tend to ignore the footnote liability, and instead focus mainly upon the financial ratio information. If this is indeed the case, then the firm with the footnote liability will display more favorable ratios then the firm with the liability on the balance sheet. Therefore, inefficiencies are expected and the sign is predicted. The firm

with the footnote will be favored over the equivalent firm
without the footnote.

Sign Ignored

Under an alternative view any descrepencies in percep-
tion between the two firms is inefficient no matter which
firm is favored. Although it may be difficult to explain
why a firm with the liability on the balance sheet is
favored over an equivalent firm with off balance sheet
financing, such a result is still an evidence of ineffici-
ency.

The first view allows positive and negative differences
to cancel each other out. The result is a statistic that
will show the overall subject performance. The second view
is more individualistic. Differences are not constrained as
to sign (i.e. absolute values are used), therefore the
resulting statistic will be an average of individual ineffi-
ciencies.

Results of Ho(1)-Sign Considered

Paired t-Test

As mentioned previously the efficiency of groups and
individuals, independently, will be tested via a paired t
test. For both the individuals and the groups the hypothe-
sis can be rewritten:

Ho(1): $\bar{d}$ =0 for PRICE, DEFAULT, and ALLOCATE

Ha(1): $\bar{d} < 0$ for PRICE and DEFAULT

Ha(1): $\bar{d} > 0$ for ALLOCATE

Again it is assumed that the sign of the average differences ($\bar{d}$) is relevant. For PRICE and DEFAULT, in the event of inefficient responses, one would expect a larger numerical response for the balance sheet presentation of the liability than for the footnote presentation. Similarly, given inefficiencies, a greater allocation of loanable funds to the footnote firm than to the balance sheet firm could be expected.

Table III, (Appendix D) presents the results of the paired t test for the individuals. For the 28 loan officers only DEFAULT approaches significance at the .10 level. Curiously, ALLOCATE does not even possess the expected sign and PRICE does not approach significance. This is somewhat contrary to a priori expectations.

The group results are presented in Table IV, (Appendix D). The group results indicate general processing efficiency except on the PRICE variable. Evidently, the groups priced the two loans differently. Since the sign is in the appropriate direction it can be surmised the liability disclosure was the cause of such a result. The other two variables did not approach significance, but demonstrate some inefficient effects by possessing the expected sign for inefficiency.

Nonparametric Sign Test

A second analytical technique for testing the equality of two dependent samples is the sign test. The sign test is a derivation of the binomial test where the probability for a '+' or '-' is 1/2, under the null hypothesis. The signs in this case represent the signs of the differences on the matched pair responses. In the event of processing efficiency one would expect an approximately equal representation of sign among the differences. The asymptotic relative efficency of the sign test to the paired t test is .637 (16). This is a measure of the sample size efficiency between the two tests at the same alpha and beta levels.

Table V (Appendix D) provides the sign test results on the individuals' responses.[1] The results of the sign test are markedly different from the parametric results. In two out of the three variables the test approaches significance, while for DEFAULT the test is close to the .10 level. These results indicate that the subjects were inefficient with respect to the sign of their responses, although not necessarily with the magnitude of those responses.

The sign test was also used to test the group results. Table VI (Appendix D) provides a summary. Again, these results indicate some inefficiency relative to the sign of

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[1]Ties or 'zero differences' are excluded in this analysis.

the differences. Both PRICE and ALLOCATE have sign frequencies indicating a preference for the loan application with footnote disclosure. The DEFAULT variable is clearly not significant.

A Wilcoxon rank test for matched pairs was not applied to the data because the necessary assumptions of a symmetrical distribution function and continuous random variables did not appear to be met.

Clearly the sign tests above cannot be taken as evidence by themselves, but should be interpreted in light of the parametric results. Apparently, the footnote firm is favored over the balance sheet firm in the majority of cases. However, this preference is not great enough in magnitude to deliver a rejection of Ho(1) for all variables. In combining the results of both tests it appears as though inefficiency is present in individuals as evidenced by the DEFAULT variable, and is also present in groups as indicated by the PRICE variable and somewhat by the ALLOCATE variable.

A Binomial Test on Choice

The CHOICE variable requires a somewhat different analysis because of its dichotomous nature. If Ho(1) is true then a forced choice between the two loan opportunities should provide nearly equivalent preference frequencies for each firm. This can be tested via a Binomial test with $p=1/2$. Table VII (Appendix D) provides the individual

results.   As can be seen,   the relative choice frequencies are not   equivalent.   Approximately 68% of   the respondents chose   the   statements   with footnote   disclosure   over   the statements with balance sheet disclosure.   Apparently,   the favorable ratios of the footnote firm over the balance sheet firm affected the subjects' preferences.

A similar result is present in the group decision making as can be seen in Table VIII (Appendix D).   The groups also favor the firm with the more attractive financial ratios.   In both cases there is a clear trend towards inefficient responses in a dichotomous forced choice setting.

Overall, when the sign is considered there appears to be ample evidence of inefficient preference towards the footnote firm at both the individual and group level.

Analysis of Results-Absolute Values

The prior analysis on the mean of the signed differences allows the positive and negative differences to cancel each other in aggregation.   To understand the efficiency of the individuals in the experimental task, an analysis on absolute values of the differences becomes desirable.   Such an approach considers any difference between the matched statement responses to be evidence of inefficiency.   The absolute differences were averaged to obtain the mean of the individual inefficiencies, irrespective of direction.

Paired t Test

Again, a paired t test was used to test the Ho(1) hypothesis on the absolute differences. Table IX (Appendix D) displays the individuals' results.

When the mean of the absolute differences are compared to zero there is a clear rejection of the null hypothesis. Given the results of Table III (Appendix D) and Table V (Appendix D) together, there would appear to be responses causing positive differences. In fact, from the sign test, this is known to be the case. In addition, the positive differences must be of relatively high magnitude to cause such large increases in the absolute mean differences over the mean differences of Table III (Appendix D). This would seem to be true because there were not many positive differences.

A similar approach was applied to the group data. Table X (Appendix D) provides a summary of the results. Although the t values are not as large as in the individuals' results, Ho(1) can still be rejected at a .10 level.

When considering the mean of the absolute differences there is a clear indication that the subjects evaluated the two matched firms differently, but that the direction of the difference is somewhat less obvious. Most subjects did provide some inefficient responses based upon the favorability of the footnote financial statements over the non-footnote statements. However, the analysis of the absolute differ-

ences indicate that the inefficiency is more complex than such a simple explanation. Some subjects, just as inefficiently, favored the firm with the less favorable ratios (liability on the balance sheet) over the firm with the more favorable ratios (liability in the footnotes).

Results of Ho(2)-Sign Considered

The second hypothesis addresses the question of whether the groups are more efficient in the processing of accounting information than are the individuals. As mentioned, a two independent sample t test appears to be the appropriate statistic for answering this question. The hypothesis can be expressed as follows:

Ho(2): $\overline{d}_i = \overline{d}_g$ for PRICE, DEFAULT, and ALLOCATE

Ha(2): $\overline{d}_i > \overline{d}_g$ for PRICE, DEFAULT, and ALLOCATE

where $\overline{d}_i$ is the average difference score for the individuals and $\overline{d}_g$ is the average difference score for the groups. Table XI, (Appendix D) shows the results of this test.

The results are very clear. In no instance can the null hypothesis be rejected in favor of the alternative. In fact, the PRICE and ALLOCATE variables produce greater inefficiencies in the groups than in the individuals, which is the opposite of expectations. Even for the CHOICE variable analyzed in Table VII, (Appendix D) and Table VIII, (Appendix D), the groups were slightly more inefficient.

Results of Ho(2)-Absolute Values

A comparison of the mean differences in absolute terms reveals the same conclusions as above. The results are produced in Table XII (Appendix D). Even though both the groups and individuals were inefficient in their responses towards the two firms, they were not significantly different in their inefficiency. Again, Ho(2) cannot be rejected for any of the variables.

Order Effects-Sign Considered

Testing Ho(1) Under Partitioned Data Sets

The order of group versus individuals responses could have a significant impact upon an interpretation of the results. Order effects would especially be evident in the event of carryover effects from one phase to another. To test for such a possibility the Ho(1) and Ho(2) hypotheses were reevaluated on data sets partitioned by the order of response. Table XIII (Appendix D) provides the Ho(1) results for the individuals on the partitioned data set.

The results indicate a sharp contrast between the two orders of response. When the individual phase occurred after the group phase there was no support for inefficient information processing. In contrast, when the individual phase occurred first there was a distinct trend towards

inefficiency. This was evidenced by the negative signifi-
cance of the PRICE and DEFAULT variables from zero.

Likewise, the group responses were also partitioned and
reanalyzed. Table XIV (Appendix D) displays the results.
The conclusions to be drawn are similar to the individual
phase results. When the groups respond first there is lit-
tle indication of inefficient processing of the accounting
data. However, when the groups respond after the individual
phase there is ample evidence of inefficient processing.
All three variables approach significance at the .10 level,
which is in sharp contrast to the results in the opposite
order.

Testing Ho(2) Under Partitioned Data
Sets-Sign Considered

To determine if the order of responses had an effect on
the Ho(2) results, a two independent sample t test was per-
formed on the partitioned data sets. Table XV (Appendix D)
shows the results. Unfortunately there is no support for
Ho(2) in either of the partitioned sets. Apparently, the
groups are not significantly more efficient than the indi-
viduals for either the aggregate or partitioned sets.

Order Effects-Absolute Values

The same statistical procedure will be used to discover
if there are any order effects on the absolute values of the

variables as shown in Table XVI (Appendix D). Curiously, there does not appear to be as much of an order effect on the absolute values as there was on the signed variables. For the individuals the inefficiency persisted, even when the individual phase was sequenced first. The groups also produced similar responses for the two sequence orders.

For a partitioned test of Ho(2) with absolute values the results were much the same as for the signed variables. In no case were the group responses significantly more efficient (smaller) than the individual responses.

CHAPTER V

SUMMARY AND CONCLUSIONS

Summary of Ho(1) Results

Table XVII (Appendix D) and Table XVIII (Appendix D) provide a simple summary of the analyses presented in the previous chapter. For each of the four dependent variables the test results are categorized by the various statistical approaches reported. The following code is used:

NS= not significant

S = significant

NA= not appropriate

where the significance of a particular response indicates processing inefficiency.

As can be seen there is a strong similarity between the individual and group results. Both phases exhibit moderate decision making inefficiency with respect to the signed pair t and sign test. For six possibilities there are three significant results in both cases. The binomial test on the CHOICE variable is highly significant in both cases. Analyzing the paired t results further by partitioning the results according to response sequence reveals an interest-

ing trend. When groups respond second both groups and individuals display inefficiency that does not exist for the opposite sequence. When the sign of the differences is ignored highly significant mean differences on the paired t test obtains. This is true regardless of response sequence order. Such a result may be due to an overestimation of the effect of the footnote on the financial position of the firm.

Although the results are not unanimous, there appears to be processing inefficiency at the individual and group level of aggregation. Such a result is particularly evident when the inefficiency is not constrained as to sign. The order of sequence also has a marked effect on the results. Individuals apparently gain some expertise with the problem by participating in a group discussion of a similar problem first. The groups fair better if they do not solve a similar problem first as an individual. Possibly, an erroneous solution scheme is fixed during the individual phase and carried through to the group phase. When the groups respond first, such a scheme may also be fixed. However, the scheme may be more accurate due to group interaction and input. Such a conclusion supports an anchor bias explanation as discussed by Tversky and Kahneman (56).

Summary of Ho(2) Results

The second hypothesis results reveal whether or not the groups are more sophisticated than the individuals. A significant difference between the group and individual mean responses would be evidence of this a priori expectation. Unfortunately, Table XIX (Appendix D) reveals that in no instance did the groups outperform the individuals. This was even true when the responses were partitioned as to response order.

Conclusions

Recall that the a priori expectations were for individual inefficiency and group efficiency, with a significant difference between the two. A pilot study provided results consistent with these expectations. Unfortunately, the results with sophisticated subjects were less accommodating. The individuals appeared to be inefficient, as was expected; however, the groups were just as inefficient. In fact the similarity of the groups and individuals resulted in no significant differences in the level of response efficiency between the two aggregations. There are several reasons why such a result might occur.

First, the dependent variables may not be relevant in the loan decision, and therefore unfamiliar to the subjects. This seems highly unlikely according to the personal interviews obtained from senior and executive level loan offi-

cers. The pricing variable and default variable capture the main task responsibilities of the officers. The choice and allocate variables produce a contrived environment, but still should not have caused confusion or misinterpretation.

A second explanation would suggest that the relatively small group sample size reduces the power of the tests. As a result any conclusions may not be accurately inferred from the population of bank loan officers. This is clearly a legitimate concern that only more extensive data collection could answer.

Third, the group size may have an effect on the group responses. In the pilot study, group sizes of three were utilized while the main study used only two person groups. It is possible that certain dynamics present in a three person group may foster decision making efficiency that does not exist in a two person group. Certain salient features of groups that would aid decision making are present in both types of groups. Both sizes require the verbal interaction of ideas between the partners, and the input of more than one member. However, a group of three has the advantage of adding a single mind or viewpoint to the discussion. Again, only future research could answer the question of whether an added group member would significantly increase the group processing efficiency.

Fourth, the results may be a function of the subjects themselves. The students performed to expectations, but the

professionals did not.   Possibly this professional popula-
tion was not sufficiently versed in financial statement
analysis to be able to accomodate the task.   There was some
indication of this as some subjects required explanations
for several of the financial ratios.   For many of the sub-
jects it had been a long time since they were required to
perform formal statement analyses.   Although one would have
expected the loan officers to be sufficiently capable of
elementary statement interpretation, such may not have been
the case.

It is possible the inefficiencies stem from the 43%
that did not possess experience in oil related loans.   To
investigate this possibility deeper, the groups and individ-
uals were segregated as to their oil loan experience.   Sur-
prisingly, the results persisted for the experienced sub-
jects.   The paired t results indicated several significant
mean differences for the individuals and groups with oil
related expertise.   In no case were the individual and group
responses significantly different form each other within the
experienced class.

To conclude, this study indicated that both the groups
and individuals possessed a moderate amount of inefficiency.
Furthermore, this inefficiency was not significantly differ-
ent between the two classes.

Accounting Implications

If the conclusions of this research can be replicated in future studies, then there exist certain policy implications relative to groups and individuals.

The presence of group and individual processing of accounting data by the credit granting community requires a broader set of objectives in policy development, then those suggested by Beaver. The welfare changes of bank loan officers, or even more basically bank stockholders, is a function of rate of return. Rate of return is further a function of pricing and minimizing loan losses. The decisions pertinent to pricing and risk assessment are made by small groups and individuals. Unfortunately, these groups and individuals were found to be inefficient information processors on a fairly simple task. In contrast to the point consistent with aggregate market research, these inefficiencies must be taken into consideration during policy development if a broad view of user need is to be obtained.

Such considerations should recognize that simple footnote disclosure of information may not be sufficient to guarantee efficient loan appraisal. Besides the problems of information overload, the credit granting community may not be sufficiently versed in accounting to apply the added information in meeting their needs. Furthermore, diverse choices in accounting method, as in different formats for liability disclosure, can only cause to hamper the loan

officer's and credit analyst's ability to interpret the economic postion of a firm.

Footnote disclosure appears to be is a less preferable method of disclosing an economic event that could alternatively be placed on the balance sheet. This research indicated that to a great extent the loan officers did not correctly assimilate the footnote information. The nature of credit analysis biases against footnote information. Credit analysis is still basic ratio, cross-sectional, and trend analyses derived from the face of the statements. Rarely do the credit summaries advance beyond the aggregated numerical data.

Limitations

As with all research attempting to obtain responses in a contrived setting, there exists the problem of external validity. This project was no exception. The experimental task was constructed so as to replicate the external environment without presenting complexities that would overburden the subjects. Most of the loan officers would have desired additional information in making the kinds of decisions required by this study. Some of the more common requests were for a five year history (instead of the two year comparatives), current asset information (receivable aging, inventory composition and marketability), outstanding debt terms, common size financial statements, and a funds

statement. Although it may have been desirable to include additional data such as the above, it was not feasible under the session time constraints. Furthermore, internal validity could have been diminished by such additional data. It does not appear desirable to sacrifice internal validity for external validity. The outcome would be a study that reflects the real world environment, but does not reliably answer the researcher's question of interest.

The lack of data complexity could be cause for another concern. It is possible that the treatment condition (liability disclosure format) was too obvious to the subjects. The two comparative financial statements may not have been comouflaged enough. This does not appear to be a valid criticism. First, it is desirable that the treatment condition provides a clear signal, and is not hidden among a mass of data. Without such a clear signal, the internal validity of the study could be hampered. Second, the results don't appear to confirm this accusation. If the subjects were able to "see through" the instruments, then there should have been no discrepencies in the variable values. This was not the case. In many instances the discrepencies were significantly different than zero.

The results of this study could be limited by the lack of any subject motivation towards the experimetal task. It was not possible to duplicate the reward structure present in the banking environment, so it is possible the sub-

jects did not provide thoughtful responses. It should be noted, however, that the researcher's observations did not confirm this potential criticism. Nearly all of the subjects used the maximum available time. Likewise, many of the subjects appeared diligent in performing the task.

A fourth limitation envolves an alternative explanation for the results, that was not directly tested by this study. It is possible that, in practice, the different liability disclosures communicate different levels of riskiness to the loan officers. Such levels could be explained by the attitudes of the debtors (statement preparers) when given alternative disclosure options. As an example, the manager of a firm may attempt to "hide" a liability in the footnotes when he perceives his firm as highly levered. Therefore, footnote presentation could provide an informatin datum that could account for different risk assessments by loan officers. Under such an explanation, different risk assessments would not be a result of inefficient application of accounting data, at least not as defined in this paper.

Implications for Future Research

This study does not provide a final answer to the proposed question, nor was it ever intended to do so. Given the somewhat surprising results of this study, it would appear that future research in this area could be fruitful. Specifically, future research might attempt to discover why

professional, supposedly sophisticated, subjects do not increase their processing efficiency in a group setting. For purposes of answering this question the differences between student subjects and professionals should be addressed. Additionally, different aggregation levels, say three or four person groups, might be investigated.

Apparently, the choice of subjects is critical to the results obtained. Future work should choose a different subject population, such as credit analysts or investment analysts. Likewise, a different psychological effect could be investigated. This study closely approximates previous work in the functional fixation area. Other areas such as information overload effects, anchor biases, representative biases, and availability biases (56) could be examined at the individual and group levels.

In general, future work should focus upon different variables so as to discover the significant features in finding or not finding group processing efficiency over individuals.

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APPENDIX   A

EXPERIMENTAL INSTRUMENTS

Individuals

	Footnote Disclosure	Balance Sheet Disclosure
Brown=(.8)Green	Brown	Green
White=(.8)Brown	Brown	White

Groups

	Footnote Disclosure	Balance Sheet Disclosure
Black=(.8)Blue	Black	Blue
Red=(.8)Brown	Black	Red

Figure 3.   Experimental Instruments

Assumptions

1.) These two applications are the only ones presently
    in your files.

2.) Both firms are fairly mature firms, and have worked
    with your bank since their inception.

3.) Both firms intend to use the funds for short term
    operations.

4.) Repayment will be made by a single lump sum payment
    generated from operations.

5.) The managements of both firms expect past trends
    to continue into the near future.

6.) Each firm will maintain a 20% compensating balance.

The Brown Oil Company

Statement of Financial Position
Fiscal Year End

Assets	19X2	19X1
Current Assets		
Cash	505,000	479,000
Marketable Securities	634,700	621,300
Accounts Receivable	3,152,000	3,368,600
Inventories(at cost)	3,001,500	2,799,500
Total Current Assets	7,293,200	7,268,400
Plant & Equipment	13,667,700	10,710,000
Total Assets	$20,960,900	$17,978,400

Liabilities		
Current Liabilities		
Notes Payable	920,000	861,000
Accounts Payable & Accrued Liabilities	4,386,200	4,562,900
Current Maturities on Long-Term Debt	215,100	190,600
Total Current Liabilities	5,521,300	5,614,600
Long-Term Debt	5,055,400	3,355,400
Deferred Credits		
Deferred Taxes	1,105,900	1,068,100

Stockholder's Equity		
Common Stockholder's Equity	767,800	622,300
Retained Earnings	8,510,500	7,318,000
Total Stockholder's Equity	9,278,300	7,940,300
Total Liabilities & Stockholder's Equity	$20,960,900	$17,978,400

The Brown Oil Company

Statement of Income
Fiscal Year

	19X2	19X1
Net Sales	30,864,500	27,469,700
Costs & Expenses		
Cost of Product Sold	24,888,700	22,144,100
Selling & General Expenses	2,964,100	2,864,300
Depletion & Depreciation	1,061,400	929,600
Taxes, other than income taxes	450,000	431,100
Interest & Debt Expense	307,800	246,100
Net Income	$ 1,192,500	$ 854,500

Summary of Notes to the Statements

1.) All financial statements are audited with an unqualified
auditor's opinion.

2.) There are no unsatisfied judgements or legal suits pending.

3.) Inventories are valued under the LIFO cost flow assumption.

4.) Fixed assets are depreciated under the straight line method.

5.) The Company follows the successful efforts method of accounting
for exploration and development costs.

6.) At the beginning of 19X1 the Company entered into a gas production
payment agreement whereby it was to receive $2,100,000 from
the Natural Gas Co.(NGC). Under the agreement the Company
has dedicated a percentage of gas production revenues for
repayment of the purchase amounts and interest on NGC's
financing arrangements. The payments for 19X1 and 19X2
on this agreement each came to $150,000 of which $80,000
is related to the interest costs. This payment was netted
against the gas revenues. Repayment of the production payments
is being made solely out of the revenues derived from recovered
gas applicable to this agreement.

The Green Oil Company

Statement of Financial Position
Fiscal Year End

Assets	19X2	19X1
Current Assets		
Cash	531,200	498,700
Marketable Securities	793,400	776,600
Accounts Receivable	4,127,500	4,398,200
Inventories(at cost)	3,751,900	3,499,500
Total Current Assets	9,204,000	9,173,000
Plant & Equipment	19,184,600	15,750,000
Total Assets	$28,388,600	$24,923,000

Liabilities		
Current Liabilities		
Notes Payable	1,150,000	1,076,400
Accounts Payable & Accrued Liabilities	5,482,800	5,703,600
Current Maturities on Long-Term Debt	356,400	325,800
Total Current Liabilities	6,989,200	7,105,800
Long-Term Debt	8,769,200	6,731,700
Deferred Credits		
Deferred Taxes	1,382,300	1,335,100

Stockholder's Equity		
Common Stockholder's Equity	959,800	777,900
Retained Earnings	10,288,100	8,972,500
Total Stockholder's Equity	11,247,900	9,750,400
Total Liabilities & Stockholder's Equity	$28,388,600	$24,923,000

The Green Oil Company

Statement of Income
Fiscal Year

	19X2	19X1
Net Sales	38,768,100	34,524,600
Costs & Expenses		
Cost of Product Sold	31,110,900	27,680,100
Selling & General Expenses	3,705,100	3,580,400
Depletion & Depreciation	1,589,200	1,424,500
Taxes, other than income taxes	562,500	538,900
Interest & Debt Expense	484,800	407,600
Net Income	$ 1,315,600	$ 893,100

Summary of Notes to the Statements

1.) All financial statements are audited with an unqualified auditor's opinion

2.) There are no unsatisfied judgements or legal suits pending

3.) Inventories are valued under the LIFO cost flow assumption.

4.) Fixed assets are depreciated under the straight line method.

5.) The Company follows the successful efforts method of accounting for exploration and development costs.

Summary of Financial Ratios
for the Two Firms

Ratio	Industry Average	Brown Oil Co.		Green Oil Co.	
		19X2	19X1	19X2	19X1
Return on Total Assets	.062	.057	.047	.046	.036
Current Ratio	1.51	1.32	1.29	1.32	1.30
Quick Ratio	.96	.77	.80	.78	.804
Current Assets to Total Assets	.36	.35	.40	.32	.37
Sales to Net Working Capital	17.46	17.42	16.61	17.50	16.40
Total Debt to Stockholders' Equity	1.20	1.26	1.26	1.52	1.56
Return on Stockholders' Equity	.132	.128	.108	.117	.092
Interest Coverage	9.37	4.87	4.47	3.71	3.19

The White Oil Company

Statement of Financial Position
Fiscal Year End

Assets	19X2	19X1
Current Assets		
Cash	340,000	319,200
Marketable Securities	507,800	497,000
Accounts Receivable	2,641,600	2,814,800
Inventories(at cost)	2,401,200	2,239,700
Total Current Assets	5,890,600	5,870,700
Plant & Equipment	12,278,200	10,080,000
Total Assets	$18,168,800	$15,950,700

Liabilities		
Current Liabilities		
Notes Payable	736,000	688,900
Accounts Payable & Accrued Liabilities	3,509,000	3,650,300
Current Maturities on Long-Term Debt	228,100	208,500
Total Current Liabilities	4,473,100	4,547,700
Long-Term Debt	5,612,300	4,308,200
Deferred Credits		
Deferred Taxes	884,700	854,500

Stockholder's Equity		
Common Stockholder's Equity	614,300	497,900
Retained Earnings	6,584,400	5,742,400
Total Stockholder's Equity	7,198,700	6,240,300
Total Liabilities & Stockholder's Equity	$18,168,800	$15,950,700

The White Oil Company

Statement of Income
Fiscal Year

	19X2	19X1
Net Sales	24,811,600	22,095,700
Costs & Expenses		
Cost of Product Sold	19,911,000	17,715,300
Selling & General Expenses	2,371,300	2,291,500
Depletion & Depreciation	1,017,100	911,600
Taxes, other than income taxes	360,000	344,900
Interest & Debt Expense	310,200	260,800
Net Income	$ 842,000	$ 571,600

Summary of Notes to the Statements

1.) All financial statements are audited with an unqualified
auditor's opinion

2.) There are no unsatisfied judgements or legal suits pending

3.) Inventories are valued under the LIFO cost flow assumption.

4.) Fixed assets are depreciated under the straight line method.

5.) The Company follows the successful efforts method of accounting
for exploration and development costs.

Summary of Financial Ratios
for the Two Firms

Ratio	Industry Average	Brown Oil Co.		White Oil Co.	
		19X2	19X1	19X2	19X1
Return on Total Assets	.062	.057	.047	.046	.036
Current Ratio	1.51	1.32	1.29	1.32	1.30
Quick Ratio	.96	.77	.80	.78	.804
Current Assets to Total Assets	.36	.35	.40	.32	.37
Sales to Net Working Capital	17.46	17.42	16.61	17.50	16.40
Total Debt to Stockholders' Equity	1.20	1.26	1.26	1.52	1.56
Return on Stockholders' Equity	.132	.128	.108	.117	.092
Interest Coverage	9.37	4.87	4.47	3.71	3.19

The Black Oil Company

Statement of Financial Position
Fiscal Year End

Assets	19X2	19X1
Current Assets		
Cash	220,600	211,600
Marketable Securities	539,900	542,000
Accounts Receivable	2,150,600	2,092,600
Inventories(at cost)	1,871,500	1,665,800
Total Current Assets	4,782,600	4,512,000
Plant & Equipment	13,534,900	8,066,100
Total Assets	$18,317,500	$12,578,100

Liabilities		
Current Liabilities		
Notes Payable	381,200	362,200
Accounts Payable & Accrued Liabilities	2,614,000	2,267,000
Current Maturities on Long-Term Debt	303,100	211,600
Total Current Liabilities	3,298,300	2,840,800
Long-Term Debt	5,633,900	2,681,200
Deferred Credits		
Deferred Taxes	576,500	554,000

Stockholder's Equity		
Common Stockholder's Equity	3,015,600	1,810,000
Retained Earnings	5,793,200	4,692,100
Total Stockholder's Equity	8,808,800	6,502,100
Total Liabilities & Stockholder's Equity	$18,317,500	$12,578,100

The Black Oil Company

Statement of Income
Fiscal Year

	19X2	19X1
Net Sales	17,146,600	14,085,400
Costs & Expenses		
Cost of Product Sold	12,828,800	10,566,300
Selling & General Expenses	1,418,100	1,261,200
Depletion & Depreciation	810,000	651,500
Taxes, other than income taxes	561,800	510,000
Interest & Debt Expense	426,800	186,600
Net Income	$ 1,101,100	$ 909,800

Summary of Notes to the Statements

1.) All financial statements are audited with an unqualified auditor's opinion.

2.) There are no unsatisfied judgments or legal suits pending.

3.) Inventories are valued under the LIFO cost flow assumption.

4.) Fixed assets are depreciated under the straight line method.

5.) The Company follows the successful efforts method of accounting for exploration and development costs.

6.) At the beginning of 19X1 the Company entered into several "throughput or deficiency" agreements with certain pipelines in which it has equity interests. These obligations require the corporation to provide specified minimum revenues from crude shipments for the next 10 years. At the end of the year the contingent liability had an upper limit of $1,950,000 over the remaining life of the agreement. Payments of $200,000 (including $120,000 in interest equivalents) were made in both 19X1 and 19X2. The agreement provided financing for $1,500,000 of pipeline equipment.

It is anticipated that shipments or other operating factors will be at levels sufficient to provide substantially all of the revenues required.

The Blue Oil Company

Statement of Financial Position
Fiscal Year End

Assets	19X2	19X1
Current Assets		
Cash	400,800	389,500
Marketable Securities	674,900	677,500
Accounts Receivable	2,688,200	2,615,700
Inventories(at cost)	2,339,400	2,082,300
Total Current Assets	6,103,300	5,765,000
Plant & Equipment	18,418,600	11,770,000
Total Assets	$24,521,900	$17,535,000

Liabilities

	19X2	19X1
Current Liabilities		
Notes Payable	476,500	452,700
Accounts Payable & Accrued Liabilities	3,292,500	2,858,700
Current Maturities on Long-Term Debt	478,900	364,500
Total Current Liabilities	4,247,900	3,675,900
Long-Term Debt	8,717,400	5,126,500
Deferred Credits		
Deferred Taxes	720,600	692,500

Stockholder's Equity

	19X2	19X1
Common Stockholder's Equity	3,769,500	2,262,500
Retained Earnings	7,066,500	5,777,600
Total Stockholder's Equity	10,836,000	8,040,100
Total Liabilities & Stockholder's Equity	$24,521,900	$17,535,000

The Blue Oil Company

Statement of Income
Fiscal Year

	19X2	19X1
Net Sales	21,433,200	17,606,800
Costs & Expenses		
Cost of Product Sold	15,786,000	12,957,900
Selling & General Expenses	1,772,600	1,576,500
Depletion & Depreciation	1,200,000	1,001,900
Taxes, other than income taxes	702,200	637,500
Interest & Debt Expense	683,500	383,200
Net Income	$ 1,288,900	$ 1,049,800

Summary of Notes to the Statements

1.) All financial statements are audited with an unqualified auditor's opinion

2.) There are no unsatisfied judgements or legal suits pending

3.) Inventories are valued under the LIFO cost flow assumption.

4.) Fixed assets are depreciated under the straight line method.

5.) The Company follows the successful efforts method of accounting for exploration and development costs.

Summary of Financial Ratios
for the Two Firms

Ratio	Industry Average	Black Oil Co.		Blue Oil Co.	
		19X2	19X1	19X2	19X1
Return on Total Assets	.062	.06	.072	.053	.06
Current Ratio	1.51	1.45	1.59	1.43	1.57
Quick Ratio	.96	.88	1.00	.89	1.00
Current Assets to Total Assets	.36	.26	.36	.25	.33
Sales to Net Working Capital	17.46	11.55	8.43	11.55	8.44
Total Debt to Stockholders' Equity	1.20	1.08	.943	1.26	1.18
Return on Stockholders' Equity	.132	.125	.14	.119	.13
Interest Coverage	9.37	3.58	5.87	2.89	3.74

The Red Oil Company

Statement of Financial Position
Fiscal Year End

Assets	19X2	19X1
Current Assets		
Cash	256,500	249,300
Marketable Securities	431,900	433,600
Accounts Receivable	1,720,500	1,674,000
Inventories(at cost)	1,497,200	1,332,700
Total Current Assets	3,906,100	3,689,600
Plant & Equipment	11,787,900	7,532,800
Total Assets	$15,694,000	$11,222,400

Liabilities		
Current Liabilities		
Notes Payable	305,000	289,700
Accounts Payable & Accrued Liabilities	2,107,200	1,829,600
Current Maturities on Long-Term Debt	306,500	233,300
Total Current Liabilities	2,718,700	2,352,600
Long-Term Debt	5,579,100	3,281,000
Deferred Credits		
Deferred Taxes	461,200	443,100

Stockholder's Equity		
Common Stockholder's Equity	2,412,400	1,448,000
Retained Earnings	4,522,600	3,697,700
Total Stockholder's Equity	6,935,000	5,145,700
Total Liabilities & Stockholder's Equity	$15,694,000	$11,222,400

The Red Oil Company

Statement of Income
Fiscal Year

	19X2	19X1
Net Sales	13,717,300	11,262,400
Costs & Expenses		
Cost of Product Sold	10,103,000	8,293,100
Selling & General Expenses	1,134,500	1,009,000
Depletion & Depreciation	768,000	641,200
Taxes, other than income taxes	449,500	408,000
Interest & Debt Expense	437,400	245,200
Net Income	$ 824,900	$ 671,900

Summary of Notes to the Statements

1.) All financial statements are audited with an unqualified auditor's opinion

2.) There are no unsatisfied judgements or legal suits pending

3.) Inventories are valued under the LIFO cost flow assumption.

4.) Fixed assets are depreciated under the straight line method.

5.) The Company follows the successful efforts method of accounting for exploration and development costs.

Summary of Financial Ratios
for the Two Firms

Ratio	Industry Average	Black Oil Co.		Red Oil Co.	
		19X2	19X1	19X2	19X1
Return on Total Assets	.062	.06	.072	.053	.06
Current Ratio	1.51	1.45	1.59	1.43	1.57
Quick Ratio	.96	.88	1.00	.89	1.00
Current Assets to Total Assets	.36	.26	.36	.25	.33
Sales to Net Working Capital	17.46	11.55	8.43	11.55	8.44
Total Debt to Stockholders' Equity	1.20	1.08	.943	1.26	1.18
Return on Stockholders' Equity	.132	.125	.14	.119	.13
Interest Coverage	9.37	3.58	5.87	2.89	3.74

APPENDIX B

EXPERIMENTAL QUESTIONNAIRE

Questionnaire

The two firms are applying for the following revolving credit lines (1 year term).

The Brown Oil Company is applying for a $1,000,000 loan.

The Green Oil Company is applying for a $1,250,000 loan.

1.) What would be your initial interest recommendations on these arrangements? Express your responses as a percent of the prime interest rate.

My interest rate recommendations, as a percent of the prime rate, are: (a response of 100%, means you think the prime rate is appropriate)

for the Brown Oil Company   _____%

for the Green Oil Company   _____%

2.) If both firms were granted, and subsequently exercised the above loan arrangements, what do you believe the probability of technical default would be for each firm? Express your answer as a decimal between 0 and 1.

I believe the probability of technical default for each firm is:

The Brown Oil Company   _____(between 0 and 1)

The Green Oil Company   _____(between 0 and 1)

3.) If you were constrained such that you could only accept one of the two loan applications above, which firm would you select? Place a check by the firm whose application you would accept. (please check only one firm)

_____ The Brown Oil Company

_____ The Green Oil Company

4.) Assume that these are the only two loan applications in your files. Assume further that you would like to allocate X dollars among the two loan opportunities. What percent of the X dollars would you allocate to each firm? (Note: both allocations should add to 100%, also 0% is an admissible response.) I would allocate, as a percentage of X, to each firm:

The Brown Oil Company   _____%

The Green Oil Company   _____%

Questionnaire

The two firms are applying for the following revolving credit lines (1 year term).

The Brown Oil Company is applying for a $1,000,000 loan.

The White Oil Company is applying for a $800,000   loan.

1.) What would be your initial interest recommendations on these arrangements? Express your responses as a percent of the prime interest rate.

My interest rate recommendations, as a percent of the prime rate, are: (a response of 100%, means you think the prime rate is appropriate)

for the Brown Oil Company _____%

for the White Oil Company _____%

2.) If both firms were granted, and subsequently exercised the above loan arrangements, what do you believe the probability of technical default would be for each firm? Express your answer as a decimal between 0 and 1.

I believe the probability of technical default for each firm is:

The Brown Oil Company _____(between 0 and 1)

The White Oil Company _____(between 0 and 1)

3.) If you were constrained such that you could only accept one of the two loan applications above, which firm would you select? Place a check by the firm whose application you would accept. (please check only one firm)

_____ The Brown Oil Company

_____ The White Oil Company

4.) Assume that these are the only two loan applications in your files. Assume further that you would like to allocate X dollars among the two loan opportunities. What percent of the X dollars would you allocate to each firm? (Note: both allocations should add to 100%, also 0% is an admissible response.) I would allocate, as a percentage of X, to each firm:

The Brown Oil Company _____%

The White Oil Company _____%

Questionnaire

The two firms are applying for the following revolving credit lines (1 year term).

The Black Oil Company is applying for a $ 800,000 loan.

The Blue Oil Company is applying for a $1,000,000 loan.

1.) What would be your initial interest recommendations on these arrangements? Express your responses as a percent of the prime interest rate.

My interest rate recommendations, as a percent of the prime rate, are: (a response of 100%, means you think the prime rate is appropriate)

for the Black Oil Company _____%

for the Blue Oil Company _____%

2.) If both firms were granted, and subsequently exercised the above loan arrangements, what do you believe the probability of technical default would be for each firm? Express your answer as a decimal between 0 and 1.

I believe the probability of technical default for each firm is:

The Black Oil Company _____(between 0 and 1)

The Blue Oil Company _____(between 0 and 1)

3.) If you were constrained such that you could only accept one of the two loan applications above, which firm would you select? Place a check by the firm whose application you would accept. (please check only one firm)

_____ The Black Oil Company

_____ The Blue Oil Company

4.) Assume that these are the only two loan applications in your files. Assume further that you would like to allocate X dollars among the two loan opportunities. What percent of the X dollars would you allocate to each firm? (Note: both allocations should add to 100%, also 0% is an admissible response.) I would allocate, as a percentage of X, to each firm:

The Black Oil Company _____%

The Blue Oil Company _____%

Questionnaire

The two firms are applying for the following revolving credit lines (1 year term).

The Black Oil Company is applying for a $800,000 loan.

The Red Oil Company is applying for a $640,000 loan.

1.) What would be your initial interest recommendations on these arrangements? Express your responses as a percent of the prime interest rate.

My interest rate recommendations, as a percent of the prime rate, are: (a response of 100%, means you think the prime rate is appropriate)

for the Black Oil Company _____ %

for the Red Oil Company _____ %

2.) If both firms were granted, and subsequently exercised the above loan arrangements, what do you believe the probability of technical default would be for each firm? Express your answer as a decimal between 0 and 1.

I believe the probability of technical default for each firm is:

The Black Oil Company _____(between 0 and 1)

The Red Oil Company _____(between 0 and 1)

3.) If you were constrained such that you could only accept one of the two loan applications above, which firm would you select? Place a check by the firm whose application you would accept. (please check only one firm)

_____ The Black Oil Company

_____ The Red Oil Company

4.) Assume that these are the only two loan applications in your files. Assume further that you would like to allocate X dollars among the two loan opportunities. What percent of the X dollars would you allocate to each firm? (Note: both allocations should add to 100%, also 0% is an admissible response.) I would allocate, as a percentage of X, to each firm:

The Black Oil Company _____ %

The Red Oil Company _____ %

Post Experimental Questionnaire

1.) How many years have you been making loan evaluations?

_____ years

2.) What additional data would you have preferred in making your evaluations?

3.) Are you familiar with "throughput or deficiency" or any other "take or pay" types of arrangements?

_____ very familiar

_____ somewhat familiar

_____ not familiar

4.) Are you familiar with advance production payments or any other "carved-out production payment" types of agreements?

_____ very familiar

_____ somewhat familiar

_____ not familiar

5.) Have you evaluated or otherwise analyzed loan applications for oil related concerns?

_____ Yes   _____ No

APPENDIX   C

PILOT STUDY RESULTS

A pilot study employing 56 senior level accounting students was conducted. The instruments used in this pilot experiment were similar, although not identical, to the instruments provided in Appendix A. The students were required to make responses on matched pairs of financial statements both as individuals and as members of three person groups. The three dependent variables used in the analysis were,

VAR 1: an interest rate assignment

VAR 2: a subjective assessment of the probability of technical default

VAR 3: an allocation of an arbitrary fixed dollar amount between the two hypothetical loan opportunities.

Throughout the experiment the students were requested to place themselves into the role of a loan officer, and to provide responses based upon their best perception of that role. The treatment variables for the pilot study were the different liability disclosures (footnote versus face), and an arbitrary size adjustment, used for disguising the similarity between the matched pair financial statements.

The data was arranged such that there was repeated responses across the two levels of the disclosure treatment for each level of the size treatment. Therefore, a split plot ANOVA procedure was used to test for treatment effects. The analysis was conducted under the assumption that the size and disclosure effects are fixed and the subjects (blocks) are random.

As can be seen by Tables XX, XXI, XXII, XXIII, XXIV, and XXV (Appendix D) the size effect was not significant for any variable under either individuals or groups. This is as expected. The arbitrary size adjustment does not affect the relative financial positions of the firms, just the absolute dollar amounts of the accounts. As such, the subjects should not have responded differently to statements constructed in this manner.

The disclosure effect was significant for all three variables under the individual phase of the experiment, but was not significant under the group phase. This is a very interesting result. The individuals were inefficient information processors. They responded differently to matched identical firms under different disclosure formats. Evidently, the method of disclosing a liability has a pronounced effect on the assessment of risk by students. In contrast, these same students arranged into groups did not respond differently to the financial data of the matched firms. Apparently, efficiency is quickly achieved as the subjects are aggregated into small groups. Furthermore, the interaction effect between size and disclosure format was not significant for any of the variables at either aggregation level.

Given these ANOVA results further testing appeared appropriate. Paired t tests were performed to test for the significance of the disclosure effect. The differences were defined as follows:

DIF 1= the difference between VAR 1 for the two format types

DIF 2= the difference between VAR 2 for the two format types

DIF 3= the difference between VAR 3 for the two format types

The results in Table XXVI (Appendix D) support the earlier findings. For all three dependent variables, the individuals reacted differently to the two disclosure formats. Apparently, the individuals ignored the footnote information and relied instead upon the financial ratios. For all three variables, the firms including the footnote were rated as more desirable then the firms incorporating the liability into the face of the statements. In the latter case the economic consequences of the financing arrangement were reflected in the financial ratios.

The group results shown in Table XXVII (Appendix D) support a priori expectations. The student groups were able to recognize the implications of the footnote presentation of the liability. As such, there were no significant average differential responses between the two disclosure formats for all three variables.

The above results indicate that individuals display inefficent processing behavior, while groups evidence efficient processing behavior. Given this, is the efficiency of the groups significantly greater than that of the individuals? To answer this question the mean differences were com-

pared between groups and individuals for all three variables. Two independent sample t test results, shown in Table XXVIII (Appendix D), indicated significant differences between the means for DIF 2 and DIF 3, but not for DIF 1. In all cases the homogeneity of variance assumption for the two samples was not violated. The preponderance of evidence indicates the groups are not only efficient, but significantly more so than are the individuals in processing accounting information.

One could argue that the observed relative efficiency of the groups over the individuals could be influenced by the order of collecting the data. Suppose the group phase of the experiment was administered first. It could then be argued that the information learned through group discussion could be applied at the individual stage, thereby minimizing processing efficiency discrepencies between the individual and group phases. To test for such an effect the student experiment was designed such that approximately half of the subjects responded as groups first, while the remainder responded as individuals first. The main hypotheses were then tested for the partitioned sets. Tables XXIX and XXX (Appendix D) summarize the results.

Recall that overall, the individuals were found to respond to the two disclosure formats differently. However, if the individuals first respond in a group this inefficiency is reduced. In fact, paired t results do not approach

significance (indicating inefficiency) for the "group first" partition. In contrast, if the individuals respond first, before the group phase, then the inefficiencies occur. As before, the group responses (irregardless of the order of data presentation) were found not to be different across the two disclosure formats.

The mean differences for the group phase and individual phase were compared within the same order class. Tables XXXI and XXXII (Appendix D) provide the results of the analysis. When groups respond first, the means of the individual and the group phases were found not to be statistically different. However, a statistical difference did occur when the individuals responded first. Apparently, the individuals gained some benefit from participating in a group discussion before providing individual responses. Such a discussion greatly reduced the individual inefficiencies, and furthermore, reduced the discrepency between the individual and group processing abilities. Such a benefit apparently did not accrue to the groups as a result of response order.

The above results would seem to indicate that group efficiency over individuals is dependent upon the order of individual-group decision making in sequential tasks.

APPENDIX D

TABLES

TABLE I

A SUMMARY OF THE INDIVIDUAL PROCESSING
LITERATURE

Author	Date	Report Change	Dependent Variable	Subjects	Findings
Bruns	1965	FIFO/LIFO	managerial variables	students	no effect
Dyckman	1964	FIFO/LIFO	managerial variables	students	no effect
Dyckman	1964	FIFO/LIFO	price/share	students	differential effect
Jensen	1966	FIFO/LIFO St.Line/Acl.	fund allocation	analysts	differential effect
Dyckman	1966	FIFO/LIFO	purchase price	students & managers	differential effect
Dyckman	1969	GPL/Conventional	price offering	analysts	differential effect
Barrett	1971	equity/ cost	price/ share	analysts	no effect
Dopuch & Ronen	1973	FIFO/LIFO	fund allocation	students	mixed (see text)
McIntyre	1973	conventional vs. current cost stmnts.	price/ share	students	no effect
Ortman	1975	segment vs. no segment disclosure	price/ share	analysts	differential effect
Chang & Birnberg	1977	change in cost standard	subjective probability of control	students	no effect (see text)
Abdel-khalik & Keller	1979	FIFO/LIFO	see text	students	differential effect

TABLE II

DESCRIPTIVE STATISTICS ON THE COMMERCIAL LOAN OFFICERS

Average years of experience   13.2 yrs.

Familiarity with "throughput and deficiency" agreements

    Very Familiar   4%

    Somewhat Familiar   36%

    Not Familiar   60%

Familiarity with advance production payments

    Very Familiar   0%

    Somewhat Familiar   50%

    Not Familiar   50%

Experience with oil related loans?

    Yes   57%

    No   43%

TABLE III

A TEST OF HO(1) FOR INDIVIDUALS USING A PAIRED TEST

Variable	Mean	Standard Error	t	OSL (sign considered)
PRICE	-.964	1.390	-0.69	.247
DEFAULT	-.019	.014	-1.36	.092
ALLOCATE	-.054	.085	-0.63	.734

TABLE IV

A TEST OF HO(1) FOR GROUPS USING A PAIRED TEST

Variable	Mean	Standard Error	t	OSL (sign considered)
PRICE	-3.571	1.829	-1.95	.036
DEFAULT	-0.009	.023	-0.41	.344
ALLOCATE	.108	.119	0.91	.19

TABLE V

A TEST OF HO(1) FOR INDIVIDUALS USING
THE SIGN TEST

Variable	−	+	n	OSL sign considered
PRICE	12	4	16	.038
DEFAULT	12	6	18	.119
ALLOCATE	9	16	25	.08

TABLE VI

A TEST OF HO(1) FOR GROUPS USING THE
SIGN TEST

Variable	−	+	n	OSL sign considered
PRICE	6	0	6	.0156
DEFAULT	4	4	8	.6367
ALLOCATE	3	10	13	.0461

TABLE VII

A TEST OF HO(1) FOR INDIVIDUALS USING A
BINOMIAL TEST

CHOICE	Frequency	Proportion	OSL sign considered
Firm with footnote disclosure	19	.68	
Firm with balance sheet disclosure	9	.32	.03

TABLE VIII

A TEST OF HO(1) FOR GROUPS USING A
BINOMIAL TEST

CHOICE	Frequency	Proportion	OSL sign considered
Firm with footnote disclosure	11	.79	
Firm with balance sheet disclosure	3	.22	.0287

TABLE IX

A TEST OF HO(1) USING A PAIRED TEST ON INDIVIDUAL ABSOLUTE DIFFERENCES

Variable	Mean	Standard Error	t	OSL
PRICE	3.464	1.234	2.81	.0092
DEFAULT	.048	.011	4.40	.0001
ALLOCATE	.336	.055	6.06	.0001

TABLE X

A TEST OF HO(1) USING A PAIRED TEST ON GROUP ABSOLUTE DIFFERENCES

Variable	Mean	Standard Error	t	OSL
PRICE	3.571	1.83	1.95	.073
DEFAULT	.045	.019	2.34	.036
ALLOCATE	.335	.08	4.19	.001

TABLE XI

COMPARISON TEST OF THE MEAN DIFFERENCES
IN TESTING HO(2)

Variable		N	Mean	t	OSL sign considered
PRICE	Individual	28	-0.964		
	Group	14	-3.57	1.107	.862
DEFAULT	Individual	28	-0.019		
	Group	14	-0.009	-0.38	.353
ALLOCATE	Individual	28	-0.053		
	Group	14	0.108	-1.104	.861

TABLE XII

COMPARISON TEST OF MEAN ABSOLUTE
DIFFERENCES IN TESTING
HO(2)

Variable		N	Mean	t	OSL sign considered
PRICE	Individual	28	3.464		
	Group	14	3.571	-.049	.519
DEFAULT	Individual	28	0.048		
	Group	14	0.045	.156	.438
ALLOCATE	Individual	28	0.336		
	Group	14	0.335	.015	.494

TABLE XIII

A TEST OF HO(1) USING A PAIRED TEST ON
INDIVIDUAL DATA PARTITIONED BY
RESPONSE ORDER

	Variable	N	Mean	t	OSL sign considered
Group First	PRICE	14	-0.571	-0.21	.42
	DEFAULT	14	0.007	.40	.653
	ALLOCATE	14	-0.166	-1.32	.896
Group Second	PRICE	14	-1.36	-2.46	.014
	DEFAULT	14	-0.046	-2.59	.011
	ALLOCATE	14	.059	.53	.30

TABLE XIV

A TEST OF HO(1) USING A PAIRED TEST ON
GROUP DATA PARTITIONED BY
RESPONSE ORDER

	Variable	N	Mean	t	OSL sign considered
Group First	PRICE	7	-4.57	-1.31	.118
	DEFAULT	7	0.029	1.55	.66
	ALLOCATE	7	-0.113	-0.65	.731
Group Second	PRICE	7	-2.57	-1.78	.063
	DEFAULT	7	-0.047	-1.25	.13
	ALLOCATE	7	0.329	2.66	.018

TABLE XV

MEAN COMPARISON BETWEEN GROUPS AND
INDIVIDUALS FOR A DATA SET
PARTITIONED BY
ORDER

Groups First

Variable		N	Mean	t	OSL sign considered
PRICE	Individual	14	-0.571		
	Group	7	-4.571	.862	.80
DEFAULT	Individual	14	0.008		
	Group	7	0.029	-.675	.75
ALLOCATE	Individual	14	-0.168		
	Group	7	-0.113	-.246	.40

Groups Second

Variable		N	Mean	t	OSL sign considered
PRICE	Individual	14	-1.357		
	Group	7	-2.571	.956	.82
PRICE	Individual	14	-0.046		
	Group	7	-0.047	.039	.52
ALLOCATE	Individual	14	.058		
	Group	7	.329	-1.506	.93

TABLE XVI

A TEST OF HO(1) USING A PAIRED TEST ON
THE ABSOLUTE VALUES OF A
PARTITIONED DATA
SET

Individuals

	Variable	N	Mean	t	OSL sign considered
Groups First	PRICE	14	5.571	2.41	.031
	DEFAULT	14	.044	2.82	.014
	ALLOCATE	14	.374	4.47	.0006
Groups Second	PRICE	14	1.357	2.46	.028
	DEFAULT	14	.053	3.30	.006
	ALLOCATE	14	.299	4.00	.001

Groups

	Variable	N	Mean	t	OSL sign considered
Groups First	PRICE	7	4.571	1.31	.236
	DEFAULT	7	.029	1.55	.172
	ALLOCATE	7	.341	3.06	.023
Groups Second	PRICE	7	2.571	1.78	.125
	DEFAULT	7	.061	1.80	.12
	ALLOCATE	7	.329	2.66	.037

TABLE XVII

A SUMMARY OF THE RESULTS FOR HO(1) ON
INDIVIDUALS

	PRICE	DEFAULT	CHOICE	ALLOCATE
Signed Pair t Test	NS	S	NA	NS
Sign Test	S	NS	NA	S
Binomial Test	NA	NA	S	NA
Unsigned Pair t Test	S	S	NA	S
Signed Pair t Test-Groups First	NS	NS	NA	NS
Absolute Value Pair t Test-Groups First	S	S	NA	S
Signed Pair t Test-Groups Second	S	S	NA	NS
Absolute Value Pair t Test-Groups Second	S	S	NA	S

TABLE XVIII

A SUMMARY OF THE RESULTS FOR HO(1) ON
GROUPS

	PRICE	DEFAULT	CHOICE	ALLOCATE
Signed Pair t Test	S	NS	NA	NS
Sign Test	S	NS	NA	S
Binomial Test	NA	NA	S	NA
Unsigned Pair t Test	S	S	NA	S
Signed Pair t Test-Groups First	NS	NS	NA	NS
Absolute Value Pair t Test- Groups First	NS	NS	NA	S
Signed Pair t Test-Groups Second	S	NS	NA	S
Absolute Value Pair t Test- Groups Second	NS	NS	NA	S

TABLE XIX

A SUMMARY OF THE RESULTS FOR HO(2)

	PRICE	DEFAULT	ALLOCATE
Signed t Test	NS	NS	NS
Absolute Value t Test	NS	NS	NS
Signed t Test-Groups First	NS	NS	NS
Signed t Test-Groups Second	NS	NS	NS
Absolute Value t Test-Groups First	NS	NS	NS
Absolute Value t Test-Groups Second	NS	NS	NS

TABLE XX

ANALYSIS OF VARIANCE RESULTS ON
INDIVIDUAL DATA FOR
VAR1

Source	Sum of Squares	D.F.	Mean Square	F	OSL
Between Subjects	40797.99				
Size	661.24	1	661.24	.89	.35
Size(Subj.)	40136.75	54	743.27		
Within Subjects	13712.50				
Disclosure	2014.51	1	2014.51	9.3	.003
Disc. x Size	.58	1	.58	.00	.96
Disc. x Size(Subj.)	11697.41	54	216.62		

TABLE XXI

ANALYSIS OF VARIANCE RESULTS ON
INDIVIDUAL DATA FOR
VAR2

Source	Sum of Squares	D.F.	Mean Square	F	OSL
Between Subjects	3.845				
Size	.125	1	.125	1.81	.184
Size(Subj.)	3.72	54	.0689		
Within Subjects	1.201				
Disclosure	.224	1	.224	12.45	.001
Disc. x Size	.005	1	.005	.27	.608
Disc. x Size(Subj.)	.972	54	.018		

TABLE XXII

ANALYSIS OF VARIANCE RESULTS ON
INDIVIDUAL DATA FOR
VAR3

Source	Sum of Squares	D.F.	Mean Square	F	OSL
Between Subjects					
Size	0	This treatment is not interpretable under this design for VAR 3.			
Size(Subj.)	0				
Within Subjects	5.451				
Disclosure	1.096	1	1.096	13.74	.001
Disc. x Size	.048	1	.048	.61	.44
Disc. x Size(Subj.)	4.307	54	.08		

TABLE XXIII

ANALYSIS OF VARIANCE RESULTS ON GROUP
DATA FOR VAR1

Source	Sum of Squares	D.F.	Mean Square	F	OSL
Between Subjects	8836.87				
Size	330.62	1	330.62	.70	.414
Size(Subj.)	8506.25	18	472.57		
Within Subjects	3962.51				
Disclosure	82.37	1	82.37	.34	.57
Disc. x Size	213.75	1	213.75	.87	.364
Disc. x Size(Subj.)	3666.39	15	244.43		

TABLE XXIV

ANALYSIS OF VARIANCE RESULTS ON GROUP
DATA FOR VAR2

Source	Sum of Squares	D.F.	Mean Square	F	OSL
Between Subjects	1.036				
Size	.161	1	.161	3.32	.085
Size(Subj.)	.875	18	.049		
Within Subjects	.354				
Disclosure	.008	1	.008	.35	.565
Disc. x Size	0	1	0	0	.999
Disc. x Size(Subj.)	.346	15	.023		

TABLE XXV

ANALYSIS OF VARIANCE RESULTS ON GROUP DATA FOR VAR3

Source	Sum of Squares	D.F.	Mean Square	F	OSL
Between Subjects					
Size	0	This treatment is not inter-			
Size(Subj.)	0	pretable under this design for VAR 3.			
Within Subjects	1.534				
Disclosure	.006	1	.006	.06	.805
Disc. x Size	.006	1	.006	.06	.81
Disc. x Size(Subj.)	1.522	15	.1015		

TABLE XXVI

INDIVIDUAL PAIRED RESULTS FOR COMPARING TWO LIABILITY DISCLOSURE FORMATS

Variable	N	Mean	t	OSL
DIF 1	56	-7.768	-2.82	.0067
DIF 2	56	-0.087	-3.45	.0011
DIF 3	56	0.198	3.72	.0005

TABLE XXVII

GROUP PAIRED RESULTS FOR COMPARING TWO LIABILITY DISCLOSURE FORMATS

Variable	N	Mean	t	OSL
DIF 1	20	-1.75	-0.37	.7165
DIF 2	20	.013	.29	.7760
DIF 3	20	-0.031	-0.32	.7524

TABLE XXVIII

TEST OF MEAN DIFFERENCES BETWEEN GROUPS
AND INDIVIDUALS

Variable		N	Mean	t	OSL
DIF 1	individuals groups	56 20	-7.768 -1.175	-1.11	.135
DIF 2	individuals groups	56 20	-0.087 .013	-2.0	.025
DIF 3	individuals groups	56 20	.198 -0.031	2.16	.017

TABLE XXIX

PAIRED RESULTS FOR INDIVIDUAL DATA
PARTITIONED BY RESPONSE
ORDER

	Variable	N	Mean	t	OSL
Group First	DIF 1 DIF 2 DIF 3	29 29 29	-3.793 -0.053 0.103	-1.02 -1.56 1.47	.314 .13 .153
Group Second	DIF 1 DIF 2 DIF 3	27 27 27	-12.037 - 0.122 0.30	-2.99 -3.37 3.88	.006 .0024 .0006

TABLE XXX

PAIRED RESULTS FOR GROUP DATA
PARTITIONED BY ORDER

	Variable	N	Mean	t	OSL
Group First	DIF 1	10	-2.5	-0.41	.694
	DIF 2	10	-0.006	-0.10	.92
	DIF 3	10	-0.032	-0.30	.77
Group Second	DIF 1	10	-1.00	-0.13	.90
	DIF 2	10	0.032	0.45	.67
	DIF 3	10	-0.03	-0.18	.86

TABLE XXXI

MEAN COMPARISON BETWEEN GROUPS AND
INDIVIDUALS WHEN GROUPS
RESPOND FIRST

Variable		N	Mean	t	OSL
DIF 1	Individual	29	-3.793		
	Group	10	-2.5	-0.178	.43
DIF 2	Individual	29	-0.053		
	Group	10	-0.006	-0.703	.245
DIF 3	Individual	29	0.103		
	Group	10	-0.032	0.998	.162

TABLE XXXII

MEAN COMPARISON BETWEEN GROUPS AND INDIVIDUALS WHEN GROUPS RESPOND LAST

Variable		N	Mean	t	OSL
DIF 1	Individual	27	-12.04		
	Group	10	- 1.00	-1.37	.09
DIF 2	Individual	27	- 0.122		
	Group	10	0.032	-2.09	.022
DIF 3	Individual	27	0.30		
	Group	10	- 0.03	2.04	.025

VITA

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