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JOURNAL OF COMMERCIAL BANKING AND FINANCE

CONTENTS

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MANUSCRIPTS

AN ANALYSIS OF ALTERNATIVE PROFIT EFFICIENCY SCORES AND FINANCIAL RATIOS: DOES BANK SIZE MATTER?

Stephen K. Lacewell, Murray State University
Larry R. White, Mississippi State University
Kevin E. Rogers, Mississippi State University

ABSTRACT

The subject of bank performance has been and still is a subject of much debate among researchers in the financial institutions area. Bank performance arguably can take on varied meanings. Some would define performance as to the level of profitability attained by the institution. Others measure performance with regard to the safety and stability of the firm. Yet others seek to measure performance utilizing one of many efficiency indexes. Although there is probably no one correct measure of performance, the area of performance measurement can be divided into two rather large streams of research: bank efficiency measures and accounting-based financial ratios. As clearly shown by the wide variety of literature concerning these topics, determining the correct performance measure of a bank operating in the United States today is a diverse and complicated issue to say the least. The two performance measures mentioned above may seem varied and appear to utilize different information, which is why most previous studies investigate these areas in isolation. This paper merges the topics of bank efficiency and accounting-based financial ratio performance. It examines the relationship between these seemingly separate areas to determine when and if they should be used in combination. While this area has been touched on by previous studies to some extent there are no studies which involve the type or depth of analysis as performed here. Also, many previous studies in this area involve only large banks or bank holding companies, ignoring community banks, a significant part of the United States banking community.

The study involves a multi-stage process. Stage one is the calculation of alternative profit efficiency scores, using the stochastic frontier approach, for all banks operating in the United States during the years 1996 and 1999. Stage two involves gathering and/or calculating financial ratios that are, according to previous research, highly correlated with each of the CAMELS rating components used by financial regulators. Stage three involves the use of multiple regression to determine 1) if a relationship exists between the chosen financial ratios, which serve as a proxy for the publicly unavailable CAMELS ratings, and the alternative profit efficiency scores and 2) the strength and direction of the aforementioned possible relationship. It is hypothesized that accounting-based financial ratios utilized by various financial institution examination agencies in the formulation of CAMEL ratings provide significant information regarding the efficiency measure of a bank. It is further hypothesized that different types of relationships will exist among banks of varying asset size. If different relationships do exist, this will shed new light on the issue proposed by many researchers regarding the use of efficiency measures as complements to CAMELS ratings

in the financial institution examination process. The results of this paper will be of interest to many parties due to the fact that determining a correct measure of bank performance must take into account the high degree of competitiveness, technological change, customer-base diversity and other areas of the firm's operating environment found in the U.S. banking industry.

INTRODUCTION

Although there is probably no one correct measure of performance, the area of performance measurement can be divided into two rather large streams of research: bank efficiency measures and accounting-based financial ratios. Thus, determining the correct performance measure of a bank operating in the United States today is a diverse and complicated issue. The two performance measures mentioned above may seem varied and appear to utilize different information, which is why most previous studies investigate these areas in isolation. This paper merges the topics of bank efficiency and accounting-based financial ratio performance and examines the relationship between these seemingly separate areas to determine when and if they should be used in combination.

This study involves a multi-stage process. Stage one is the calculation of alternative profit efficiency scores, using the stochastic frontier approach (SFA), for all banks operating in the United States during the years 1996 and 1999. This model is termed the national model per Mester (1997) due to the fact that all banks, for which sufficient data are available, are used to estimate the efficient alternative profit frontier. Stage two involves gathering and/or calculating financial ratios that are, according to previous research, highly correlated with each of the CAMELS rating components used by financial regulators. Stage three involves the use of multiple regression to determine 1) if a relationship exists between the chosen financial ratios, which serve as a proxy for the publicly unavailable CAMELS ratings, and the alternative profit efficiency scores and 2) the strength and direction of the aforementioned possible relationship.

It is hypothesized that accounting-based financial ratios utilized by various financial institution examination agencies in the formulation of CAMELS ratings provide significant information regarding the efficiency measure of a bank. It is further hypothesized that different types of relationships will exist among banks of varying asset size. If different relationships do exist, this will shed new light on the issue proposed by many researchers regarding the use of efficiency measures as complements to CAMELS ratings in the financial institution examination process. The results of this paper will be of interest to many parties due to the fact that determining a correct measure of bank performance must take into account the high degree of competitiveness, technological change, customer-base diversity, and other areas of the firm's operating environment found in the U.S. banking industry.

LITERATURE REVIEW

While the area of production frontiers was introduced by Farrell (1957), the stochastic frontier, also called the composed error, is relatively new having been introduced by Aigner, Lovell and Schmidt (1977) and Meeusen and van den Broeck (1977). Many of the first papers on this topic were applied to manufacturing data, as were other efficiency methods. Much study has taken place

regarding the early problems associated with this method. (See also Battese and Corra (1977), Lee and Tyler (1978), Stevenson (1980), Pitt and Lee (1981), Kalirajan (1982), Bagi and Huang (1983), Schmidt and Sickles (1984), Waldman (1984), and Battese and Coelli (1988) for early examples of SF estimation.) Stochastic frontier analysis (SFA) is today, however, one of the most popular efficiency estimation techniques due in part to its robustness and relative ease of use.

Among the first to examine the relationship between financial performance, measured by accounting-based ratios, and production performance proxied by efficiency indices, are Elyasiani, Mehdian, and Rezvanian (1994). They find a significant association between financial ratios and bank efficiency and suggest that efficiency analysis should be considered as a supplement to financial ratio analysis by regulatory agencies and bank managers. The article focuses, however, on large banks and utilizes a rather small sample. Thus, the true nature of the relationship is not explored across a wide variety of banks operating in the U.S. One study which provides a very brief although interesting attempt to integrate the information provided by efficiency measures with that found in CAMELS ratings is by Simeone and Li (1997). Their study, which focuses on a limited sample of 35 closed Rhode Island credit unions ranging in asset size from $131 thousand to $338 million, seeks to determine if stochastic frontier analysis (SFA) measures of efficiency would have been useful in identifying and preventing the failure of the aforementioned credit unions. The authors determine that SFA can be considered a good substitute for, or a valid supplement to, the CAMELS rating due to the fact that SFA avoids the subjective and difficult management rating utilized by CAMELS.

Studies concerning bank size and efficiency are readily available. However, as there are many types of efficiency measures, the ability to make direct comparisons with this study are inherently difficult. An early survey article by Clark (1988) reveals just how far the area of efficiency measurement has progressed in a relatively short time period. His review covers only 13 studies from the early- and mid-80s and finds that large diversified depository institutions have not enjoyed a large cost advantage over smaller, more specialized institutions. This, compared to the 130 articles covered by Berger and Humphrey (1997) shows how popular and important this area is with researchers. Studies regarding productive efficiency by bank size include Evanoff (1998) and Elyasiani and Mehdian (1995). They find that under the hypothesis of identical frontiers for large and small banks that the efficiency measures for each are similar in 1979 but separate in favor of large banks in 1986. This finding is consistent with Shaffer (1989) but inconsistent with Rhodes and Savage (1981) and Zimmerman (1990). It is also found that large and small banks possess separate and dissimilar best practice frontiers. Thus, the efficiency patterns of the two groups may be said to be correlated with distinct characteristics of the markets and environments in which the two groups operate. Rogers (1998) assess the viability of small banks by examining their X-efficiency relative to larger institutions. He uses a balanced panel of 8,386 banks over the years 1991 to 1996 to estimate both cost and alternative profit frontiers using the translog specification of the distribution free approach. Results suggest that after adjusting the frontier for size, small banks are found to be less profit efficient than larger institutions but more cost efficient. It is posited that this will allow small banks to compete with large banks in terms of costs but may hamper their profitability as industry consolidation continues. Other studies of interest include DeYoung, Hasan and Kirchhoff (1997), Park and Simar (1995) and Park, Sickles and Simar (1998).

As evidenced by the above array of literature, the area of bank efficiency measurement is vast. Many studies have been performed regarding cost, revenue, and profit efficiency. Although studies have been performed which touch on the relationship between efficiency measures, financial ratio performance, and CAMELS ratings, none have been conducted as yet which combine all of these factors in the way of the examination undertaken here.

DATA AND METHODOLOGY

The data used in this study are obtained from the Sheshunoff BankSearch Commercial and Savings Banks database for the years 1996 and 1999, respectively. A sample of all banks for which there is available data is obtained for the two years with 7,514 banks for 1999 and 8,179 banks for 1996. The sample is then decomposed, by asset size, into sub-samples representing banks that fit into small, medium, and large categories. The definition of a small bank, for purposes of this study, is a bank with less than $100 million in total assets. A medium bank is an institution with $100 million to $1 billion in assets and large bank is one with greater than $1 billion in total assets. The size categories include 319 large, 2,577 medium, and 4,618 small banks in 1999 and 338 large, 2,533 medium, and 5,308 small banks in 1996.

Efficiency Estimation

A relatively new model concerning the measurement of profit efficiency is used in this study. The alternative, or nonstandard, profit efficiency model, as given by Berger and Mester (1997) and Humphrey and Pulley (1997), differs from the standard profit efficiency model in that it measures how efficient a bank is at earning its maximum available profit given its output levels. Alternative profit efficiency is especially useful when there is a violation of at least one of the underlying assumptions of cost and standard profit efficiency. These assumptions include:

1. the quality of banking services has no substantial unmeasured variations;
2. a bank can achieve its optimum volume and mix of output, meaning outputs are completely variable;
3. a bank cannot affect output price due to perfectly competitive output markets; and
4. output prices are accurately measured allowing for unbiased standard profit efficiency estimation.

It is apparent from the above assumptions that the data used for this study would violate at least assumptions i and ii. Thus, alternative profit estimation is chosen as the profit efficiency measure of choice over standard profit efficiency.

The alternative profit frontier function is:

$$\pi = \pi(y, w, u_\pi, v_\pi), \tag{1}$$

where π represents the variable profits of the bank, y is a vector of variable output quantities, w is a vector of prices for variable inputs, u_π represents profit inefficiency and v_π is random error.

The alternative profit efficiency score for any bank can be calculated once the alternative profit frontier has been constructed. The alternative profit efficiency of bank i is calculated as the predicted actual observed profit of bank i divided by the predicted maximum profit of the best practice bank, i.e., the predicted maximum profit across all banks, adjusted for random error. This calculation is given by the following:

$$Alt\pi Eff_i = \frac{\hat{\pi}^{i}}{\hat{\pi}^{\max}}, \tag{2}$$

where $\hat{\pi}^{\max}$ represents the predicted maximum profit, associated with the best practice bank, across N banks in the sample and $\hat{\pi}^{i}$ denotes the predicted actual profit for the ith bank, with i = 1,...,N. The calculated raw profit efficiency scores are then truncated at the top 5 and 10 percent levels, per Berger (1993), so as to eliminate any distortion which may be caused by outliers when the maximum profit is used. The truncated profit efficiency scores can range from 0 to 1 with 1 representing the most efficient bank or the best practice bank. The profit efficiency score represents the percentage of profits or resources that are used efficiently. Thus, a bank that receives a profit efficiency score of 0.75 is 75% efficient or consequently loses 25% of its potential profits relative to the best practice bank facing similar operating conditions.

A modified intermediation approach is used for the analysis, which views a bank's primary goal as that of intermediating funds between savers and borrowers and uses the dollar volume of various deposit accounts and loan categories as output variables. Input variables include the cost of funds utilized in the process of transferring funds between savers and borrowers. The modification to this approach occurs due to the inclusion of nontraditional activities. Due to increased competition banks are placing increased emphasis on nontraditional activities. Rogers (1998b) finds that bank efficiency measures which do not account for these nontraditional activities as an output tend to understate the true bank efficiency measure. Considering the aforementioned information, the variables included for analysis include the following:

	Input Variables (Cost)		Output Variables (Quantity)
1.	Labor	1)	Demand Deposits
2.	Physical Capital	2)	Time and Savings Deposits
3.	Time and Savings Deposits	3)	Real Estate Loans
4.	Purchased Funds	4)	Other Loans
		5)	Net Non-interest Income

Given the above inputs and outputs, and based on Berger's (1993) similar model specification, the empirical profit frontier model is given as follows:

$$\ln \pi = \alpha + \sum_{j=1}^{5} \beta_j \ln y_j + \sum_{k=1}^{4} \gamma_k \ln w_k + \tfrac{1}{2} \sum_{j=1}^{5} \sum_{l=1}^{5} \beta_{jl} \ln y_j \ln y_l$$
$$+ \tfrac{1}{2} \sum_{k=1}^{4} \sum_{l=1}^{4} \gamma_{kl} \ln w_k \ln w_l + \sum_{j=1}^{5} \sum_{k=1}^{4} \delta_{jk} \ln y_j \ln w_k + \varepsilon_\pi \quad (3)$$

where: j = 1,...,5 outputs,
k = 1,...,4 inputs,
π = total profit
y_j = the amount of output j,
w_k = the input price of k, and
ε_π = the natural residual or total error

If the two components of the disturbance term, u_π and v_π, meet the following assumptions:

$$u_\pi \sim |N(0, \sigma_{u\pi}^2)|, v_\pi \sim N(0, \sigma_{v\pi}^2), \quad (4)$$

then per Jondrow, et.al. (1982) the natural residual, ε_π, will be decomposed into an inefficiency measure, u_π, and random noise, v_π.

Estimation of the Association Model

After the efficiency estimates have been calculated the next step of the analysis involves the selection of variables which theoretically correlate to each of the CAMELS rating categories used by examiners. The efficiency estimates obtained in stage one are then regressed on the group of financial variables obtained in stage two to determine the direction and strength of the association and to allow for comparisons of such relationships considering bank size. A control variable representing a bank's regulatory affiliation is also included in the regression.

Due to the non-availability of data needed to calculate all of the financial ratios chosen for the analysis, the sample size of banks included in stage two of the study is reduced. (All of the banks used in frontier estimation did not have the appropriate financial information available to construct the financial ratios needed for the second stage of the analysis. However, all of the banks are included for frontier estimation, since this allows for more accurate individual efficiency estimates. These individual efficiency scores are used in stage two as the dependent variable with various financial ratios serving as independent variables.) The final sample consists of 4,376 banks in 1999 and 5,158 banks in 1996. The sample by size category includes 282 large, 1,916 medium, and 2,178 small banks for 1999 and 318 large, 2,003 medium, and 2,837 small banks for 1996.

Several regression models are estimated for this study utilizing identical independent variables with only the dependent variables changing. The appropriate method of estimation in this situation is the seemingly unrelated regression (SUR), since it would be unrealistic to believe that the disturbance terms of the equations are unrelated. However, in some instances ordinary least squares (OLS) is as efficient as SUR. One of these situations is when the equations contain identical explanatory variables (Greene, 1997). Since the regressors used for analysis are the same across all models the OLS method is chosen and is as efficient as SUR per a previous study by Elyasiani et. al., (1994).

The model used for estimation is specified as follows:

$$EFF_{ijt} = \alpha_{it} + \sum_{k=1}^{k} \beta_{kt} R_{kjt} + e_{ijt}, \tag{5}$$

where EFF_{ijt} is the *i*th type of efficiency index estimated ($i = Alt\pi EFF$) of bank j (j = 1,...n) in year t (t = 1996 or 1999). It should be noted that the efficiency score utilized as the dependent variable is the raw efficiency index before normalization on the 0,1 interval. Hence, the dependent variable is not bounded by a 0,1 scale. α_{it} represents the intercept term, β_{kt} (k = 1,...,k) are coefficients to be estimated, R_{kjt} is the *k*th financial performance ratio and e_{ijt} represents the error term.

Association Model Variable Selection

The selection of accounting-based financial ratios which accurately represent a bank's CAMELS rating is the most difficult yet meaningful undertaking of the empirical portion of this study for a number reasons. First, CAMELS ratings are proprietary information, which means that only regulatory personnel and researchers with regulatory associations have access to this data. Second, CAMELS ratings are based on a combination of objective and subjective information. Although a large portion of a bank's rating is derived from the analysis of various financial ratios corresponding to a specific CAMELS component, an important aspect of the rating results from examiner subjectivity. Thus, items such as differences among regulatory agencies, examiner experience, and inconsistencies among examination districts arguably have an effect on the ratings received by banks. Finally, empirical literature on this topic is scarce due to the aforementioned proprietary nature of the data. Literature on the financial performance of banks is found in great supply but few researchers have tackled the more elusive CAMELS modeling issue unless they have access to private CAMELS data (see Cole et.al., 1995 and DeYoung, 1998). The problems of a study of this type not withstanding, it is very realistic to conclude that most of the CAMELS categories can be proxied by financial ratios corresponding to the component in question per previous studies by Cole, et al. (1995) and Cole and Gunther (1998).

The one area that meets with a greater degree of subjectivity is the management component (M). A study by DeYoung (1998) suggests that there is a high degree of correlation between the M

rating and the overall financial performance of a bank. Other variables such as unit costs and insider loans are shown to be good predictors of the M rating as well. As various financial ratios are used in this study as proxies of the C, A, E L, and S components, the M component will be proxied by the amount of insider loans, overhead expense, and the number of full-time equivalent employees to average assets, which mirrors Gilbert, et. al. (1999). Although in no way a perfect measure of management quality, these variables should provide useful insight into an otherwise unmeasurable rating component.

Exhibit 1
Financial Ratios Representing Each CAMELS Category

VARIABLE	DESCRIPTION
Capital Adequacy (C)	
Risk-Based Capital (RBC)	Total capital divided by risk-weighted assets
Asset Quality (A)	
Nonaccrual Loans (NONACCRL)	Nonaccrual loans divided by average assets
Allowance for Loan and Lease Loss (ALLL)	Allowance for loan and lease loss divided by average loans and leases
Charge-Offs (COFF)	Charged-off loans and leases divided by average loans and leases
Management Quality (M)	
Insider Loans (IL)	Loans to insiders divided by average assets
Overhead Expense (OE)	Overhead expense divided by average assets
FTE Employees (FTE)	Number of full-time equivalent employees divided by millions of dollars of average assets
Earnings (E)	
Operating Income (OI)	Total operating income divided by average assets
Return on Equity (ROE)	Total income divided by total stockholder's equity
Noninterest Income (NII)	Total noninterest income divided by average assets
Liquidity (L)	
Liquid Assets (LA)	Liquid assets divided total assets
Jumbo CDs (JMBOCD)	$100,000+ time deposits divided by total assets
Core Deposits (COREDEP)	Core deposits plus equity divided total assets
Sensitivity (S)	
1 Year Gap (ONEGAP)	Rate sensitive assets repricing within 1 year minus rate sensitive liabilities repricing within one year divided by total assets

Financial theory regarding the operation of banking firms provides some insight into the use of certain financial ratios to proxy the six categories of a CAMELS rating. These ratios and their definitions are given in Exhibit 1. The aforementioned theory also allows for the formulation of hypotheses as to the expected signs of these proxies when efficiency scores are regressed upon them.

Risk-based capital is chosen to represent the capital component. Although there are many other capital measures, the level of risk-based capital is chosen because of the importance regulators have placed on this measure in recent years. One would expect a positive relationship between the level of risk-based capital and profit efficiency due to the fact that a more well-capitalized bank results in a lower exposure to financial risk, which leads to a lower cost of both purchased funds and deposit insurance (Elyasiani, et. al. 1994).

The ratios of past due loans, nonaccrual loans, and the allowance for loan and lease loss are chosen to represent asset quality. A negative relationship is expected between the amount of nonaccrual loans and charged-off loans and profit efficiency, while a positive relationship between the allowance for loan and lease loss (ALLL) and profit efficiency is predicted. This stems from the fact that nonaccrual loans and charged-off loans are a drain on profits, while a healthy ALLL will provide an adequate cushion against further profit decreases. However, since money is transferred to the ALLL as an expense on the income statement there is an increased cost to the bank. The predicted relationship is, however, based only on the current balance of the allowance for loan and lease loss account and doesn't include any predictions regarding future transfers to the account due to the non-performance of loans and leases.

The three management quality ratios -- insider loans, overhead expense, and the number of full-time employees – are discussed previously. They are expected to exhibit negative relations with profit efficiency. This is fairly self-explanatory in terms of overhead expense and the number of employees. Banks with lower overhead and fewer employees per million dollars of assets should be more efficient in the profit area. The amount of insider loans would also be expected to display a negative coefficient because a higher proportion of insider loans may indicate closely held or family owned institutions which tend to be smaller and more conservative than other banks.

Operating income, return on equity, and noninterest income are chosen to represent the earnings component. All of these are expected to show a positive relation with profit efficiency since all are directly related to the profits of a bank.

Liquidity is represented by liquid assets, jumbo CDs, and core deposits. Theory dictates that the more money a bank has in liquid assets the less it has invested in profitable loans and other products, thus a negative relation is forecast for profit efficiency. Jumbo CDs are time deposits in excess of $100,000 and are not FDIC insured above the $100,000 level. Thus these types of deposits tend to be purchased by banks needing funding for more profitable investments. This would lead to a positive relation between profit efficiency. Core deposits, on the other hand, tend to be very stable and low cost. Thus, a positive relation is predicted for core deposits. The final CAMELS category, interest rate sensitivity, is represented by the one year gap. There is no explicit assumption made regarding the relationship of this variable with the efficiency estimate.

A dummy variable is also included in the regression to determine if a bank's regulatory authority is a significant determinant of its level of profit efficiency. The bank is coded a 1 if it has a federal charter and a 0 if it has a state charter. This will allow for a comparison of charter authority among the total sample of banks as well as by asset size.

EMPIRICAL RESULTS

The results of the efficiency estimation as well as the association regressions prove interesting. Given in Exhibit 2 is an analysis of total assets for all banks utilized in the formulation of the efficient profit frontier for the years 1999 and 1996. The numbers, as expected, show the effects of frenzied merger activity in the mid and late 1990s. The average asset size, when considering all banks, increased by $108,489 while there was a decrease of 665 banks from 1996 to 1999. When considering large banks -- banks with assets greater than $1 billion -- the average asset size increased by over $2 billion from $9.6 billion to $11.67 billion. The number of large banks declined from 338 to 319. Banks that fall in the medium-size category for purposes of this study increased their average asset size by $5.4 million to slightly over $248 million and their numbers, the only category to show an increase, grew by 44 institutions. As for small banks, those with assets under $100 million, their average asset size increased from $45.2 million to $47.8 million. The number of small or community banks, easily the largest category, decreased by 690 from 5,308 in 1996 to 4,618 in 1999. This shows that while large banks are becoming larger, small and medium banks' asset growth is fairly stagnant.

Exhibit 3 shows the descriptive statistics for all variables utilized in the estimation of profit efficiency for the years 1999 and 1996, respectively, when using the national model. Specifically the mean and standard deviation for total profit, as well as the four input variables and five output variables, are reported. The mean of each category for its respective year of observation remains relatively stable. Additionally, the cost of inputs appear to make sound intuitive sense when examined by size classification. The number of observations do vary slightly for each year. However, as discussed previously, this is due to the many mergers and acquisitions occurring at this time as well as a very few bank failures. Since this study uses the population of all banks for which data were available this should not induce bias into the study and should not affect the comparability of efficiency and its relationship with selected financial ratios over the chosen years.

Exhibit 4 provides the mean profit efficiency scores as well as the standard deviation and minimum and maximum scores at the 5% and 10% truncation levels for the years 1999 and 1996. The efficiency scores by size category are also reported. While the degree of truncation used in a particular study is largely a matter of subjectivity, the 5% and 10% levels are most common. It is shown by Berger (1993) that profit efficiency scores rise very fast up to the 5% level and tend to taper-off after that. Thus, to be consistent with other studies in this area both the 5% and 10% truncation scores are reported but, for consistency purposes, the discussion will focus on the 10% truncation scores. Exhibit 4 shows that the mean profit efficiency for all banks in 1996 was 46.22% and increased to 48.84% in 1999 at the 10% truncation level. These numbers indicate that banks have considerable room for improvement in the area of profit efficiency. For example, the 1999 estimate of 48.84% means that the average bank generates only 48.84% of the profit of the "best-practice" bank operating in the United States. The relatively large standard deviation of 26.78% additionally indicates a wide dispersion in profit efficiency among banks. The profit efficiency estimates as a whole are consistent with previous studies (e.g., Bauer et al., 1993; Berger and Mester, 1997; and Berger and Humphrey, 1997) which is the key factor for purposes of the second-stage regression to be discussed later. Also, when compared to Huang (1999), a study using the

same input and output variables, the estimates are consistent. Finally, to add additional credibility to the current investigation, the results are in line with previous studies (e.g., Hermalin and Wallace, 1994; Berger and Mester, 1997; and Rogers, 1998) when the profit efficiencies are examined by size classification. Large banks are shown to be less profit efficient than medium banks and medium banks less efficient than small banks in both 1999 and 1996.

Exhibit 2
Summary Statistics of Total Assets for All Banks Analyzed for 1999 and 1996

		1999	1996	Difference
All Banks	Mean	610,219	501,730	108,489
	Std. Dev	8,762,162	5,346,773	3,415,389
	Minimum	2,306	2,374	-68
	Maximum	571,732,000	272,429,000	299,303,000
	No. of Obs.	7,514	8,179	-665
Large Banks ($1 Billion +)	Mean	11,671,792	9,605,605	2,066,187
	Std. Dev	41,069,115	24,629,191	16,439,924
	Minimum	1,002,227	1,015,159	-12,932
	Maximum	571,732,000	272,429,000	299,303,000
	No. of Obs.	319	338	-19
Medium Banks ($100 MM to $1B)	Mean	248,913	243,415	5,498
	Std. Dev	177,163	175,059	2,104
	Minimum	100,031	100,151	-120
	Maximum	999,137	994,385	4,752
	No. of Obs.	2,577	2,533	44
Small Banks (< $100 MM)	Mean	47,835	45,287	2,548
	Std. Dev	24,413	24,453	-40
	Minimum	2,306	2,374	-68
	Maximum	99,822	99,971	-149
	No. of Obs.	4,618	5,308	-690

Note: Mean, Std. Dev., Minimum and Maximum values are in thousands of dollars.

The summary statistics of the financial ratios used as explanatory variables in the second stage regressions are contained in Tables 5 and 6 by size category for 1999 and 1996, respectively, and in Table 7 for all banks. Due to the unavailability of data in all of the financial ratio categories the number of banks used in the deterministic regression is decreased to 4,376 for 1999 and 5,158 for 1996. The ratios tend to be consistent with the operation of banks by size category. For example, in 1999 large banks had a mean risk-based capital ratio (RBC) of 11.04%, which is lower than that of both medium and small banks. This is consistent with the fact that smaller banks tend to be better capitalized than their larger counterparts. Large banks also have a lower full-time equivalent employee ratio (FTE) than either medium or small banks. Thus, large banks on average can manage more dollars of assets with fewer employees than can smaller institutions.

Exhibit 3
Descriptive Statistics of Variables Used in the 1996 and 1999 SFA Profit and Cost Frontier National Models

	1999		1996		Difference	
Variables:	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Total Profit[a]	19,758	341,355	14,741	221,818	5,017	119,537
Input Price:						
Price of Labor[a]	39.50	9.09	35.14	8.58	4.36	.51
Price of Capital[b]	.3472	.3535	.3747	.3802	-.0275	-.0267
Cost of Deposits	3.90	.65	4.15	.63	- .25	.02
Cost of Purch. Funds	4.63	1.12	4.92	1.30	- .29	-.18
Output Quantity:						
Transaction Deposits[c]	80,382	916,932	92,243	759,512	-11,861	157,420
Time & Savings Dep[c]	233,290	2,853,011	185,332	1,295,194	47,958	1,557,817
Real Estate Loans[c]	179,734	2,315,876	133,856	1,065,328	45,878	1,250,548
Other Loans[c]	215,566	3,491,460	182,113	2,237,613	33,453	1,253,847
Net Nonint. Income[c]	13,591	214,203	9,687	128,553	5,904	85,650
No. of Observations	7,514		8,179		-659	

Note: [a] Values are in thousands of dollars per full-time equivalent employee
[b] Values are in dollars per dollar of fixed assets
[c] Values are in thousands of dollars

Exhibit 4
Summary Statistics of Profit Efficiency Estimates Obtained from the National Model

		1999		1996	
		5% Truncation	10% Truncation	5% Truncation	10% Truncation
All Banks	Mean	.39722	.48845	.37692	.4622
	Std. Dev	.24424	.26787	.24928	.27488
	Minimum	.00911	.01169	.02568	.03286
	Maximum	1.0000	1.0000	1.0000	1.0000
	No. of Observations	7,514	7,514	8,179	8,179
Large Banks	Mean	.28376	.35581	.25743	.32661
	Std. Dev	.19275	.22015	.17243	.21040
	Minimum	.00915	.01174	.02568	.03286
	Maximum	1.0000	1.0000	1.0000	1.0000
	No. of Observations	319	319	338	338
Medium Banks	Mean	.37542	.46154	.35737	.44052
	Std. Dev	.23765	.25803	.23707	.26349
	Minimum	.00912	.01169	.03201	.04095
	Maximum	1.0000	1.0000	1.0000	1.0000
	No. of Observations	2,577	2,577	2,533	2,533
Small Banks	Mean	.41725	.51267	.39387	.48120
	Std. Dev	.24790	.27218	.25627	.28061
	Minimum	.01403	.01800	.02830	.03620
	Maximum	1.0000	1.0000	1.0000	1.0000
	No. of Observations	4,618	4,618	5,308	5,308

Exhibit 5
Summary Statistics for Financial Ratios Used as Independent Variables for 1999

	Variable	Mean	Std. Dev.	No. of Obs.
Large Banks ($1 Billion +)	RBC	11.04	3.60	282
	NONACCRL	.39	.35	
	ALLL	1.66	.70	
	COFF	.54	.57	
	IL	1.01	1.46	
	OE	3.45	1.61	
	FTE	.35	.16	
	OI	2.08	.95	
	ROE	17.48	8.60	
	NII	1.76	1.70	
	LA	10.34	6.56	
	JMBOCD	11.09	9.19	
	COREDEP	68.89	13.91	
	ONEGAP	-21.31	15.42	
Medium Banks ($100 MM to $1B)	RBC	13.28	4.71	1,916
	NONACCRL	.37	.49	
	ALLL	1.42	.60	
	COFF	.36	.64	
	IL	1.56	1.58	
	OE	3.26	1.44	
	FTE	.44	.15	
	OI	1.77	1.28	
	ROE	14.21	7.12	
	NII	1.05	1.80	
	LA	10.26	5.84	
	JMBOCD	12.12	6.75	
	COREDEP	80.85	8.73	
	ONEGAP	-21.28	14.20	
Small Banks (< $100 MM)	RBC	15.65	6.24	2,178
	NONACCRL	.52	.72	
	ALLL	1.56	.72	
	COFF	.48	.76	
	IL	1.44	1.52	
	OE	3.28	1.12	
	FTE	.47	.16	
	OI	1.37	.87	
	ROE	10.80	8.35	
	NII	.77	.78	
	LA	13.85	7.96	
	JMBOCD	11.97	6.62	
	COREDEP	84.42	7.68	
	ONEGAP	-18.48	15.15	

Note: Definitions given in Exhibit 1.

Medium banks tend to outperform large and small institutions when asset quality ratios are considered. They exhibit a lower level of nonaccrual loans (NONACCRL), a lower allowance for loan and lease loss reserve (ALLL), and a lower instance of charged-off loans (COFF) for both years. There is, however, a direct relationship shown between bank size and the profitability ratios.

Large banks have higher ratios in the areas of operating income (OI), return on equity (ROE), and net noninterest income (NII) than do their smaller counterparts for 1999 and 1996. However, as typically is the case, small banks are shown to be more liquid than medium and large banks with a higher proportion of liquid assets (LA) and core deposits (COREDEP) for each year.

Exhibit 6
Statistics for Financial Ratios Used as Independent Variables for 1996

	Variable	Mean	Std. Dev.	No. of Obs.
Large Banks ($1 Billion +)	RBC	11.54	4.97	318
	NONACCRL	.46	.43	
	ALLL	1.97	1.01	
	COFF	.76	1.00	
	IL	1.48	2.33	
	OE	3.84	2.03	
	FTE	.40	.20	
	OI	2.14	1.19	
	ROE	17.68	9.69	
	NII	1.95	2.17	
	LA	15.41	8.02	
	JMBOCD	9.09	7.44	
	COREDEP	72.75	14.87	
	ONEGAP	-5.75	14.86	
Medium Banks ($100 MM to $1B)	RBC	14.44	4.60	2,003
	NONACCRL	.46	.60	
	ALLL	1.55	.67	
	COFF	.47	2.04	
	IL	1.55	1.46	
	OE	3.31	1.51	
	FTE	.49	.16	
	OI	1.94	.83	
	ROE	14.65	6.54	
	NII	1.02	1.45	
	LA	14.76	7.12	
	JMBOCD	10.26	6.04	
	COREDEP	85.23	7.53	
	ONEGAP	-10.72	13.49	
Small Banks (< $100 MM)	RBC	16.13	6.07	2,837
	NONACCRL	.51	.66	
	ALLL	1.63	.79	
	COFF	.49	.72	
	IL	1.41	1.41	
	OE	3.38	1.35	
	FTE	.54	.18	
	OI	1.67	.83	
	ROE	12.02	6.82	
	NII	.86	1.04	
	LA	17.57	8.41	
	JMBOCD	10.50	6.29	
	COREDEP	87.50	6.53	
	ONEGAP	-9.08	14.09	

Note: Definitions given in Exhibit 1.

Exhibit 7
Summary Statistics for Financial Ratios Used as Independent Variables for All Banks (1999 and 1996)

	Variable	Mean		Std. Dev.		No. of Obs.	
		1999	1996	1999	1996	1999	1996
All Banks	RBC	14.31	15.19	5.66	5.62	4,376	5,158
	NONACCRL	.45	.49	.62	.63		
	ALLL	1.51	1.62	.68	.77		
	COFF	.43	.50	.70	1.40		
	IL	1.46	1.47	1.55	1.51		
	OE	3.28	3.38	1.30	1.47		
	FTE	.45	.51	.15	.18		
	OI	1.59	1.80	1.10	.87		
	ROE	12.72	13.39	8.12	7.12		
	NII	.95	.99	1.40	1.33		
	LA	12.05	16.35	7.24	8.03		
	JMBOCD	11.98	10.32	6.87	6.28		
	COREDEP	81.86	85.71	9.48	8.44		
	ONEGAP	-19.89	-9.51	14.82	13.96		

Note: Definitions given in Exhibit 1.

Exhibit 8 provides evidence regarding the direction and strength of the relationship between the financial variables selected to represent a bank's CAMELS rating and its measure of profit efficiency. Reported are the coefficients for each variable, the standard error, and the adjusted R^2 of the model. Raw profit efficiency scores estimated from the national model are used as dependent variables as opposed to the scores normalized to lie between 0 and 1. Thus, to allow for more accuracy regarding a bank's true efficiency score the raw scores are regressed on the 14 financial variables and the signs of the coefficients as well as their significance levels are examined for all banks as well as by asset size. As shown in Exhibit 8 the regression using all banks displays an adjusted R^2 of .2058 for 1999 and .2128 for 1996. This gives a starting point for comparison when the same regression is used to analyze the association between variables. It is very interesting to note that when large banks are analyzed the R^2 increases to .3839 in 1996 and .3014 in 1999. The model using large banks displays the best fit of any size category, as medium banks have R^2s of .2904 and .2935 while small banks display a rather low .1800 and .1688 for 1996 and 1999, respectively.

The signs of the coefficients are mostly as hypothesized earlier. The capital category proxy of risk-based capital (RBC) is found to be positive and significant for each size bank, lending to the theory that a more well-capitalized bank is more profit efficient. The proxies for asset quality provide a mixed output as to that predicted. For all banks , large banks, and small banks the nonaccrual loans coefficient (NONACCRL) is negative and significant as predicted. This is strangely enough not the case for medium-sized banks as the coefficient is found to be positive and insignificant. The coefficient for charged-off loans (COFF) is also found to have the expected negative sign and is significant for every category except 1999 large banks. Both of these findings make intuitive sense in that a bank with a lower percentage of nonaccrual and charged-off loans should display a higher degree of profit efficiency. The allowance for loan and lease loss variable (ALLL) displays the predicted positive sign and significance for all categories except 1999 small

banks. The ratios selected to represent management quality are all predicted to display a negative relationship with profit efficiency. This is indeed the case for insider loans (IL) and overhead expense (OE). Both are also significant except for the large bank category.

Exhibit 8: Regression Results Using Raw Profit Efficiency Scores Estimated from the National Model

Variable	All Banks		Large Banks		Medium Banks		Small Banks	
	1999	1996	1999	1996	1999	1996	1999	1996
INTERCEPT	-.3590**	-.1657	-.2721	.1307	-.6054***	-.5318**	-.3891	.1066
	(.1496)	(.1547)	(.2624)	(.1691)	(.2286)	(.2564)	(.3492)	(.4511)
RBC	.0215***	.0343***	.0284**	.0384***	.0405***	.0549***	.0121***	.0277***
	(.0024)	(.0023)	(.0119)	(.0060)	(.0040)	(.0043)	(.0033)	(.0030)
NONACCRL	-.0388*	-.0467***	-.4463***	-.2335***	.0121	.0060	-.0588**	-.0738***
	(.0206)	(.0171)	(.1163)	(.0640)	(.0343)	(.0264)	(.0270)	(.0238)
ALLL	.0455**	.0510***	.1406**	.1003***	.0601**	.1018***	.0092	.0356*
	(.0181)	(.0141)	(.0638)	(.0311)	(.0273)	(.0240)	(.0258)	(.0200)
COFF	-.1124***	-	.0910	-.1746***	-.1534***	-.0281**	-.1069***	-.1166***
	.0419***		(.0965)	(.0357)	(.0335)	(.0124)	(.0273)	(.0246)
IL	(.0206)	(.0095)	-.0135	-.0197*	-.0377***	-.0248**	-.0243**	-.0262**
	-.0292***	-	(.0249)	(.0112)	(.0099)	(.0101)	(.0111)	(.0104)
OE	.0207***		-.0093	-.0334	-.3493***	-.0977***	-.2410***	-.1085***
	(.0073)	(.0067)	(.0611)	(.0338)	(.0299)	(.0271)	(.0362)	(.0286)
FTE	-.2477***	-	.5439	.4765**	-.3406**	.4975***	-.2764*	-.0030
	.0785***		(.3361)	(.2053)	(.1481)	(.1389)	(.1644)	(.1243)
OI	(.0212)	(.0181)	-.3189***	-.3036***	-.4597***	-.4446***	-.3561***	-.4958***
	-.2617**	.1760**	(.1005)	(-.0650)	(.0356)	(.0388)	(.0434)	(.0377)
ROE	(.1045)	(.0857)	.0221**	.0282***	.0053	.0206***	.0073*	.0218***
	-.3311***	-	(.0107)	(.0078)	(.0039)	(.0047)	(.0043)	(.0043)
NII	.4016***		-.0506	.0516**	.3608***	.1185***	.1333***	.1338***
	(.0257)	(.0257)	(.0610)	(.0258)	(.0292)	(.0266)	(.0404)	(.0291)
LA	.0059**	.0200***	.0177***	.0186***	.0152***	.0243***	.0060**	.0155***
	(.0026)	(.0030)	(.0062)	(.0033)	(.0030)	(.0024)	(.0026)	(.0020)
JMBOCD	.2306***	.1052***	.0112**	.0012	.0172***	.1004***	.0073*	.0083*
	(.0209)	(.0177)	(.0049)	(.0035)	(.0030)	(.0033)	(.0042)	(.0048)
COREDEP	.0086***	.0187***	.0054	-.0016	.0274***	.0057**	.0287***	.0111**
	(.0018)	(.0014)	(.0033)	(.0020)	(.0025)	(.0028)	(.0037)	(.0047)
ONEGAP	.0107***	.0080***	-.0121***	-.0107***	-.0112***	-.0140***	-.0086***	-
	(.0021)	(.0021)	(.0027)	(.0019)	(.0012)	(.0012)	.0102***	
CHARTER	.0238***	.0079***	-.0103	-.1027**	.0638*	.0700**	(.0012)	(.0012)
	(.0017)	(.0017)	(.0675)	(.0468)	(.0332)	(.0304)	.0384	.0754**
Adjusted R^2	-.0101***	-	.3014	.3839	.2935	.2904	(.0393)	(.0334)
N	.0122***		282	318	1,916	2,003	.1688	.1800
	(.0008)	(.0008)					2,178	2,837
	.0602**	.0585***						
	(.0246)	(.0218)						
	.2058	.2128						
	4,376	5,158						

***, **, and * indicates significance at the .01, .05 and .10 levels, respectively

The number of full-time equivalent employees (FTE) shows mixed results with both positive and negative coefficients for varying years in different categories. Variables representing the earnings component are all expected to be positively related to profit efficiency. The return on equity (ROE) is indeed positive and significant except for medium banks in 1999, for which no significance is noted. Net noninterest income (NII) is positive for all categories except large banks

in 1999. This variable also displays a high degree of significance across all categories excluding large 1999 banks. The variable representing operating income (OI), however, shows a completely opposite outcome as to what is predicted. It is found to be negative and significant across all bank sizes and years of operation, for which there is no readily available explanation. This finding does, however, compare to that of Taylor, et al. (1997). The variables which serve as a proxy for the liquidity category display a mixture of outcomes compared to that expected. Liquid assets (LA) are hypothesized to have a negative relationship with profit efficiency, but all categories are shown to be positive and significant. Jumbo CDs (JMBOCD), which often are purchased by banks to fund profitable investments, are expected to display a positive relation with profit efficiency. This is indeed the case, with all categories displaying significance, except for large banks in 1996. Core deposits (COREDEP) are a low cost of funds for banks and result in positive and significant coefficients for all categories with the exception of large banks. A bank's one year gap (ONEGAP) proxies the difficult to measure interest rate sensitivity category. It is found to be negative and significant for all categories. The dummy variable, CHARTER, is included to determine if the chartering authority of a bank is a significant determinant of its level of profit efficiency. A nationally chartered bank is coded 1 and a state chartered bank is 0. The results show CHARTER to be positive and significant in 1999 and 1996 for the all banks category, implying nationally chartered banks are more efficient than state chartered banks. However, when decomposed by size classification the results show positive and significant coefficients for medium and small banks in 1996 and medium banks in 1999, with large banks having negative coefficients for both years and significance for 1996 only.

The results of the regression as a whole seem to support *a priori* expectations and are mostly consistent with Elyasiani et al. (1994), with the exception being the operating income variable. The output shows that many of the relationships that exist using the results of the national model and financial ratios in the all banks category disappear when the banks are segmented by asset size. Additionally, these differences indicate that large and small banks are fundamentally not the same in terms of input and output mix, which is consistent with previous studies. Thus, as evidenced by the inconsistency of the relationships between financial ratios and profit efficiency estimates by asset size, if an efficiency indicator is to be used as an addition to the CAMELS rating, one should be chosen that takes these differences into account so as not to penalize either large or small institutions.

CONCLUSIONS

There is no refuting the fact that banks today are more complicated entities than ever before. The added duties and services, permitted by the passage of laws such as the Gramm-Leach-Bliley Act, place a greater importance on the reliability of regulators to adequately assess a bank's efficiency and financial performance due to the allowance of increased risk-taking scenarios. In turn, the methods regulators utilize to assess the viability and productivity of banks must increase in sophistication to handle the added complexity of today's banking environment.

Furthermore, the areas of accounting-based financial ratios and efficiency are much debated in terms of the best measure of bank performance. While most studies tend to examine the two areas

in isolation, this study chooses to merge the areas of bank efficiency and financial ratio performance. It examines the relationship between financial ratios deemed highly correlated with a bank's CAMELS rating and measures of profit efficiency to determine when and if the two should be used in combination, as suggested by previous studies. This examination, unlike others, is not solely dependent on data derived from large institutions. The data consists of banks of all sizes and is segmented by asset size to determine if the aforementioned relationship is the same for all banks. As shown in the previous section, the relationship between financial ratios and profit efficiency estimates is indeed different for banks of varying size. The relationship also differs when analyzing all banks together versus segmenting them by asset size. It is found that large banks achieve, on average, a better fit between financial ratios and profit efficiency scores. This supports the hypothesis that an efficiency measure added to the financial ratio analysis currently used by regulators would be more beneficial to large banks than small banks, thus penalizing smaller institutions. Furthermore, the findings indicate that, as widely hypothesized, large and small banks are fundamentally not the same in terms of input and output mix, which is consistent with previous studies. Thus, as evidenced by the inconsistency of the relationships between financial ratios and profit efficiency estimates by asset size, if an efficiency indicator is to be used as an addition to the CAMELS rating, one should be chosen that takes these differences into account so as not to penalize either large or small institutions.

This study expands on the claim by previous researchers that an efficiency indicator should be added to the current bank rating system used by regulators. The findings are promising that an equitable model can be developed to rate fairly an institution regardless of size. However, this study uses only the parametric stochastic frontier efficiency approach. A similar analysis using other parametric and nonparametric techniques would provide more insight into this area. Furthermore, while a strong introduction to the problem, the research presented in this paper contains only two years of data. The use of a more comprehensive time frame would serve to better justify the results. Finally, the choice of the financial ratios used to simulate a CAMELS rating is arbitrary. As long as the CAMELS system remains proprietary information it is a researcher's best guess as to the accuracy of the ratios chosen to represent a bank's rating. Thus, making the CAMELS rating available to researchers not affiliated with a regulatory agency would greatly enhance study in this area. This in turn would provide beneficial results to bankers, regulators, and academicians alike.

REFERENCES

Aigner, D.J., C.A.K. Lovell & P. Schmidt (1977). Formulation and estimation of stochastic frontier production function models. *Journal of Econometrics*, *6*, 21-37.

Bagi, F.S. & C.J. Huang (1983). Estimating production technical efficiency for individual farms in Tennessee. *Canadian Journal of Agricultural Economics*, *31*, 249-256.

Battese, G. E. & G. S. Corra (1977). Estimation of a production frontier model with application to the pastoral zone of eastern Australia. *Australian Journal of Agricultural Economics*, *21*, 169-179.

Battese, G. E. & T. J. Coelli (1988). Prediction of firm level efficiencies with a generalized frontier production function and panel data. *Journal of Econometrics*, *38*, 387-399.

Bauer, P. W., A. N. Berger & D.B. Humphrey (1993). Efficiency and productivity growth in U.S. banking," in H.O. Fried, C.A.K. Lovell, and S.S. Schmidt (eds.), *The Measurement of Productive Efficiency: Techniques and Applications,* Oxford University Press, Oxford, 386-413.

Berger, A. N. (1993). Distribution-free estimates of efficiency in the U.S. banking industry and tests of the standard distributional assumptions. *Journal of Productivity Analysis*, *4*, 261-292.

Berger, A. N. & D. B. Humphrey (1997). Efficiency of financial institutions: International survey and directions for future research. *European Journal of Operational Research*, *98*, 175-212.

Berger, A. N. & L. J. Mester (1997). Inside the black box: What explains differences in the efficiencies of financial institutions? *Journal of Banking and Finance*, *21*, 895-947.

Clark, J. A. (1988, September/October). Economies of scale and scope at depository financial institutions: A review of the literature. Federal Reserve Bank of Kansas City *Economic Review*, 16-33.

Cole, R. A., B.G. Cornyn & J. W. Gunther (1995, January). FIMS: A new monitoring system for banking institutions. *Federal Reserve Bulletin*, 1-15.

Cole, R. A. & J. W. Gunther (1998). Predicting bank failures: A comparison of on- and off-site monitoring systems. *Journal of Financial Services Research*, *13*, 103-117.

DeYoung, R. (1998). Management quality and x-inefficiency in national banks. *Journal of Financial Services Research*, *13*, 5-22.

DeYoung, R., I. Hasan & B. Kirchhoff (1997). Out-of-state entry and the cost efficiency of local commercial banks. Office of the Comptroller of the Currency, *E&PA Working Paper*, 97-7.

Elyasiani, E. & S. Mehdian (1995). The comparative efficiency performance of small and large US commercial banks in the pre- and post-deregulation eras. *Applied Economics*, *27*, 1069-1079.

Elyasiani, E., S. Mehdian & R. Rezvanian (1994). An empirical test of the association between production and financial performance: The case of the commercial banking industry. *Applied Financial Economics*, *4*, 55-59.

Evanoff, D. D. (1998, Second Quarter). Assessing the impact of regulation on bank cost efficiency. Federal Reserve Bank of Chicago *Economic Perspectives*, 21-32.

Farrell, M.J. (1957). The measurement of productive efficiency. *Journal of the Royal Statistical Society*, *120,* 253-281.

Gilbert, R. Alton, A., P. Meyer & M. D. Vaughan (1999, November/December). The role of supervisory screens and econometric models in off-site surveillance. Federal Reserve Bank of St. Louis *Review*, 31-48.

Greene, W. H. (1997). *Econometric Analysis (Third Edition)*. New Jersey: Prentice Hall.

Hermalin, B.E. & N.E. Wallace (1994). The determinants of efficiency and solvency in savings and loans. *Rand Journal of Economics*, *25*, 361-381.

Huang, M. (1999). *The role of frontier efficiency in explaining market reaction to bank merger announcements*. Unpublished doctoral dissertation, Mississippi State University.

Humphrey, D.B. & L.B. Pulley (1997). Banks' response to deregulation: Profits, technology, and efficiency. *Journal of Money, Credit, and Banking*, *29*, 73-93.

Jondrow, J., C.A. Knox Lovell, I. S. Materov & P. Schmidt (1982). On the estimation of technical inefficiency in the stochastic frontier production function model. *Journal of Econometrics*, *19*, 233-238.

Kalirajan, K. (1982). On measuring yield potential of the high yielding varieties technology at farm level. *Journal of Agricultural Economics*, *33*, 227-235.

Lee, L.F. & W.G. Tyler (1978). A stochastic frontier production function and average efficiency: An empirical analysis. *Journal of Econometrics*, *7*, 385-390.

Meeusen, W. & J. van den Broeck (1977). Efficiency estimation from Cobb-Douglas production functions with composed error. *International Economic Review*, *18*, 435-444.

Mester, L. J. (1997). Measuring efficiency at U.S. banks: Accounting for heterogeneity is important. *European Journal of Operational Research*, *98*, 230-242.

Park, B.U. & L. Simar (1995). Efficient semiparametric estimation on stochastic frontier models. *Journal of the American Statistical Association*, *89*, 929-936.

Park, B.U., R.C. Sickles & L. Simar (1998). Stochastic frontiers: A semiparametric approach. *Journal of Econometrics*, *84*, 273-301.

Pitt, M.M. & L.F. Lee (1981). Measurement and sources of technical inefficiency in the Indonesian weaving industry. *Journal of Development Economics*, *9*, 43-64.

Rhoades, S.A. &D. Savage (1981, January/February). Can small banks compete? *Bankers Magazine*, 59-65.

Rogers, K. E. (1998). Product mix, bank powers, and complementaries at U.S. commercial banks. *Journal of Economics and Business*, *50*, 205-218.

Rogers, K. E. (1998b). Consolidation is the U.S. Banking industry and the viability of small commercial banks: X-efficiency and bank size. Unpublished Working Paper, Mississippi State University.

Schmidt, P. & Robin C. Sickles (1984). Production frontiers and panel data. *Journal of Business and Economic Statistics*, *2*, 367-374.

Shaffer, S. (1989, September/October). Challenges to small bank survival. Federal Reserve Bank of Philadelphia *Business Review*, 15-27.

Simeone, W. J. & H.C. Li (1997). Credit union performance: An evaluation of Rhode Island institutions. *American Business Review*, *15*, 99-105.

Stevenson, R.E. (1980). Likelihood functions for generalized stochastic frontier estimation. *Journal of Econometrics*, *13*, 57-66.

Taylor, W. M., R. G. Thompson, R. M. Thrall & P.S. Dharmapala (1997). DEA/AR efficiency and profitability of Mexican banks: A total income model. *European Journal of Operational Research*, *98*, 346-363.

Waldman, D.M. (1984). Properties of technical efficiency estimators in the stochastic frontier model. *Journal of Econometrics*, *25*, 353-364.

Zimmerman, G.C. (1990, January). Small California banks hold their own, Federal Reserve Bank of San Francisco *Weekly Letter*, 26.

DOES PLANNING MAKE A BANK MORE EFFECTIVE?

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ABSTRACT

The planning process needs to be reduced to a reasonable number of components to be manageable and effective. At the same time, it must be a thorough and thought-provoking session that evaluates all of the major components that might reasonably impact the bank's successful operation of the next three to five years. To prepare a bank for a highly competitive environment, it is imperative that a careful study be made of its market and the economic and competitive forces within it. To fine-tune the process, the bank must address the financial drivers that impact profitability. There are ten drivers that impact the planning process. These drivers include fine tuning earnings, increasing net interest margins, effective deposit and loan pricing, strengthening asset quality, delivery of quality service, effective marketing, expense control, fee income generation, incentives, and a positive perception of the bank. These drivers occur throughout the process and manifest themselves in numerous forms as will be noted.

INTRODUCTION

A properly orchestrated plan will begin with a planning session, usually led by an outside facilitator that puts into focus the general direction the bank should take over the next three to five years. Make sure the facilitator understands banking in practice not just theory. The planning meeting or retreat should involve senior management and members of the board of directors, and must be held away from the bank-preferably an hour or more away to avoid distractions! Management should deal with directors' concerns, strengths of the bank, weaknesses of the bank, opportunities available to the bank, and threats to the bank, as well as specific issues such as the economy, existing markets and potential new markets, competition, new and existing products products, technology, staffing and budgets. After the issues of strengths, weaknesses, opportunities, and threats are addressed, the bank must deal with the financial drivers that can make or break profitability, and must be mindful of what the competition is doing.

PLANNING IS NOT A ONE-TIME THING

There has been a tendency on the part of some banks to not perform the planning process on an annual basis, however when a major anomaly occurs such as a drop in earnings or loss in market share, banks then determine that there must be a need for a major planning session. Banks should conduct a planning meeting annually. Markets that banks serve change over time and banks must change to meet the needs of their customers and take what the market will give them. Therefore,

it is important for banks to conduct annual planning sessions to stay abreast of the needs of the customers and prospects in that market as well as to evaluate what the competition has to offer.

PLANNING IMPACTS PROFITABILITY

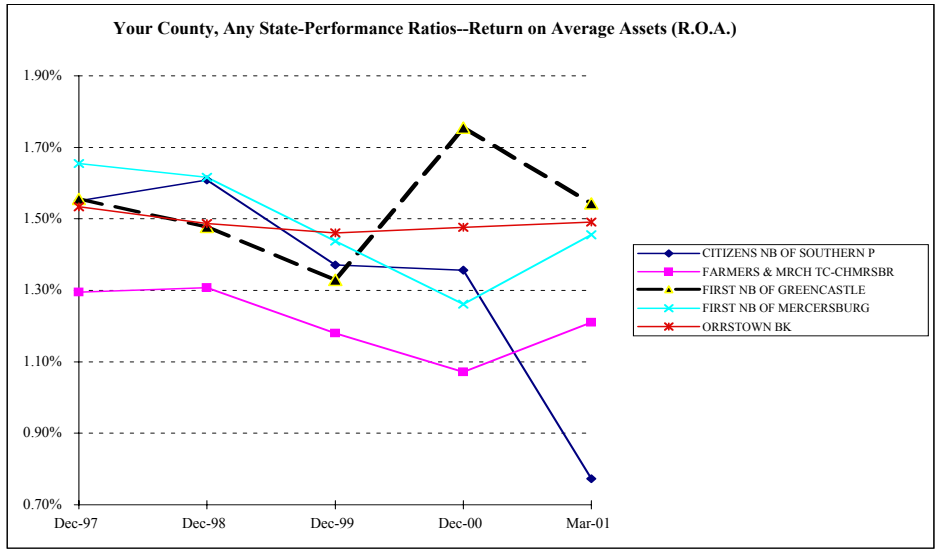
After addressing the more global aspects of the planning process, the key to "fine-tuning" the bank's profitability revolves around the following specific issues:

Fine Tune Earnings	Increase Net Interest Margin
Effective Deposit and Loan Pricing	Strengthen Asset Quality
Delivery of Quality Service	Effective Marketing
Expense Control	Fee Income Generation
Incentives	Positive Perception of Bank.

Fine Tune Earnings

Sometimes, a little fine-tuning is all that it takes to enhance earnings. Some methods banks could use include examining what peer banks are doing, evaluate what high performance banks are doing, and last, look for expenses that can be eliminated or reduced. In today's highly competitive environment, the difference between successful banks and mediocre banks may be brought about by very small adjustments. In the year 2000, the average community bank had a return on assets of 1.37 percent. In the following chart, peer banks in a given area are measured and charted for their return on average assets, which is an excellent device to instantly measure the subject bank to its peers.

Chart 1: Return on Average Assets

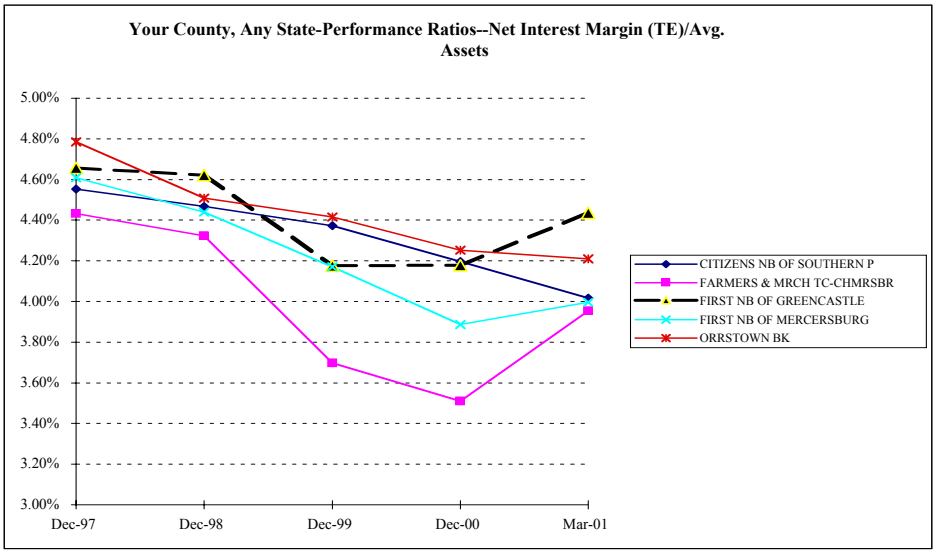


In the foregoing chart, the state and county names have been taken out of the charts and the "subject bank" is indicated by a heavy, dashed line. It should be noted that the subject bank in this example is performing well above the national average.

Increase Net Interest Margin

When banks had over fifty percent of their deposits free of interest costs as recently as the early to mid-1970s, it was not uncommon for the average bank to have a net interest margin of six or seven percent. In today's environment, a four percent net interest margin is considered extremely good. Since banking by simple definition is buying money at one price and selling it at a price, it becomes obvious that net interest margin is, perhaps, the most important factor impacting profitability. Pricing in the areas of deposits and loans have the most significant impact on the net interest margin and are discussed below. The following chart shows the subject bank is performing over the four percent level and half of its competitors are performing above the four percent level. This chart tells the bank that it must continue to watch its margins to stay competitive in their market.

Chart 2: Net Interest Margin



Effective Deposit and Loan Pricing

As noted in the above discussion, net interest margins are shrinking and present the greatest threat to bank profitability. Competition has caused some banks to pay more for deposits than they should. Likewise, some banks allow competition to drive down the rate that they charge for loans. Since loans constitute approximately two-thirds of the average community bank, and deposits constitute roughly ninety percent of the funding source for loans, a bank can severely impact its profitability by failing to carefully establish pricing policies for both loans and deposits. Note in

chart 3 that the subject bank has priced its deposits in the lower quadrant of its market and in chart 4 that the loans are priced in the upper quadrant of the market.

Chart 3: Deposit Pricing

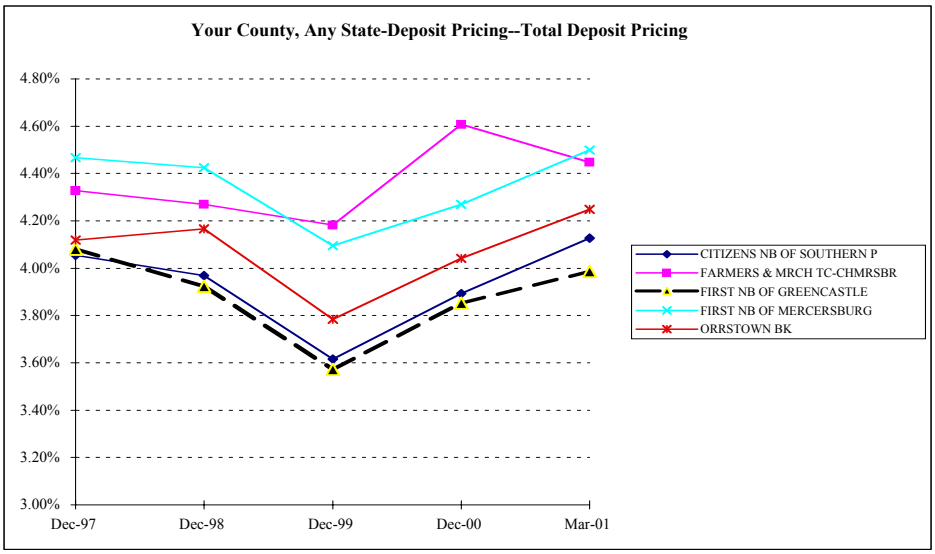
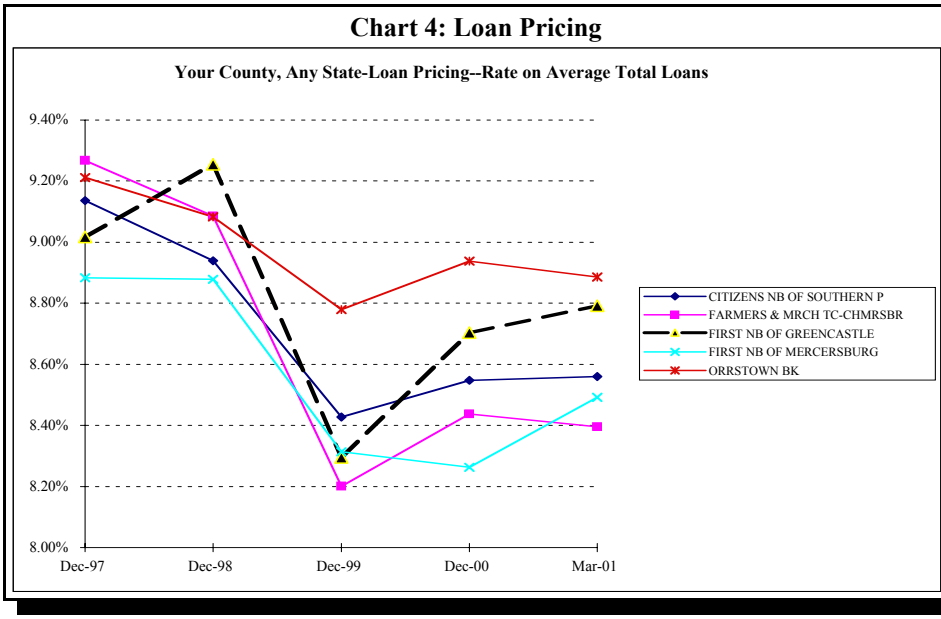


Chart 4: Loan Pricing



There is a tendency for competition to cause banks to pay more for deposits to attract more deposits and avoid losing existing deposits. While this strategy is certainly flawed, it is prevalent in the industry. Likewise, competition or weak loan demand causes some banks to lower their loan

rates to attract more loans as well as keep the existing loans. Planning and establishing strategies is vital to the pricing process.

Strengthen Asset Quality

A community banker once noted that asset quality at ninety-nine percent equates to a one percent loss! If the average community bank has one percent of its loan portfolio charged off, it would effectively reduce its return on assets by approximately one-half. For example, a $100 million bank earning a return on average assets of 1.2% would earn $1.2 million annually. However, if there is a 1% loss caused by loan losses, it would reduce its earnings by over one-half! To insure adequate quality, a bank should have a credit analysis program, which would carefully analyze statements of prospective loan customers before approving loans. To avoid asset quality deterioration, the bank should develop a formal credit review process, to provide quality control in the area of loan quality, loan documentation and credit/collateral exceptions. Additionally, the bank should address asset quality problems immediately.

Delivery of Quality Service

Business Week reported in its October 23, 2000 issue that bank customers perceive an 8.1% reduction in quality service delivery in the past six years. It was noted that service was more important than price. Further the article stated that service quality starts with management. An additional tool is asking customers and prospects in focus groups to evaluate service quality. Employing "shoppers" to evaluate service is also an effective tool. A major problem in society today exists because firms do not know what their customers want-even though most companies think they know what their customers want.

A bank must not implement a program and assume it will meet the needs of the customer and forget it. Instead, the bank must constantly be fine-tuning its service delivery to insure that the bank is satisfying the customer and doing it in such a fashion that it meets or exceeds what our competition is able to do. Products, customers, competition, and employees all change and your methods must change to meet the ever-changing marketplace. Berry (1999) found that there were three challenges in sustaining service quality success. He said the three challenges are operating effectively while growing rapidly, operating effectively when competing on price, and maintaining the initial entrepreneurial spirit of the younger, smaller company.

Effective Marketing

To be effective in the marketing arena, community banks must know the competition, know their own bank, know the customers and prospects, understand the make-up of their market, and last, adjust the marketing approach to what the marketing will give the bank. The bank must have a grasp of its present penetration of the marketplace, and at the same time, it is equally important to know its competitors' share of the market. Without such information, it would be extremely difficult to make an accurate assessment of the bank's prior year successes or failures in the marketplace, and

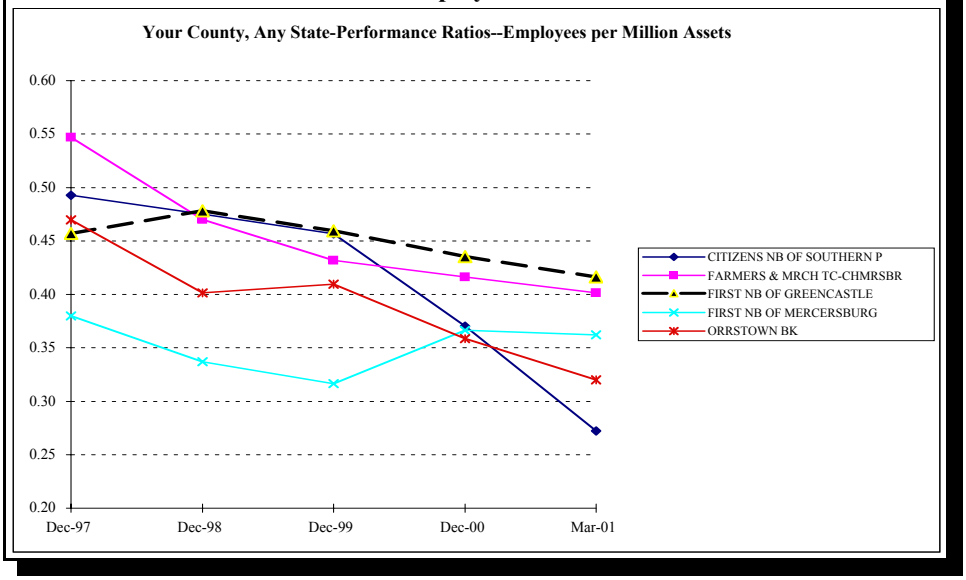
more importantly, address where the bank is going. The level of market penetration is a valuable device as a planning tool. It can provide strong and weak segments of the market for the bank, as well as providing the same data about its principal competitors.

Market penetration gain or loss provides one of the best early warning devices to management, signaling potential strengths or weaknesses for the bank or its competitors. To make a proper assessment of market penetration, it is necessary to look at the overall picture for the past several years, not just one year. Additionally, it is important to look at the combined effects of present market penetration by the bank and its competitors and look at the bank's greatest potential for growth.

Expense Control

Expense control is a process-not an edict. Additionally, controlling expenses is important to the bottom-line when the bank focuses on the fact that salary expenses normally constitute the largest non-interest expense in the bank. Therefore, it is important that everyone in the organization be involved in as well as "buy-in" expense control. A good rule of thumb would be to have no more that four-tenths of one employee per million dollars of assets in banks with six or fewer branches. As noted in the following table, the subject bank is below the four-tenths of one employee per million dollars in assets.

Chart 5: Employees Per Million



Fee Income Generation

Fee income is the most logical means of relieving pressure on net interest margins. However, conventional fee income generation from check fees and mortgage fees is not enough. Banks must develop new products such as financial counseling, insurance products, and other products. Bankers should follow the lead of other professionals such as accountants, attorneys, and physicians and not give their services or products away.

Incentives

A more recent tool to improve earnings is the use of incentives. Most staff members would be reluctant to tell you that they perform better when they are given incentives, but it is a well-established fact. Incentives truly provide a win-win situation for shareholders and staff members, since incentives should only be paid when the bank performance meets the agreed upon standard. Directors should set fair performance standards at the beginning of the year, distributing 20 to 30 percent of the income for performance.

Positive Perception of Bank

What does a positive perception of a bank have to do with profitability? Everything! If a bank is perceived to be a problem institution or for some other reason has a bad reputation, it will have a substantial impact on the bank's ability to attract profitable business. Customers like to do business with quality organizations so their perceptions will play a major role in the selection of a financial institution.

CONCLUSIONS

Banks that conduct regular annual planning sessions and follow-up in the implementation of the plan will position themselves to be successful in today's competitive environment. Banks must conduct all their planning on a dynamic basis and be prepared to act or react rapidly to changes in their markets and changes in the needs of their customers and prospects. There are many challenges to banking in the future, but there are also many opportunities for those financial organizations flexible enough to adapt their planning approaches to meet the demands brought about by the changing banking scene.

REFERENCES

Berry, L. A. (1999), *Discovering the Soul of Service* (pp.10, 148),New York: Free Press.

Bexley, J. B. (1998), *Directors' Duties & Responsibilities in Financial Institutions.* Huntsville, TX: Sam Houston Press.

Bexley, J. B. & J. Duffy, (2000), "Adapting Financial Institution Directors' Roles in the Management Process to Achieve a Competitive Advantage: A Challenge for 2000 and Beyond," *Advanced Mangement Journal*, Society for Advancement of Management, Volume 65, Number 3, Summer 2000.

Business Week, (2000), "University of Michigan's American Customer Service Satisfaction Index," October 23 Issue, New York.

Stratus Technologies, *The Bank Strategist,* Lexington, Kentucky, 2001.

STOCK SPLITS AND ABNORMAL RETURNS IN AN OVERACTIVE INTERNET MARKET SEGMENT

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ABSTRACT

Theoretical arguments about the financial relevance of dividend policy reveal that in perfect and costless markets, dividend policy is irrelevant. The introduction of market imperfections into these arguments presents grounds for the relevance of dividend (or virtually any other publicly observable) activity on the part of a firm's managers. A particular segment of dividend theory involves stock dividends and stock splits, often theoretically presented as inconsequential to the value of the firm. There are many ideas, however, about why firms feel the need to carry out these actions. One suggestion of particular interest to this study is that firms may use stock splits as a signaling device, perhaps as a way to call attention to the firm's current under-valuation. This contention would seem to take on even more importance in a market segment experiencing a continual flurry of activity, where firms may seek to become noticed among the ruckus.

This study examines the effectiveness of stock splits as a signaling device in an overactive stock market segment. The examination focuses specifically on business firms in the internet market segment, which experienced phenomenal growth from late 1997 to early 2000. Investors appeared to flock to this segment with reckless abandon. It represents an excellent opportunity to observe the effectiveness of stock splits in producing abnormal returns, and in a market where informational 'noise' and substantial price volatility was virtually an everyday condition. The study lends insight into strategic use of the stock split event announcement as a way to gain attention in an environment where many and varied distractions tended to be predominant. Based on the statistical results of the study, general conclusions are drawn about the effectiveness of observed stock split announcements in creating abnormal returns in an overactive market segment.

INTRODUCTION

The significance of dividend policy to managerial finance continues to be a topic of contention. The work on the role of dividend policy is quite extensive. Stock splits are perhaps even more questionable in terms of the rationale and results of their use. A variety of arguments concerning stock splits have been pursued in past literature. Copeland (1979) provides six reasons for splitting a stock: maintenance of a price range for the firm's shares, reduction of odd-lot trading (since high stock price reduces divisibility), creation of an increase in trading volume, increased brokerage revenue, lowering of bid-ask price, and to encourage an increase the number of shareholders. Ikenberry, Rankine & Stice (1996) found that stock splits most often occur when there

has been a substantial increase in the price of the stock, or when a stock trades at a high price. They also found that stock splits allow the investor an excess return during the period after the announcement. Additionally, they discovered that only short-term positive results were achieved when firms had low pre-split share prices.

Copeland (1979) defined liquidity as "changes in the proportional share volume traded and change in transaction costs as a percent of volume traded" and found that there was reduced liquidity following a stock split. He also determined that the announcement information about a stock split was disseminated within a two to three week time frame. Since the study was carried out prior to deregulation of brokerage commissions and the advent of the $8 trade, these results may vary based upon today's market. The information flow through cable television (e.g.: CNBC) and through various Internet sites facilitates dissemination of news about a stock split.

Other studies of stock splits yield further insight into the dynamics of market reactions. Brennan and Copeland (1988) determined that companies with stock splits had greater variance in returns on the announcement date of the stock split. The Beta of the stock would increase around the ex-date and on the day following. There was also a permanent increase in the stocks' average Betas after the ex-date. This followed the work of Ohlson and Penman (1985), who concluded that stock returns would increase immediately following the effective date of a stock split.

From a value viewpoint, it may be argued that a stock split does nothing more than change the denomination of the number of shares held, while the value per share changes such that the total value remains constant. From this perspective, stock splits would appear benign in terms of affecting any change in wealth. It is analogous to the idea that a five dollar bill is equivalent to five one dollar bills. The wealth is equal, no matter which denomination is held.

Other studies have pursued the possibility that, in an imperfect world where information is not heterogeneous to all market subgroups, there is the possibility of information content in any variety of managerial actions, including stock splits. Public announcements of stock splits may have the effect of drawing attention to the company's condition. This would be especially useful to management if the firm is undervalued, because a closer examination of the firm by an outsider may have the effect of a positive revaluation and, thus, higher bids. Penman (1983) asserts that, if stock splits signal manager's future value of the firm, the stock price should react upon the time of the announcement. Upon an announcement, therefore, investors should reassess the value of the firm.

There seems to be considerable belief that an optimal stock price range exists, although there is little empirical support for that belief (Lakonishok & Lev, p. 929, 1987). A stock split does not increase the shareholders proportional ownership of the firm, but only increases the number of shares outstanding. Since the number of shares rise upon a stock split, the question arises about why the price of the stock would increase. McNichols and Dravid (1990) state that splits realign the price of the stock prices to a preferred trading range. Splits increase the number of shares outstanding with the presumption that by increasing the number of shares it will result in increasing the number of shareholders, and thereby increasing the number of trades in the stock. A price range that allows for trading flexibility would be one that prevents the per share value from rising to levels that would rule out small-scale investors. It would also keep shares from appearing 'too cheap' by preventing share values from dropping below some value, determined by the perception of the markets. Angel (1997) found that share prices are relatively stable over an extended period of time. Interestingly,

different countries maintain different average share prices. In the U.S., the average price per share on the New York Stock Exchange was relatively stable during the period of 1924 until 1994, even though the Standard and Poor's Index had a substantial increase in value during the same period.

Ikenberry, Rankine and Stice (1996) found that stock splits occur more frequently during a period of a rising bull stock market. This suggests that there exists some underlying reason for split frequency. This study explores the possibility of whether or not stock split announcements are strategically advisable in chaotic market conditions. Specifically, we examine stocks within an overactive segment of the stock market, internet stocks. We observe changes in value during the late 1990's, a period characterized by extreme price increases and considerable price volatility. In the flurry of market activity, we consider the question of whether stock split announcements are an effective way for firms to gain attention, with the objective of excess returns.

METHODOLOGY

A sample of 360 internet companies within the Worden Telechart 2000 database was compiled. Among these companies, 122 carried out stock splits within the period under consideration, from July 1, 1998 to March 30, 2000. Among these stock splits, 75 splits occurred in public markets. Announcement dates for these splits were acquired from the "Stock Splits and Stock Dividends" database from e-analytics.com, an internet site maintained by Equity Analytics, Ltd. For nine of the 75 splits, no announcement dates were available. This left 66 observations for the statistical analysis.

For each split, daily returns were calculated from 15 days prior to the split to 15 days after the split. Using the AMEX internet index (^IIX) as our comparison base, excess return for each day (daily return for the stock minus daily return for the index) formed the observations for the dataset.

The data were organized according to an announcement date, which represents day zero for all stock splits within the data set. For each day prior to and after the announcement date, summary statistics were calculated. The summary results appear in table 1.

TABLE 1

Day	Average	Sample SD	CV	Z value	p-value
-15	-0.11%	6.74%	-6000%	-0.1323	0.8948
-14	-0.12%	6.28%	-5270%	-0.1506	0.8803
-13	1.14%	5.80%	510%	1.5555	0.1198
-12	-0.24%	6.44%	-2710%	-0.2929	0.7696
-11	0.39%	6.65%	1695%	0.4684	0.6395
-10	0.15%	6.10%	4039%	0.1981	0.8430
-9	-0.08%	4.97%	-5897%	-0.1357	0.8921
-8	-0.20%	6.84%	-3454%	-0.2316	0.8169
-7	-0.13%	5.78%	-4587%	-0.1744	0.8615

TABLE 1					
Day	**Average**	**Sample SD**	**CV**	**Z value**	**p-value**
-6	-0.93%	4.74%	-510%	-1.5684	0.1168
-5	-1.27%	5.83%	-458%	-1.7475	0.0805
-4	-0.10%	6.27%	-6413%	-0.1248	0.9007
-3	-1.61%	4.88%	-303%	-2.6367	0.0084
-2	-1.19%	6.69%	-563%	-1.4220	0.1550
-1	1.20%	11.01%	915%	0.8745	0.3819
0	4.81%	11.90%	247%	3.2326	0.0012
1	-0.84%	6.51%	-776%	-1.0303	0.3029
2	-0.33%	6.78%	-2074%	-0.3858	0.6997
3	1.01%	7.37%	731%	1.0944	0.2738
4	1.52%	9.58%	629%	1.2712	0.2037
5	-0.16%	6.98%	-4471%	-0.1789	0.8580
6	0.45%	7.57%	1687%	0.4743	0.6353
7	0.01%	6.43%	99564%	0.0080	0.9936
8	1.06%	7.44%	703%	1.1374	0.2554
9	-0.97%	5.36%	-554%	-1.4445	0.1486
10	1.60%	7.24%	453%	1.7664	0.0773
11	-0.37%	5.24%	-1423%	-0.5621	0.5740
12	0.78%	7.96%	1025%	0.7803	0.4352
13	-0.20%	5.94%	-2920%	-0.2740	0.7841
14	1.16%	6.78%	583%	1.3727	0.1698
15	-0.22%	6.71%	-3117%	-0.2567	0.7974

INTERPRETATION OF RESULTS

As the summary in table 1 indicates, only the excess returns on day zero are significant and positive. The significant and positive result may be interpreted as a same-day positive market reaction to the stock split announcement. Interestingly, the results suggest that the days immediately preceding and immediately following the announcement entail no significant excess return, positive or negative. This represents a departure from results of studies done on general market data in not-so-chaotic time periods, which indicate at least a minimal level of significance on days close to the announcement date (Ikenberry, Rankine & Stice 1996).

There are many possible reasons for our results. In this volatile environment (i.e. CV's from 247% to 99,563%), especially where prices are generally increasing at a high rate, investors may be less concerned with the relatively small possibility of gain around a stock split announcement than they are with other aspects of the same market segment. During this time period, for example, passive investors realized exceptionally high returns simply by holding a diversified portfolio of 'tech stocks.' As one of our public policy officials described it, 'irrational exuberance' was the market emotion of preference. It may also indicate that signaling may be more difficult in a chaotic, noisy environment.

Interestingly, there is a somewhat significant result for day -3, prior to the split announcement. This may be due to the considerable degree of variance and relative variance that characterizes the entire data set. It could be argued that an information 'leak' three days prior to announcement could spark movement in excess returns, but given the negative sign on the coefficient, this would be counter-rational.

To develop the argument about the significance of the differences in excess returns between the days, two ANOVAs were conducted. In table 2, we test for the null hypothesis that there is no difference between the means of the different splits:

TABLE 2: ANOVA Between Splits
Ho: Avg (obs1) = Avg (obs2) = ... Avg (obs66)

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	0.276082	63	0.004382	0.885015	0.7273	1.317316
Within Groups	9.482346	1915	0.004952			
Total	9.758428	1978				

The P-value from the table indicates that the split averages are not significantly different from zero. This result lends credence to our conclusion about the differences in days. It also suggests that there are no significant 'offsetting' effects among the averages of table 1, where one significantly positive result might otherwise negate another significantly negative result on the same day.

In table 3, we test for the null hypothesis that the difference between the means among the different days is zero:

TABLE 3: ANOVA Between Days
Ho: Avg (day -15) = Avg (day -14) = ... = Avg (day 15)

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	0.272426	30	0.009081	1.864803	0.003074	1.465002
Within Groups	9.486002	1948	0.00487			
Total	9.758428	1978				

We reject the null hypothesis of zero difference between days. This is consistent with the result from table 1.

As a supplemental test, we omit the day 1 average and test for differences among the remaining days' averages:

TABLE 4: ANOVA Between Days (omit day zero)
Ho: Avg(day-15) = Avg(day-14) = ... = Avg(day-1) = Avg(day+1) = ...= Avg(day15)

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	0.131999	29	0.004552	0.998385	0.468284	1.473534
Within Groups	8.593848	1885	0.004559			
Total	8.725847	1914				

The P-value indicates an acceptance of the null hypothesis, implying that all other days but zero have about the same average.

An interesting statistical result can also be observed from day -9 to day -2. On these days, not only did the averages all have negative signs, they also involved a total cumulative average of about 5.5%, a negative movement greater than the average positive movement on day zero. This significant negative run suggests that day zero returns may actually be a recovery of sorts.

IMPLICATIONS FOR INVESTMENT STRATEGY

The statistical summary suggests that, with an investment strategy, it would be difficult to derive benefit. In order for an investor to take advantage of the same-day excess return, prior knowledge of the split announcement would have to be available.

It is plausible that an investor capable of quickly executing trading orders could trade within the announcement day. Without intra-day data, though, determining the potential benefit is beyond this study. It does appear, however, that there is a lesser promise of excess returns (from reacting to stock split announcements) in this chaotic environment for the internet segment than may be possible in the general market.

REFERENCES

Agrawal, A.; J. F. Jaffe; and G. N. Mandelker (1992). "The Post-Merger Performance of Acquiring Firms in Acquisitions: A Reexamination of an Anomaly." *Journal of Finance*, 47 (Sept), 1605-1621.

Angel, J. J. (1994). "Tick Size, Share Prices, and Stock splits." Unpubl. Manuscript FINC 1377-11-694, Georgetown Univ.

Anshuman, V. R., and A. Kalay. (1993) "A Positive Theory of Stock Splits." Unpubl. Manuscript, Boston College.

Asquith, P.; P. Healy; and K. Palepu. (1989) "Earnings and Stock Splits." *The Accounting Review*, 64 (July), 387-403.

Baker, H. K., and P. L. Gallagher (1980). Management's View of Stock Splits." *Financial Management*, 9 (Summer), 73-77.

Baker, H. K., and A. Phillips (1994). "Why Companies Issue Stock Dividends." *Financial Practice and Education*, 3 (Fall), 29-27.

Baker, H. Kent, and Patricia L. Gallagher (1980). "Management's View of Stock Splits." *Financial Management*, Summer, 73-77.

Banz, R. W., and W. J. Breen (1986). "Sample Dependent Results Using Accounting and Market Data: Some Evidence." *Journal of Finance*, 41 (Sept.), 779-794.

Barber, B. M., and J. D. Lyon (1996). "Detecting Long-Run Abnormal Stock Returns: The Empirical Power and Specifications of Test Statistics." Unpubl. Manuscript, Univ. of California at Davis.

Brennan, M. J., and T. E. Copeland (1988). "Stock Splits, Stock Prices, and Transaction Costs." *Journal of Financial Economics*, 22 (Oct.), 83-101.

Brennen, J. J. and P. J. Hughes (1991). "Stock Prices and the Supply of Information." *Journal of Finance*, 46 (Dec), 1665-1691.

Conroy, R.; R. Harris; and B. Benet (1990). "The Effects of Stock Splits on Bid-Ask Spreads." *Journal of Finance*, 65 (Sept.), 1285-1295.

Copeland, T. "Liquidity Changes following Stock Splits (1979)." *Journal of Finance*, 34 (March), 115-141.

Copeland, Thomas E (1979). "Liquidity Changes Following Stock Splits." *Journal of Finan*ce, March, 115-141.

Cusatis, P. J.; J. A. Miles; and J. R. Woolridge (1993). "Restructuring through Spinoffs: The Stock Market Evidence." *Journal of Financial Economics*, 33 (June), 293-311.

Desai, H., and P. C. Jain (1995). "Dividend Signaling and Common Stock Returns following Stock Splits and Reverse Splits." Unpubl. Manuscript, Tulane Univ.

Dharan, B. G., and D. Ikenberry (1995). "The Long-Run Negative Drift of Post-Listing Stock Returns." *Journal of Finance*, 50 (Dec), 1547-1574.

Fama, E.; L. Fisher; M. Jensen; and R. Roll (1969). "The Adjustment of Stock Prices to New Information." *International Economic Review*, 10 (Feb), 1-21.

Grinblatt, M. S.; R. W. Masulis; and S. Titman (1984). "The Valuation Effects of Stock Splits and Stock Dividends." *Journal of Financial Economics*, 13 (Dec), 461-490.

Ikenberry, D., and J. Lakonishok (1993). "Corporate Governance through the Proxy Contest: Evidence and Implications." *Journal of Business*, 66 (July), 405-435.

Koski, J (1995). "Measurement Effects and the Variance of Returns after Stock Splits and Stock Dividends." Unpubl. Manuscript, Univ. of Wshington .

Lakonishok, J., and B. Lev (1987). "Stock Splits and Stock Dividends: Why, Who, and When." *Journal of Finance*, 62 (Sept), 913-932.

Lakonishok, J., A. Shleifer; and R. W. Vishny (1994). "Contrarian Investing, Extrapolation and Risk." *Journal of Finance*, 49 (Dec), 1541-1578.

Lamoureux, C., and P. Poon (1987). "The Market Reaction to Stock Splits." *Journal of Finance*, 62 (Dec), 1347-1370.

Loughran, T., and J. R. Ritter (1995). "The New Issues Puzzle." *Journal of Finance*, 50 (March), 23-51.

Maloney, M., and J. Mulherin (1992). "The Effects of Splitting on the Ex: A Microstructure Reconciliation." *Financial Management*, 21 (Winter), 44-59.

McNichols, M., and A. Dravid (1990). "Stock Dividends, Stock Splits, and Signaling." *Journal of Finance*, 45 (July), 857-879.

McNichols, Maureen, and Ajay Dravid (1990). "Stock Dividends, Stock Splits, and Signaling." *Journal of Finance*, July, 857-879.

Michaely, R.; R. H. Thaler; and K. L. Womack (1995). "Price Reactions to Dividend Initiations and Omissions: Overreaction of Drift?" *Journal of Finance*, 50 (June), 573-608.

Ohlson, J., and S. Penman (1985). "Volatility Increases Subsequent to Stock Splits: An Empirical Aberration." *Journal of Financial Economics*, 14 (June), 251-266.

Ritter, J. R (1991). "The Long-Run Performance of Initial Public Offerings." *Journal of Finance*, 46 (March), 1-27.

Spiess, D. K., and J. Affleck-Graves (1995). "Underperformance in Long-Run Stock Returns following Seasoned Equity Offerings." *Journal of Financial Economics*, 38, 243-267.

Szewczyk, S. H. and G. P. Tsetsekos (1995). "Why Stocks Split? Evidence from Institutional Ownership." Unpubl. Manuscript, Drexel Univ.

Womack, K (1996). "Do Brokerage Analysts' Recommendations Have Investment Value?" *Journal of Finance*, 51 (March), 137-167.

CONSUMER DEBT: WHO'S AT RISK? EVIDENCE FROM THE 1998 SURVEY OF CONSUMER FINANCES

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ABSTRACT

This article uses data from the 1998 Survey of Consumer Finances to examine which types of households carry higher relative levels of debt and may thus be at greater risk in an economic downturn. Results reveal that lower net worth households carry higher levels of credit card and installment debt. Higher net worth households, however, use higher levels of less costly mortgage and home equity debt. These findings also reveal that younger households and married households use higher levels of debt providing further substantiation for Modigliani's life cycle theory.

INTRODUCTION

In recent years there has been growing concern about the rising level of consumer debt (Kennickell et al., 2000; Maki, 2000). This concern has often been brushed aside in the face of strong employment and healthy stock market gains, both of which have enabled households to service higher levels of debt. More recently, however, employment has faltered in many sectors, and individual stocks have declined by twenty to forty percent. A growing number of households are now vulnerable to the financial pressures associated with high levels of debt.

This article will use data from the 1998 Survey of Consumer Finances to explore the types of debt held by households and to identify those households that may be most vulnerable to financial distress during an economic downturn. It will examine the effects of age, wealth, gender, and race on debt use to determine if households having certain demographic characteristics are at greater risk.

PRIOR RESEARCH

In a 1986 article Franco Modigiliani (Modigliani, 1986) posited a life cycle hypothesis for household saving. He noted that income and household requirements vary over the course of the life cycle as the size and needs of the family changes. This would lead to lower savings for the young and higher savings for more mature couples whose children have left. Avery et al. (1987) also referenced the life cycle hypothesis in a discussion of consumer installment debt. They contend that families use debt to bridge the gap between income and needs, particularly the need for large consumer durables. Thus, younger families who are building households would have higher levels of debt and older families with more modest needs would have lower levels.

Using the 1995 and 1998 Surveys of Consumer Finances, Kennickell et al., (2000) found that debt repayments in 1998 represented a larger share of income than in 1995. Similarly, the percentage of families who were late with their payments by at least 60 days was higher in 1998 than in 1995. As Modigiliani suggested, Kennickell et al. found that debt use increases with age but declines after the age of 45, largely due to paying off the mortgage on a primary residence.

Maki (2000) examined the ratio of debt service to net worth to find that lower income households carried the highest relative levels of debt. He also found that consumer confidence has an effect on households' willingness to accumulate debt. The growth in consumer durables and consumer credit were highly correlated leading him to conclude that the use of debt may signal optimism about the future. Chien and Devaney (2001) similarly found that attitude has an impact on the willingness to use credit card debt and installment loans. Households with a more favorable attitude toward credit were significantly more likely to use debt than those with a less favorable attitude. Chien and Devaney also found that married households, professional households, higher income households, and more highly educated households held higher levels of debt.

Taken together, the results of prior research suggest that debt use is determined by age, income, marital status, education, and attitude toward debt. This research will examine the effect of these variables as well as variables representing gender and race.

DESCRIPTION OF THE DATA

Data for this study were drawn from the 1998 Survey of Consumer Finances (SCF) conducted every three years by the Federal Reserve. The 1998 SCF is the most recent survey for which data are publicly available and includes financial and other information on 4,305 American households. The survey, which last from 1 1/2 to 3 hours, collects information of household assets and liabilities, use of financial products and financial service providers, and employment.

Tables 1 through 4 examine the use of various types of debt held by American households. Since the prior research suggests that both age and wealth have an impact on debt use, the data have been divided in three age groups and four net worth groups. The age groups are 1) less than 40, 2) greater than or equal to 40 and less than 55, and 3) greater than or equal to 55 years of age. The net worth groups are 1) less than $20,000 in net worth, 2) greater than or equal to $20,000 but less than $100,000, 3) greater than or equal to $100,000 but less than $500,000, and 4) greater than or equal to $500,000 in net worth.

Table 1 focuses on credit card (including store card) holdings and debt levels. The most obvious differences are those between members of different net worth classes. Although approximately half of the lowest net worth group has credit cards, almost 100 percent of the highest net worth group has them; the likelihood of having a credit card increases as net worth increases. The reverse is true, however, for credit card balances. A much higher percentage of low net worth households have credit card balances and fail to pay off their cards from month to month than is the case for higher net worth households. This suggests that the lowest net worth households are the ones most likely to hold high interest credit card debt on a continuous basis. It is very likely that lower net worth households do not have sufficient financial resources to pay off their credit card

debt and may, in fact, use their credit cards to make ends meet. If this is the case, lower net worth households may be particularly vulnerable to an economic downturn accompanied by job losses.

Table 1: Households with Credit or Store Cards

	Age1	Age2	Age3
NW1			
Number of households	672	232	195
% having credit cards	49.3	44.6	38.5
% with balances	81.9	86.6	64.0
% who pay off each month	28.1	22.3	44.0
credit card debt/total income	29.2	19.3	19.8
credit card debt/net worth	83.2	117.0	85.0
NW2			
Number of households	269	283	214
% having credit cards	80.0	80.8	67.6
% with balances	73.6	73.6	59.0
% who pay off each month	39.4	34.8	48.6
credit card debt/total income	7.6	8.5	9.4
credit card debt/net worth	6.1	7.3	5.4
NW3			
Number of households	221	417	441
% having credit cards	90.0	94.8	84.4
% with balances	47.7	59.5	30.3
% who pay off each month	62.8	54.8	78.3
credit card debt/total income	4.6	5.4	3.8
credit card debt/net worth	1.3	1.5	.77
NW4			
Number of households	108	514	739
% having credit cards	98.1	98.6	97.0
% with balances	25.5	20.7	12.6
% who pay off each month	83.0	84.4	92.5
credit card debt/total income	1.1	1.4	1.7
credit card debt/net worth	.14	.14	.44

Table 1 also reveals that credit card debt as a ratio of net income and credit card debt as a ratio of net worth decline dramatically as net worth increases. Whereas credit card debt represents approximately 20 percent of household income for the lowest net worth households, it represents only about 1 to 1 1/2 percent of household income for the highest net worth households. Again, this highlights the vulnerability of lower net worth households to an economic downturn. Although there are some indications in Table 1 that credit card use and credit card debt decline somewhat with age, particularly for the over-55 households, this effect is much less striking than the net worth effect.

Table 2: Households With Installment Debt

	Age1	Age2	Age3
NW1			
% having installment debt	57.3	44.0	13.8
installment debt/total income	189.5	89.6	26.0
installment debt/net worth	313.3	149.2	100.9
NW2			
% having installment debt	55.8	56.5	34.1
installment debt/total income	35.6	28.2	22.0
installment debt/net worth	25.7	23.4	19.8
NW3			
% having installment debt	46.2	47.0	21.8
installment debt/total income	25.2	22.6	23.6
installment debt/net worth	8.8	7.5	6.0
NW4			
% having installment debt	41.7	27.8	12.4
installment debt/total income	20.4	42.3	48.2
installment debt/net worth	2.3	2.9	2.2

Table 2 includes information of household holdings of installment loans which include car and vehicle loans, educational loans, and consumer loans. Differences associated with both age and net income are evident. Higher net worth households are less likely to have an installment loan, and installment debt is a dramatically smaller percentage of income and net worth. This may be because higher net income households are in a better position to pay cash, or alternatively, because they use home equity loans which carry a lower interest rate. Similarly, over-55 households in particular are much less likely to have an installment loan. The reasons for this are obvious; older households no longer need to finance multiple automobiles, college educations, furniture, appliances, and the like.

Table 3: Households With Mortgage Debt			
	Age1	Age2	Age3
NW1			
% having mortgage debt	12.5	14.7	5.1
mortgage debt/total income	822.1	187.7	132.7
mortgage debt/net worth	192.5	134.7	164.2
NW2			
% having mortgage debt	51.7	64.0	36.9
mortgage debt/total income	187.0	136.7	231.4
mortgage debt/net worth	156.5	123.9	97.0
NW3			
% having mortgage debt	74.2	76.7	31.1
mortgage debt/total income	161.9	143.2	163.4
mortgage debt/net worth	50.3	42.1	25.9
NW4			
% having mortgage debt	69.4	70.0	35.3
mortgage debt/total income	124.4	110.6	160.4
mortgage debt/net worth	16.6	11.8	7.3

Households having mortgage debt are included in Table 3. In this instance, mortgage debt includes first and second mortgages as well as home equity loans. From the consumer's perspective, this is probably the most desirable form of debt because it typically carries the lowest interest rate. In addition, interest on debt secured by the primary residence is tax deductible unlike the interest on other types of loans which is not. Thus, one would anticipate that households having access to mortgage or home equity debt would choose to use it rather than the more costly alternatives of credit card and installment debt. Table 3 reveals that lower net worth households are much less likely to have mortgage debt than higher net worth households. For the youngest age category, for example, only 12.5 percent of the lowest net worth households had some type of mortgage debt compared to 69.4 percent of the highest net worth households. This discrepancy is probably due to the fact that lower net worth households do not qualify for a mortgage either because their income is too low or their debt level is too high. Thus, the lowest net worth households do not typically have access to the cheapest source of borrowing which may explain their higher dependence on credit card and installment debt.

For those households that do have mortgage debt, the ratio of mortgage debt to total income and mortgage debt to net worth declines as net worth increases. There does appear to be an age effect for mortgage debt as one would anticipate. Over-55 households are considerably less likely to have mortgage debt, probably because they have paid off their mortgages over time.

Table 4: Households With Debt From Any Source			
	Age1	Age2	Age3
NW1			
% having debt	72.3	71.6	40.5
debt/total income	319.7	179.4	101.1
debt/net worth	751.1	508.4	160.6
NW2			
% having debt	88.5	93.3	68.7
debt/total income	187.0	136.7	231.4
debt/net worth	122.7	113.4	71.7
NW3			
% having debt	91.4	93.5	49.4
debt/total income	174.4	157.7	117.6
debt/net worth	53.0	47.3	26.3
NW4			
% having debt	92.6	87.0	63.6
debt/total income	435.5	228.8	444.1
debt/net worth	19.8	18.5	17.3

Table 4 examines households' usage of debt from any source and reveals differences associated with both net worth and age. Higher net worth households are more likely to have some type of debt. Similarly, younger households are more likely to have debt, possibly because they are still in the process of accumulating assets. The ratio of debt to net worth is dramatically lower for high net worth households than for low net worth households. The ratio of debt to net income, however, remains high for high net worth households. This suggests that high net worth households are able to obtain high levels of debt relative to their incomes because they have sufficient assets to secure it. Examples of such debt might include loans for primary residences, second homes and vacation properties, multiple vehicles, boats, and the like.

High net worth households may have also chosen to finance assets with debt at this time rather than paying them off. In 1998 interest rates, particularly for mortgage debt, were approximately 7 percent while stock market gains were in excess of 20 percent. Higher net worth households may have preferred to invest their financial assets in the stock market while financing their physical assets with cheaper debt. Thus, although high net worth households could not pay off their debt using current income, they could easily pay it off by liquidating assets. The same is not true for the lower net worth households. Debt as a percentage of total income and debt as a percentage of net worth exceed 100 percent for the two lowest net worth groups. Households in

these groups are much more at risk for financial distress or bankruptcy in the event of an economic downturn.

MULTIVARIATE ANALYSIS

Although univariate analysis provides some useful insights into households' use of different types of debt, it does not take into account the possible effects of several household characteristics, i.e. age, wealth, and gender, acting in concert. In fact, however, debt use may be determined by a combination of variables. Multivariate analysis, and more specifically Tobit analysis, is used to explore this possibility.

A Tobit model is a regression model in which the range of the dependent variable, in this case the ratio of each type of debt to net worth, is constrained in some way (Amemiya, 1984; Tobin, 1958). For example, if the dependent variable is the ratio of credit card debt to net worth, some households will have zero credit card debt, because they either choose not to have credit cards or because they are unable to obtain them. If there are a number of observations for which the value of the dependent variable is 0, the linearity assumptions implicit in the least squares method do not hold (Amemiya, 1984).

The Tobit model used in this analysis took the following form:

$$\textit{Dependent Variable} = a + b_1 Age + b_2 LogNW + b_3 Gender + b_4 Married + b_5 Black + b_6 Hispanic + b_7 Ed + b_8 CredAtt + e$$

Dependent variables included the following ratios:

Credit card debt (including store cards)/household net worth
Installment debt (including car and vehicle loans, education loans, and consumer loans)/household net worth
Mortgage debt (including first and second mortgages and home equity loans)/household net worth
Total household debt/household net worth

Age was included as an independent variable since prior research (Avery et al., 1987, Kennickell et al., 2000; Modigliani, 1986) indicates that younger households use higher levels of debt than older households. This finding is reinforced by univariate analysis (Tables 1-4) which reveals that debt use declines with age. The log of net worth was used as a variable representing household wealth and consists of total household assets minus total household liabilities. The logged form of the variable was used since net worth for this sample of households was highly skewed. Prior research reveals that lower income households carry the highest relative levels of debt (Maki, 2000). In addition, Tables 1 through 4 indicate a strong inverse relationship between household net worth and debt levels.

A variable representing gender was included in the model to determine if women demonstrate greater or lesser willingness to hold debt than men. Prior research on investment

behavior suggests that women are more risk averse than men, and the use of debt increases risk for a household as it does for a corporation. If, in fact, women are more risk averse than men, one would anticipate that households headed by women would hold lower levels of debt. Bajtelsmit and VanDerhei (1997) found that women were less likely to invest in stock than men and more likely to invest in fixed income securities. Similarly, Hinz et al. (1997) found that a large percentage of women invested in the minimum risk portfolio available when given a range of pension alternatives. Using the 1998 Survey of Consumer Finances, Coleman (2001) found that women over 40 held a significantly lower percentage of risky assets than men.

Marital status may also affect a household's willingness to use debt. Married households are in all probability more likely to be homeowners requiring furniture, appliances, and mortgages. Similarly, married households are more likely to have children who need clothes, toys, and college educations. Married households are also more likely to have two income streams if both individuals work and are thus in a better position to service higher levels of debt. Chien and Devaney (2001) found that married households held higher levels of debt than households headed by single individuals.

The variables Black and Hispanic were included to determine if race has an impact on household debt levels. Prior research on mortgage lending reveals that black and hispanic households are more likely to be turned down for mortgages than white households (Canner, 1991; Canner & Smith, 1992; Munnell & Tootell, 1996). Thus, members of racial minorities may have less access to various types of debt than white households.

Educational level as represented by the variable Ed may have an effect on households' willingness and ability to use debt since more highly educated households may be more aware of some of the advantages of leverage, i.e. the tax deductibility of debt secured by a primary residence. Similarly, more high educated borrowers may be viewed more favorably by lenders as having greater earnings potential and ability to repay debt. Chien and Devaney (2001) found that more highly educated households did, in fact, use higher levels of debt. Cohn and Coleman (2000) also found that more highly educated households held a higher level of risky assets thus indicating a lower level of risk aversion and greater willingness to assume risk to maximize returns.

The final independent variable, CredAtt, is a dichotomous variable representing the head of household's attitude toward risk. If the head of household expressed a very positive attitude toward the use of debt, CredAtt was given a value of 1. Theoretically, one would anticipate that individuals expressing a favorable attitude toward debt would use higher levels of debt. Conversely, those expressing unfavorable attitudes toward debt would minimize or avoid various types of debt. Chien and Devaney (2001) examined the effect of attitude on the willingness to use credit card and installment debt to find that households with a more favorable attitude toward credit were significantly more likely to use debt.

The independent variables included in the model are defined in Appendix 1. A correlation analysis revealed that none of the independent variables were highly correlated with each other or with the dependent variables.

RESULTS

The objective of this research is to determine which types of households are most likely to have high levels of different types of debt. As described above, the ratio of various types of debt to net worth were related to a series of explanatory variables using Tobit models. The results of this analysis are included in Tables 5 through 8. Several findings are consistent across all the models, most notably the significance of age, household wealth, and marital status.

Table 5: Tobit Analysis
Dependent Variable: Credit card debt/household net worth

Variable	Estimate	ChiSquare	Pr>ChiSquare
Intercept	0.0170	0.00106	0.9181
Age**	-0.0239	85.6430	0.0001
LogNW**	-0.0428	11.9241	0.0006
Gender*	0.2555	5.0173	0.0251
Married**	0.4063	17.4269	0.0001
Black	-0.0123	0.0100	0.9204
Hispan	-0.1231	0.6857	0.4076
Ed	0.0975	1.5884	0.2075
Credatt*	0.1907	6.4600	0.0110

*variable significant at the .05 level **variable significant at the .01 level

Table 6: Tobit Analysis
Dependent Variable: Installment debt/household net worth

Variable	Estimate	ChiSquare	Pr>ChiSquare
Intercept**	2.3506	17.2935	0.0001
Age**	-0.1195	179.7935	0.0001
LogNW**	-0.1179	7.0643	0.0079
Gender	-0.4653	1.4889	0.2224
Married**	1.1440	13.57701	0.0002
Black	-0.5061	1.5003	0.2206
Hispan*	-1.0132	4.1200	0.0424
Ed	0.2312	0.8099	0.3682
Credatt	0.3391	1.9044	0.1676

*variable significant at the .05 level **variable significant at the .01 level

Table 7: Tobit Analysis Dependent Variable: Mortgage debt/household net worth			
Variable	Estimate	ChiSquare	Pr>ChiSquare
Intercept**	-14.7629	83.8589	0.0001
Age**	-0.2591	108.2129	0.0001
LogNW**	1.1121	82.6443	0.0001
Gender	-0.5579	0.2439	0.6214
Married**	5.9569	44.2843	0.0001
Black*	-2.6112	4.1453	0.0418
Hispan*	-3.0147	3.9472	0.0469
Ed*	1.6525	5.1930	0.0227
Credatt	-0.1831	0.0706	0.7905
*variable significant at the .05 level		**variable significant at the .01 level	

Table 8: Tobit Analysis Dependent Variable: Total debt/household net worth			
Variable	Estimate	ChiSquare	Pr>ChiSquare
Intercept**	9.0948	30.4398	0.0001
Age**	-0.1901	75.3306	0.0001
LogNW**	-0.5291	14.0377	0.0002
Gender	-1.2866	1.6808	0.1948
Married**	3.3839	17.4787	0.0001
Black	-1.7418	2.3993	0.1214
Hispan	-1.7816	1.7063	0.1915
Ed**	3.2031	22.1784	0.0001
Credatt	0.9018	2.0020	0.1570
*variable significant at the .05 level		**variable significant at the .01 level	

For all four models the variable representing age of the head of household was significant and negative indicating that younger households use higher levels of credit card, installment, mortgage, and total debt. This finding is consistent with prior research (Modigliani, 1986; Avery et al., 1987) and gives further credence to Modigliani's life cycle theory. Younger households are typically in the process of accumulating assets such as cars, homes, furniture, and appliances. Thus, their capital requirements exceed current income and they use various types of debt to finance assets that will be used for both current and future consumption. Alternatively, more mature households

have probably acquired and paid for most of the assets they need, and are more likely to be downsizing than upsizing.

The log of net worth was significant and negative for the credit card, installment debt, and total debt models indicating that less wealthy households use higher levels of these types of debt. It is revealing, however, that the log of net worth was significant and positive for the mortgage debt model indicating that wealthier households use a higher level of mortgage debt than less wealthy households. There are several possible reasons for this apparent inconsistency.

First, less wealthy households may need to use credit cards and installment loans to meet current needs for both liquidity and asset accumulation. They may not have the luxury of being able to pay cash or to pay off their credit cards on a monthly basis. Alternatively, more wealthy households are more likely to own homes that can be used to provide less costly financing in the form of residential mortgages and home equity loans, both of which carry considerably lower interest rates than credit cards or installment loans. It is very likely that less wealthy households use a higher level of credit card and installment debt because that's what they have access to. More wealthy households that have access to mortgage debt, however, use it because it is tax deductible and carries a lower interest rate.

The variable representing marital status was also significant and positive for all four models indicating that married heads of household use higher levels of debt than single heads of household. This finding is also consistent with prior research (Chien & Devaney, 2001). Married individuals are more likely to have children, to own homes and multiple vehicles, to require various types of assets, and to have educational expenses that might be financed by debt. In addition, if both individuals work, they have a dual income stream and are in a better position to service debt.

Several other findings revealed by the Tobit analysis are worthy of note. The variable representing educational level was significant and positive for the mortgage and total debt models indicating that more highly educated heads of households use higher levels of mortgage debt and total debt. This may be because more highly educated individuals are more aware of the beneficial aspects of debt use, specifically the tax deductibility of mortgage interest. It may also be because lenders view educational level as a measure of human capital and associate it with a greater likelihood of repayment.

The variable representing attitude toward credit was significant and positive in the credit card model revealing that individuals who believe it is a good idea to finance with credit are more likely to have a higher level of credit card debt. This finding is consistent with prior research (Chien & Devaney, 2001).

The variable representing gender was also significant and positive for the credit card model indicating that women have a higher level of credit card debt relative to net worth than men. This may suggest that women are more likely to be impulse buyers, or it may suggest that women are more likely to use credit cards as a source of liquidity as opposed to carrying cash. There are opportunities for further research into the ways in which men and women use credit cards. Gender was not a significant variable for any of the other debt models, however.

Hispanic heads of household used a significantly lower level of installment loans, and both black and hispanic households used a significantly lower level of mortgage debt. This finding is again consistent with prior research suggesting that black and hispanic borrowers may not have the

same access to mortgage loans that white borrowers do (Canner, 1991; Canner & Smith, 1992; Munnell & Tootell, 1996). If this is the case, it places black and hispanic households at a substantial disadvantage since debt secured by the primary residence is both tax deductible and cheaper in terms of the interest rate charged. There are opportunities for further research in this area to determine if differences in the use of mortgage debt are caused by adverse discrimination, cultural differences, or other factors.

DISCUSSION

As concern grows regarding the strength of the economy and its possible vulnerability to a recession, there is simultaneously growing concern about the high levels of consumer debt. During the flush times of the mid- and late 90s, consumers piled on debt to purchase homes, vehicles, vacations, and whatever else caught their eye. High levels of employment and double digit stock market gains helped to fuel this willingness to spend and to assume high levels of debt. Consumers were willing to spend and banks, credit card companies, and retailers were more than happy to help them achieve that goal.

We now face more sobering economic times. The news is filled with announcements of corporate layoffs, and many lenders have begun to tighten up on their credit standards. The stock market has dropped sharply and faces uncertain prospects for the future. In the wake of terrorist attacks on New York and Washington, many economists worry that we may be on the brink of a global recession. The euphoria that fueled credit-driven spending has vanished as have the jobs and stock market gains that could have serviced household debt.

This article has used household financial data from the 1998 Survey of Consumer Finances to examine which types of households may be most vulnerable to an economic downturn and most at risk due to high levels of household debt. Results reveal that lower net worth households carry higher relative levels of debt than higher net worth households. This problem is particularly acute for households falling into the lowest net worth categories who have comparatively high levels of the most costly types of debt, credit card and installment debt. Since many of these households probably do not qualify for mortgage financing, they are unable to reap the benefits of less costly and tax deductible mortgage and home equity debt. These results demonstrate that lower net worth households lack sufficient annual income or net worth to pay off their debt. Possible job losses due to a slower economy may result in an inability to service debt, let alone pay it off.

The findings of this research also indicate that younger households and married households carry higher relative levels of debt consistent with Modigliani's life cycle theory. In all probability these households use debt to satisfy their needs for liquidity, to finance the expenses associated with establishing a household and having a family, and simply to make ends meet. Older households, on the other hand, carry a significantly lower percentage of debt for all four types of debt examined in this article.

The policy implications of these findings is that there is very likely a downside to providing easy credit during boom times. Given the high levels of debt for many lower net worth households, a severe or sustained economic slowdown could lead to a dramatic increase in delinquencies and

personal bankruptcies. This disturbing trend has already been noted in the business press (McGinn, 2001).

High levels of household debt will also limit the consumer's ability to contribute to a recovery. Consumer spending led to high levels of growth in the latter part of the 90s. Now, however, many consumers are so heavily burdened with debt that they will not be in a position to provide the same type of economic stimulus going forward. Since consumer spending represent two-thirds of Gross National Product, this possibility poses a substantial threat for the economy overall as well as for individual households.

REFERENCES

Amemiya, T. (1984). Tobit models: A survey. *Journal of Econometrics 24*, 3-61.

Avery, R. B., G. E. Elliehausen, & A. B. Kennickell (1987, October). Changes in consumer installment debt: Evidence from the 1983 and 1986 Surveys of Consumer Finances, *Federal Reserve Bulletin*, 761-778.

Bajtelsmit, V. L. & J. L. VanDerhei (1997). Risk aversion and pension investment choices. In M.S. Gordon, O.S. Mitchell, & M.M. Twinney (Eds.), *Positioning pensions for the twenty-first century* (pp. 45-66). Philadelphia: University of Pennsylvania Press.

Canner, G.B. (1991, November). Home Mortgage Disclosure Act: Expanded data on residential lending. *Federal Reserve Bulletin*, 859-881.

Canner, G.B. & D. S. Smith (1992, November). Expanded HMDA data on residential lending: One year later. *Federal Reserve Bulletin*, 801-824.

Chien, Y. & S. A. Devaney (2001). The effects of credit attitude and socioeconomic factors on credit card and installment debt. *The Journal of Consumer Affairs 35* (1), 162-179.

Cohn, R. & S. Coleman (2000). Factors affecting the observed degree of risk aversion. Evidence from the 1998 Survey of Consumer Finances. Working Paper.

Coleman, S. (2001). Women and risk: An analysis of attitudes and investment behavior. Working paper.

Hinz, R. P., D. D. McCarthy, & J. A. Turner (1997). Are women conservative investors? Gender differences in participant-directed pension investments. In M.S. Gordon, O.S. Mitchell, & M.M. Twinney (Eds.), *Positioning pensions for the twenty-first century* (pp. 99-106). Philadelphia: University of Pennsylvania Press.

Kennickell, A. B., M. Starr-McCluer, & B. J. Surette (2000, January). Recent changes in U.S. family finances: Results from the 1998 Survey of Consumer Finances. *Federal Reserve Bulletin*, 1-29.

Maki, D. M. (2000, February). The growth of consumer credit and the household debt service burden. Federal Reserve Board Working Paper.

McGinn, D. (August 27, 2001). Maxed out!, *Newsweek*, 34-40.

Modigliani, F. (1986). Life cycle, individual thrift, and the wealth of nations. *The American Economic Review 76* (3), 297-313.

Munnell A.H. & G. Tootell (1996). Mortgage lending in Boston: Interpreting HMDA data. *American Economic Review 86* (1), 25-54.

Tobin, J. (1958). Estimation of relationships for limited dependent variables. *Econometrica 26*, 24-36.

Appendix 1
Independent Variables Used in Tobit Model
Age: age of the head of household in years
LogNW: the log of net worth (total household assets minus total household liabilities)
Gender: dichotomous variable coded as 1 if the head of household is female
Married: dichotomous variable coded as 1 if the head of household is married
Black: dichotomous variable coded as 1 if the head of household is black
Hispanic: dichotomous variable coded as 1 if the head of household is hispanic
Ed: dichotomous variable coded as 1 if the head of household has attended college
CredAtt: dichotomous variable coded as 1 if the head of household indicates that it is a "good idea" to buy things on the installment plan

INNOVATIONS IN BANK SERVICE MARKETING OR HOW TO MARKET A BANK

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ABSTRACT

The banking industry has changed radically in the past few years and continues to change rapidly. The projection for banking in the foreseeable future make the traditional views of banking obsolete. Individuals have shifted their personal wealth and savings from banks and thrifts to other institutions. This decline requires that banks focus on innovations that facilitate new cost effective delivery of services and attraction of customers through marketing analysis and implementation strategies. This investigation will examine these concepts and will conclude with suggestions for bank marketing success.

INTRODUCTION

In 1775 there were no commercial banks in Britain's rebellious American colonies. The commercial Bank of England was almost a century old, but few colonists had any dealings with it or England's enormous funded debt. There did exist colonial institutions, both public and private, which had 'bank' in their name. Most of these institutions were so different from commercial banks that when Robert Morris, Alexander Hamilton, and the other "Founding Financiers" proposed the Bank of North America in 1781, and the Bank of New York in 1784, every aspect of banking had to be discussed repeatedly and in great detail (Wright, 1997).

Despite strong earnings the largest U.S. commercial banks are currently in the process of restructuring their retail operations. A stagnant deposit base and intense competition in the marketplace for financial services have made the overhead costs of an extensive branch network increasingly onerous. At the same time, electronic communications technology is making low-cost remote delivery of banking services more of a reality. While remote delivery provides banks the means to cut overhead in retail operation, it also enables nonbank and even nonfinancial firms to pose a credible threat to the industry's retail franchise. This threat adds urgency to this restructuring.

The main purposes of this investigation are: (1) describe the innovations that are being adopted in banking, (2) explain the integrated strategies for restructuring retail operations, and (3) review the policy issues that emerge. Banks are restructuring by developing complete customer-relationship profiles, switching over to remote electronic delivery channels (phone centers, home banking, and next-generation ATMs), relocating branches to large retail outlets, and redesigning selected branches as investment centers. To emphasize the necessity and urgency of bank restructuring plans, some banking officials maintain that they do not expect their institutions to ever build another traditional branch.

STAGNANT DEPOSIT BASE

The bank's much diminished role as holders of personal savings is the first major force prompting banks to revamp their retail operations. Deposits at banks, thrifts, and credit unions measured as a share of the household sector's financial wealth, have fallen by a little more than half during the past 21 years to 17.0% at year-end 1995. Depositories' share peaked at 38.2% at year-end 1974.

The decline in the importance of deposits in the household sector's asset holdings has accelerated during the past few years. Despite significant increases in total personal financial wealth, the dollar volume of savings and time deposits has been virtually unchanged over the past several years without adjusting for either inflation or economic growth.

COST DISADVANTAGE OF BANKS

The rapid decline of deposits in relative terms and their stagnation in absolute terms has left banks with a high cost structure for their branch operations. The disadvantage that this creates can be illustrated by breaking down the cost and revenues of a typical branch into a few major categories. A typical branch has total annual direct expenses of around $700,000, of which the largest category is staff compensation (for 12 full-time equivalent employees). The cost of the building itself is the next largest category of total direct expenses, and the remainder is for electricity, supplies, etc. On top of direct expenses are indirect operating expenses, incurred by the head office or other centralized functions for items such as computing, preparing and mailing monthly statements, and advertising. These indirect expenses are roughly equal to direct expenses, bringing total annual operating expenses of a branch to $1.4 million. The costs of branch operations cannot be allocated precisely because many noninterest expenses are shared by two or more units.

REMOTE BANKING

The second major factor prompting the consolidation of retail branch operations is "remote banking," meaning contacting or transacting with one's bank from outside the branch office using any of several electronic devices: ATM, PC, video-phone, screen-phone, fax, point-of-sale (POS) terminal, and automated clearing house (ACH). It also includes the mundane "delivery channels" of the telephone and the mails. "These are just a few of the trends driving rapid and sometimes disordered change in business today, leaving some companies struggling to catch up, while other firms crash and burn and still others flourish. Successful companies have learned to leverage today's lessons of challenge and competition and turn them into tomorrow's best practices and stories of customer satisfaction" (Koonce, 1998). "Online financial firms are investing heavily on the Web, making firms that offer services such as online trading and banking attractive advertising targets" (Naylor, 1998).

Competitive pressures from both inside and outside the industry should force banks to move in the direction of remote electronic banking. Even though banks have been earning healthy profits in recent years, they feel threatened by the substantial cost advantage that will accrue to those among

them that are the successful early adopters. Furthermore, banks see a credible threat from outside the industry. Electronic distribution, like other major technological changes, has the potential to undermine long-established business patterns. Banks fear, in particular, that households will view nonbank firms as their primary provider of banking services. Banks' traditional role as trusted intermediaries would erode further over time. Banks are thus aggressively pursuing electronic delivery channels to realize cost savings as well as to protect the banking franchise.

THE DEVELOPMENT OF MARKET PLAN

Strategic planning has returned to the spotlight. Bankers are turning their attention back to strategic planning because cost-cutting efforts are approaching the limits of what they can deliver. In today's fast-paced society, bankers must frame a vision that can withstand the test of time, but, in the same sense, be executed with ease. The planning that takes place needs to make a big difference in the world. Strategic planning needs to become implementable and trackable (Bird, 1999). Once strategic planning is established, corporations will begin to see major changes within the structure of the company.

Numerous financial institutions operate without a marketing plan. Given our current climate of bank merger mania, that is not a smart idea. It is difficult for banks to keep current customers and target desirable ones without a marketing plan. The financial goals of banks to varying extents are affected drastically without a marketing plan. Some financial institutions in today's society believe they have a marketing plan, when, in all actuality, they do not. Instead they have a business plan. "While a lot of banks spend big bucks on advertising and marketing campaigns, they often fail to correct behaviors that consistently irritate customers, the press and shareholders" (Holliday, 1999). In other circumstances, banks do have vague marketing plans, but they never refer to them.

Some institutions do not even attempt to create an effective marketing program because they feel they do not have enough creativity to establish an effective plan. According to George Wachtel (1997, [first citation]) there are several reasons to be creative in today's challenging bank marketing environment.

Many definitions have been given to the term "marketing." Although basically all definitions center around three basic elements, marketing can be defined as "a human activity directed at satisfying needs and wants through exchange processes" (Pezzullo, 1987). According to Pezzullo, (1987) the initial element of the marketing definition is "human activity that is directed." In other words people are told that marketing is work and it requires formal organization and direction to be effective. Satisfaction of people's needs and wants is the core of the definition. The terms "needs" and "wants"' tend to be used interchangeably. People have a need for shelter and clothing, but they want a three-acre lot and designer jeans, which are luxury goods. To determine what the customer wants and deliver the want successfully is the basic goal of all businesses. Peter Drucker makes the point very clearly when he noted that marketing is so basic that it is not just enough to have a strong sales department and to entrust marketing to it. Marketing is not only much broader than selling, it is not a specialized activity at all. It encompasses the entire business. It is the whole business seen from the point of view of the final result, that is, from the customer's point of view. Concern and responsibility for marketing must, therefore, permeate all areas of the enterprise (Pezzullo, 1987).

It is not that difficult to design a marketing plan. In order to establish the basis for designing a marketing plan, one must know exactly what marketing means. Demand-stimulating and demand-fulfilling efforts of the enterprise are the major concerns of the marketing activities. These activities combine and intertwine with one another as parts of the total system. The total system is where a company develops and makes it products available, distributes them through marketing channels, promotes them, and prices them. Marketing is the managerial process by which products are matched with markets and through which transfers of ownership are effected (Cundiff, Govoni, and Still, 1973, [first citation]). The American Marketing Association defines marketing as consisting "of performance of business activities that direct the flow of goods and services from producer to consumer to user" (Cundiff et al, 1973 ([subsequent citation]). Shott defines a marketing plan as "a broad set of guidelines as to how the bank is going to accomplish its strategic goals" (Gerson, 1998, [first citation]). McCabe looks upon a marketing plan as "a living document that guides the hand throughout the year" (Gerson, 1998, [subsequent citation]). A marketing plan states what is to be done, who is to do it, when it is to be done, why it should be done, how it will be done, and how much it will cost. "The ultimate objective of all these marketing plans is for the financial institution to grow. Banks are here to make money for shareholders. That's the ultimate objective," says Shott (Gerson, 1998, [subsequent citations]). McComb, Shott, and McCabe agree there are key elements that should be included in a marketing plan.

CHANGES IN MARKETS

The American market has been growing in both population and income. "Total U. S. population has grown from fewer than 100 million people in 1910 to around 205 million in 1970, and the projection for the year 2010 is that population will then exceed 300 million" (Cundiff, et al, 1973, [subsequent citations]). The American population is growing at a net rate of between 2 and 3 million persons a year.

Market growth can be related to the total number of households for some products more closely that it can be to the total population. "In 1970 the number of households approximated 60 million. An average of over 850,000 new households are being added each year" (Cundiff, et al, 1973, [subsequent citations]). The number of households is increasing at a faster rate than the total population.

Total disposable personal income is what people have left to spend or save after paying taxes. "It has increased from a little over $83 billion in 1929 to almost $688 billion in 1970. In 1980, total disposable personal income exceeded a trillion dollars" (Cundiff, et al, 1973, [subsequent citations]). Per capita disposable income has increased as well. The American market has grown increasingly affluent, and the trend is still in that direction.

An increasing amount of discretionary income is becoming a popular trend. Discretionary income is the money which is left over after buying essential food, clothing, shelter, transportation, and other items a household regards as "necessities" (Cundiff, et al, 1973, [subsequent citations]). This discretionary income may be spent, saved, used for buying "non-necessities," or for a combination of these. Time has shown that a rise in discretionary income usually results in more spending for non-necessities, which has been termed discretionary spending. "In 1946, discretionary

spending grew from about $90 billion to about $195 billion in 1967" (Cundiff, et al, 1973, [subsequent citations]). Continuing increases in discretionary purchasing power in consumers' hands have resulted in dramatic expansions in the market potentials for large-scale items such as washing machines, dishwashers, etc. Growth in market potentials for non-necessities has encouraged other firms to enter markets. This has added to the incentive all competitors have for adjusting their products more closely to what consumers demand.

CHANGES IN MARKETING CHANNELS AND PHYSICAL DISTRIBUTION

Changes in marketing channels have occurred at a more rapid rate than changes in either markets or technology. Previously a manufacturer could expect his marketing channels to remain stable over a long period of time. The appearance of new types of distributive institutions, shifts in operating methods of older institutions, and development and change in physical distribution systems have created new distribution "problems" as well as "opportunities" (Cundiff, et al, 1973, [subsequent citations]).

GROWTH OF MASS COMMUNICATIONS MEDIA

It has become possible to "spread the word" about new product developments faster, more effectively, and more widely than ever before with the appearance of new waves of mass communications such as televisions, computers, advertising, electronic mail, fax machines, the Internet, video-conferencing, etc. Advertising has played a major role in marketing. Communications effectiveness has tended to increase as well. Development and growth of different kinds of mass media has made it possible for marketers to deliver advertising messages in more ways at a faster rate (Cundiff, et al, 1973, [subsequent citations]). These environmental changes are causing marketers of consumer products to alter both their marketing philosophy and organization. They are becoming less product-oriented and more market-oriented. Operations are now geared primarily to customers' needs, wants, desires, and only secondarily to particular products (Cundiff, et al, 1973, [subsequent citations]).

A structure should be established for analyzing the external environment. It is inadequate to believe that strategic planning represents an automatic extension of what was done last year. This belief could prevent strategic change and innovation. Strategy development should look outside the business to sense changes, trends, threats, and opportunities for creating strategies that are responsive.

"The manager's work of organizing consists of visualizing the various functions which an enterprise must carry on to realize its objectives, classifying them into groups which are related or fit together, setting up administrative centers to supervise them, and establishing lines of authority, responsibility, and relationship between those centers" (Alexander, 1965, [first citation]). The lines of authority and lines of responsibility should coincide while the organizer of any organizational problems always has several factors around which to group operating, service, and staff units. The factors involved should be the basis for the structure. "The chief factors around which a marketing organization structure can be built are the functions to be performed, the geographical areas within

which they are to be carried on, the products to be marketed, and the customer groups to be served" (Alexander, 1965, [subsequent citation]).

STRATEGIC MARKET MANAGEMENT

Strategic market management is based on the assumption that strategic planning is inadequate to deal with the rapid rate of change that can occur in the environment facing the firm. This system does not necessarily accept the environment as given with the strategic role confined to adaptation and reaction. Instead strategy is seen as proactive with the possibility of affecting environmental change. The term "market" in "strategic market management" is there to emphasize that strategy development needs to be driven by the market and its environment instead of internal orientation. It also enforces the fact that the process should be proactive rather than retroactive. The task at hand should be to try and influence the environment as well as respond to it (Aaker, 1988 [first citation]).

A business strategy is a specification that includes a determination of the product market in which the business is to compete, the level of investment, the functional area strategies needed to compete in the selected product market, and the strategic assets or skills which underlie the strategy providing the sustainable competitive advantage (SCA) (Aaker, 1988 [subsequent citations]). The market where the business is to compete is the product it offers and chooses not to offer, by the markets it seeks to serve and not serve, by the competitors with whom it chooses to compete and to avoid, and by its level of vertical integration. The level of investment includes several different variations such as investing to grow, investing only to maintain the existing position, or to recover as much of the assets as possible by liquidating the business. The functional area is characterized by one or more functional area strategies such as product line strategy, positioning strategy, pricing strategy, distribution strategy, manufacturing strategy, and logistical strategy. The strategic skill is something a business does exceptionally well. A strategic asset is a resource that is strong relative to competitors. Strategy formulation must consider the cost and feasibility of generating assets of skills that will provide the basis for a sustainable competitive advantage.

COMPLETE CUSTOMER-RELATIONSHIP PROFILES

Banks are now forming master databases than contain a unified record of all their relationships with an individual customer. Prior to this effort, the standard practice was to maintain a separate database for each product (deposit accounts, IRA, auto loan, credit card, mortgage, etc). Complete customer-relationship profiles serve multiple purposes. They both increase the functionality of self-service devices and improve customer service. Internally, management uses the relationship profiles for analysis of costs and revenues, long-run planning and promotional campaigns. The anticipated benefits include:

1.	Improve functionality of self-service devices. While computerized record keeping is a vast improvement over a paper-based system, fragmented databases have limited the usefulness of ATMs and other self-service delivery channels. When information is kept on separate databases, an ATM can only dispense cash from a customer's checking account and give an account balance. Linking databases is necessary for a customer to be able to transfer funds between accounts and pay down a credit line. Partial linking of databases has been accomplished over the past 15 years, and banks are now pressing to complete the effort.
2.	Improve customer service. With a customer's total relationship immediately available on a bank's computer system, an employee can resolve problems quickly as well as make helpful recommendations.
3.	Cross-sell financial products. Complete relationship profiles create opportunities to cross-sell financial products every time customer contact is made. With the full relationship in view on a PC screen, branch or phone center personnel can suggest services complementing those already received. The need for additional services might also be anticipated and recommended at an opportune time (retirement, college attendance, change of address, or vacation). In addition, complete profiles allow banks to offer new services to existing customers with little or no additional personal information being collected, saving both parties from filling out and processing redundant forms.
4.	Profitability analysis. In the past, it was laborious, if not impossible, to determine the profitability of an individual customer's relationship. A bank knew the average cost and average profitability of each of its services, but it could not accurately identify which customers were profitable and the sources of the profits. Databases containing complete profiles can be used to determine the profitability of each customer by account. This information can be used to set the terms of accounts with the total relationship in mind. Fee structures can be adjusted to allow the bank to at least break even with every customer.
5.	Customer retention. Master databases allow profitable and unprofitable customers to be segmented. Extra efforts can then be made to retain high-profit customers, such as placing them in personal banking programs or assigning them an account representative.
6.	Marketing. Complete customer-relationship profiles can be used to develop promotions and marketing strategies. Customer segments can be identified, based on behavior, demographics or other attributes, and promotions can be customized to appeal to each segment.
7.	Measuring branch performance. Complete relationship profiles will be used to measure the performance of individual branches and employees. This allows employees who meet targets for selling profitable products to be rewarded. In addition, branches not meeting goals can be identified for management attention (Dandforth & Neill, 1996).

In sum, the construction of complete customer-relationship profiles is a prerequisite to restructuring retail operations. Everything the banks are attempting to do to revamp their branch system revolves around a substantially improved database.

HOME BANKING

In addition to the telephone and ATM, customers are being given a third electronic option: banking at home via a personal computer. The PC assesses the same master database that the ATM or phone center contacts. The customer can then check balances and credit card activity, transfer funds, and pay bills; all the functions available from the phone center. PC banking is generally thought to have more long-run potential than ATMs or phone centers because it has more powerful

bill-paying capabilities and it allows account information to be downloaded into personal finance software. "One of the biggest challenges in the development of electronic commerce has been for banks and merchants to overcome the issues of customer identification and account verification via the computer" (Denny, 1996).

Home banking has been available for several years but has only mixed success. About one million households are thought to be using PC banking services. As more households become computer literate and have their own PCs, it should become more popular. A changeover to branchless banking, however, is not dependent on PC banking turning into a huge success. Branchless banking can become widespread with greater use of ATMs and telephone banking.

NEW DESIGN: SUPERMARKET BRANCHES

In addition to developing electronic delivery channels, banks are redesigning and relocating their physical branches. The first of the new designs is commonly referred to as a "supermarket' or "in-store" branch. It is a full-service branch office operating in leased space, usually located within a giant supermarket of 50,000 or more square feet, serving 15,000 or more shoppers per week.

An in-store branch usually occupies 400 to 600 square feet, compared with a traditional branch's 5000 square feet. A typical unit would be located near the entrance or the check-out lanes and feature two teller windows, two stations at a counter to open accounts, one or two ATMs, and direct connections to the phone center. It also has a single office to hold private consultations. Some banks equip their in-store branches with high-tech devices such as a videophone or an automated loan machine. According to industry analysts, there will soon be 4000 in place out of a total of 50,000 total commercial bank branch offices. Several large banks have each announced plans to open hundreds more during the next two to three years.

Supermarket branches can be built and installed for $200,000 to $300,000, or one-fifth the cost of a conventional branch. About $60,000 to $100,000 is for construction costs and the remainder is for equipment, most of which could be removed and reinstalled elsewhere. Only construction costs represent a sunk cost. The operating expenses are estimated to be about $350,000 annually versus $700,000 or more at a traditional branch, even though the supermarket branch is open many more hours per week. As a consequence, a supermarket branch can break-even at slightly less than half the account and deposit volumes of a conventional branch.

STRATEGIC CONSIDERATIONS

Supermarket branches are seen by supermarkets and banks as mutually beneficial. The supermarket expects more of the bank's customer base to shop at a store housing a branch, by giving a boost to sales. The bigger the bank's market share, the bigger the potential boost to sales. The revenue received from renting space to the bank is somewhat incidental. From its side, the bank is tying to leverage the supermarket's flow of shoppers and it seeks out chains with a high proportion of super-sized stores; the larger the store, the larger the flow of potential bank customers.

The supermarket-bank alliances tend to be exclusive within a state or metropolitan area. The supermarket chain prefers a single large bank to put branches in all of its stores. It is much simpler

to negotiate with one bank than several, and the chain can more effectively promote the addition of a single partner's branches to its locations. The bank, in turn, is looking for a supermarket chain with a presence throughout a marketing area so that, like the supermarket chain, it can advertise the combination. As a result, it is becoming common for alliances to be formed between the largest players, both supermarkets and banks, in a geographic area.

Supermarket branching can be used as both an offensive and a defensive strategy. On the offensive side, opening in-store branches allows a bank to enter a market or expand at relatively low cost. It can also serve as a defensive strategy because only a very limited number of large supermarket chains operate in any state or metropolitan area. By forming an exclusive arrangement with one of them, a bank may hinder local competitors and potential out-of-state entrants from following the same low-cost strategy for penetrating the area on a large scale.

THE STRATEGIES UNDERLYING RESTRUCTURING

Some banks are putting in place the innovations in retail banking on a small scale, or at a slow pace, or in a piecemeal fashion. They are opening a handful of supermarket branches as a low-cost means of making incremental changes to their branch networks. Supermarket branches can be used to extend a bank's geographical reach, fill some holes in its market region, or expedite the consolidation of poorly performing traditional branches. Adding a few supermarket branches to the network is a minor change in the way a bank conducts its retail operations. Similarly, setting up an automated phone center by itself is only an incremental change. The phone center gives extra convenience and it may have been opened to match a nearby competitor's move. It is an add-on to the existing branch-based system.

LONGER-RUN STRATEGY

At this time, it is very uncertain as to which of the new technological developments in financial services will be cost effective and meet wide public acceptance. Home banking and other developments are credible threats to branch-based banking to which management must respond. If it turns out that the general public adapts slowly to home banking or the next-generation of ATMs, banks will still have taken major steps to reduce their cost structure. The phone center and a slimmer branch system will bring down operating costs. If it turns out that home banking via PC or screen phones take off, those banks that have the infrastructure (complete customer-relationship profiles and versatile phone centers) in place will be able to move quickly to a largely electronic structure.

CONCLUSION

The largest commercial banks in the U.S. are in the process of completely restructuring their retail operations over the next three to five years. The banks feel they have squeezed out as much expense as they can from the branch network in its current form. Despite earlier cost- cutting

efforts, they still have not fully addressed a stagnating retail deposit base or the credible threat of low-cost remote electronic delivery of payment services.

The restructuring of retail operations that is now occurring through electronics and alternative branch design raises a number of policy issues. Changes in the level and form of competition in banking markets will be a direct result of the overhaul of the branch office system. Other matters of concern include: the availability of banking services to low and moderate income households, the liquidity of balance sheets, and the security of electronic delivery channels.

Since different types of competition will be forming within the banking system, banks must be prepared to stand tall and press forward. They should market their "products" and "services" in a fashion that will exceed all others. A bank's aim should be to satisfy the customer. Banks should turn toward successful marketing techniques to help restructure their banking system.

REFERENCES

Aaker, D.A. (1988). *Developing Business Strategies.* John Wiley & Sons, Inc.

Alexander, R.S. & Berg, T.L. (1965*). Dynamic Management In Marketing.* First Printing.

Bird, Anat. (1999, May). Strategic Planning Returns To The Spotlight*. American Banker* 9.

Cuevas, J. (1997). *The Internet Banking Horizon: Bleak or Bright for Community Banks?* Grolier Incorporated.

Cundiff, E.W., Govoni, N.A.P., & Still, R.R. (1973). *Fundamentals of Modern Marketing.* Prentice-Hall, Inc.

Dandforth, N. & Neill, D. (1996, April). Bank Merger Impact on Small Business Services Is Changing. *Banking Policy Report.* 9.

Denny, S. (1996, February). The Electronic Commerce Challenge. *Journal of Internet Banking and Commerce.* 3.

Douglas, S. & Gehl, J. (1998). *Innovation.* Array Publishing.

Gerson, V. (1998, September). Arming Yourself With A Marketing Plan. *Bank Marketing*. 38-44.

Grabiner, L. & Hall, K. (1997, June). Counseling For Creative Marriages. *Bank Marketing*.

Holliday, K.K. (1999, January). Even After Spending Big Bucks, Banks Fail To Change. *Mississippi Business Journal.* 23.

Koonce, R. (1998). *How Well Do You Communicate?* Houghton Milton Company.

Licata, J., Reed, P.F., & Weber, J.M. (1998, December). Staying On The Right Side Of The Tracking. *Bank Machines.* 26-31.

Naylor, P. (1998, October). Marketing Strategies. *Financial NetNews.* 3.

Pezzullo, M.A. (1987). *Marketing For Bankers.* American Bankers Association.

Retail Banking Research Ltd. (1998). *The Global ATM Market to 2002.* Retail Banking Research Ltd.

Rhoades, S.A., "Bank Mergers and Industrywide Structure," *Staff Study 169* (Board of Governors of the Federal Reserve System, 1996). 24.

Sheridan, K. (1998, November). If It's Not One Thing, It's Another. *Bank Marketing.* 20-24.

Wachtel, G. (1997, September). The Idea Doctor Is In. *Bank Marketing.* 41-47.

Wright, R. (1997). *Commercial Banking in Colonial America*. University of North Carolina Press.

THE APPLICATIONS OF THE FIBONACCI SEQUENCE AND ELLIOTT WAVE THEORY IN PREDICTING THE SECURITY PRICE MOVEMENTS: A SURVEY

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ABSTRACT

This paper provides a survey of findings describing the use of Fibonacci series (a mathematical sequence that consists of two numbers in the sequence being added together to produce the third number of the series) and its underlying principles to predict future security price movements. The study further describes the details of the Elliott Wavelet theory (to describe the rhythmic regularity, which has been observed in the U.S. stock market over an eighty-year period) as an application of Fibonacci series. Applications of Fibonacci sequence and the Wavelet theory in the equity market are described to supplement the validity of the argument.

THE BACKGROUND

Leonardo Pisano Fibonacci (1170-1250) is known for describing the mathematical sequence that consists of two numbers in sequence being added together to produce a third number. The sequence is 0, 1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89, etc. The farther along the sequence, the closer the decimal equivalent of the ratio of two successive numbers in the sequence nears 1.618034. Similarly, the ratio of alternate numbers of the sequence approaches 2.618. According to Erman [3], this ratio can be seen throughout nature and is typified by the arrangement of seeds in a sunflower or the shape in a Chambered Nautilus. The sequence is also found extensively in music and in architecture.

The sequence and the ratio are also being used to predict the stock market swings or oscillations and price targets. Fischer [6], Hartle [9], and Krausz [10], however, concluded against the stand alone use of the sequence. They observed that although the Fibonacci sequence is used as a technical indicator, it is best used as a tool to supplement other technical analysis methodologies rather than a stand-alone technique. The best use of the sequence is to predict future irregular cyclic moves in a stock which are based on past moves. Fibonacci numbers can be applied to progressions of price support and resistance levels by using an initial price as the first number of a Fibonacci series and then predicting the recurrence of another price support or resistence level. The next Fibonacci number in the series is a predictor of a successor in the series.

Eng [2] and Plummer [13], [14] provided the outline for successfully using of the sequence. In order to use this technique, traders must first identify the phenomenon that they are interested in predicting market bottoms, tops, price support, and/or resistence levels. Next on a pricing chart, the

prices are tracked until the first interval has been identified. The first identifiable interval is the first term of the Fibonacci sequence. Traders then can draw a new prediction line equal to the length of the first interval to identify the next interval in the sequence. This process can be continued for as many iterations as are desired. Once Fibonacci lines are established, the professional trader will use other techniques to confirm their predictions before taking a position.

Eng [2] considered that Fibonacci cycles are especially helpful when the markets are irregular and cycles are hidden in the fluctuating activity. In this situation, it is best not to force a fit to the current market activity, but to go back in time to when the market was more predictable and use that time as the starting point. Using the technique of applying the sequence from a stable condition will aid subsequent iterations in the predicting process. The object is to find the most obvious points since they will have the best chance of providing an accurate prediction basis.

Therefore, the use of the Fibonacci sequence is based upon the idea that the market behavior must be based upon its behavior in the past. The idea runs contrary to the market efficiency argument put forward by numerous researchers. As in music, art, architecture, and nature, the Fibonacci sequence is a numerical abstraction of a pattern of events which depends upon previous events for the future development of the sequence.

The next section describes the underlying principles and the use of Fibonacci series in predicting future price movements. The following section provides details of Elliott Wavelet theory to describe the rhythmic regularity (as obtained from a Fibonacci series) of the past stock price movements. Section four details some applications of Fibonacci sequence and Wavelet theory on the equity market. The last section concludes the discussion.

THE PRINCIPLES OF FIBONACCI SEQUENCE

Garland [7] and Prechter and Frost [16] reported that the conceptual predecessor of the Fibonacci sequence is the Golden Ratio. The ratio is formally defined as,

$$(1+5^{1/2})/2 = \lim_{t\to\infty} (n_{t+1}/n_t) = 1.618033989$$

As the Fibonacci sequence is applied over a long sequence of numbers, the ratio of two successive numbers in the sequence approaches a natural limit. The natural limit produces the Golden Ratio.

The Golden Ratio is applicable to any ratio generated from a series as the numbers in the series increase. The preceding or decreasing number in the sequence can also be determined if the inverse of the ratio is calculated as follows:

$$2/(1+5^{1/2}) = \lim_{t\to\infty} (n_t/n_{t+1}) = (1/1.618033989) = 0.618033989$$

These numbers have been incorporated by several other mathematicians into variations of the Fibonacci sequence. As a variation of the Golden Ratio, the natural limit of the ratio of two alternate numbers approaches 2.618 and the inverse of that ratio approaches 0.382. The natural limit of the ratio of two alternate numbers and its inverse are calculated as follows:

$(3+5^{1/2})/2 = \lim_{t\to\infty} (n_{t+2}/n_t) = 2.618033989$

$2/(3+5^{1/2}) = \lim_{t\to\infty} (n_t/n_{t+20}) = (1/2.618033989) = 0.381966011$

Similar variations of the Golden Ratio can be obtained by calculating the ratios of every third, fourth, or fifth numbers of the Fibonacci sequence. An example of the approximation of the Golden ratio (the ratio of two successive numbers) and its inverse through Fibonacci sequence is provided in Table 1.

TABLE 1
Approximation of Golden Ratio and Its Inverse from Fibonacci Sequence

Sequence Number	Ratio of Numbers (n_{t+1}/n_t)	Inverse Ratio of Numbers (n_t/n_{t+1})
0		
1		
1	1.000000	1.000000
2	2.000000	0.500000
3	1.500000	0.666667
5	1.666667	0.600000
8	1.600000	0.625000
13	1.625000	0.615385
21	1.615385	0.619048
34	1.619048	0.617647
55	1.617647	0.618182
89	1.618182	0.617978
144	1.617978	0.618056
233	1.618056	0.618026
377	1.618026	0.618037
610	1.618037	0.618033

Tribonacci Summation Series

To compliment the analysis of Fibonacci sequence, Prechter and Frost [16] described the principles of Tribonacci series. As a variation of the Fibonacci sequence, the series uses the sequence 0, 1, 1, 2, 4, 7, 13, 24, 44, 81, etc. and adds the previous three numbers to arrive at the next number in the summation series. As the sequence grows, the ratio of two successive numbers in the series approaches 0.50. Analysis of the markets has shown that the retracements of rallies also approach this ratio in sequencing numbers.

Balan [1], Gately [8], and Murphy [12] reported various financial markets applications of the Fibonacci sequence. The Fibonacci sequence can be used to predict the occurrences in the financial markets but should not be treated as a stand-alone predictor. The markets can send a multitude of signals and there is no one indicator that is infallible in detecting the support and reversal points. A learning curve by the trader can be established as one traces the trends by applying the ratios to either a major market top or bottom (the first day) and then projecting into the future in the second day (2), the third day (3), the fifth day (5), the eighth day (8), the thirteenth day (13), and so forth in the sequence. One can expect from this exercise, with a degree of certainty, to see a reversal in the price action on one of these Fibonacci predicted significant days. On the downward movements of the markets, the application of the Fibonacci numbers can be used to trace retracement moves. Thus, retracements (the bear moves) will demonstrate the ratio of 0.618 of the previous bull move and the bull move will demonstrate the ratio of 1.618 of the previous bear move.

Eng [2] pointed out that Fibonacci cycles work well in markets which seem to have loosely defined but with seemingly unpredictable cyclicity. Fibonacci cycles give useless signals in markets with over-pronounced and very regular cyclicity. They also do not work well in very short-cycle markets, as they need time to build up a train of intervals. Fibonacci cycles are an especially good idea to use with pattern recognition methods, since they attempt to make the kind of predictions which Fibonacci cycles can confirm. In that context, the Fibonacci cycles are an appropriate tool for the Elliott Wave Theory, where they can be used for local tops and bottoms of the various waves of a cycle or the Dow/Edwards-McGee Theory (details are provided in [4] and [5]) where they can give important confirmation of patterns which predict reversals or breakouts, or of doubtful consolidation patterns.

Krausz [10] pointed out that Fibonacci cycles also have much in common with the Gann Anniversary dates (the procedure is described in detail in [4] and [5]) and can be used profitably as confirmation tools as well. Fibonacci cycles do not work quite as well with methods which rely less on global pattern recognition of price moves, such as point-and-figure, volume-based techniques, or methods which work more with the local breakout rather than tops and bottoms, such as moving averages or oscillators.

THE PRINCIPLES OF ELLIOTT WAVELET THEORY

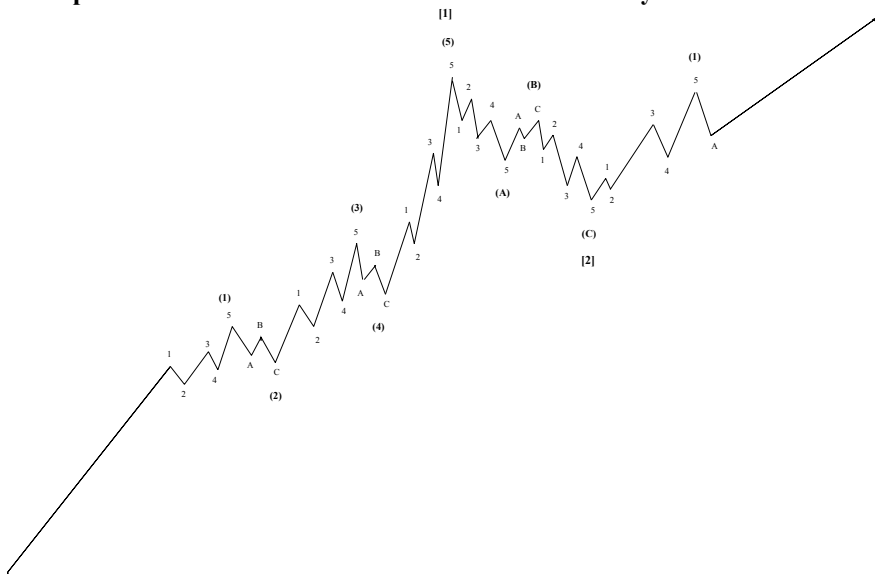
The Elliott Wave Principle was first established by R. N. Elliott in a series of articles in The Financial World in 1939. The basis of the Elliott Wave Theory has been developed from the observation that rhythmic regularity has been observed in the stock market over an eighty year period. It has been further observed that the market moved forward in a series of five (5) waves and declined in a series of three (3) waves (a Fibonacci sequence).

The longest cycle in the Elliott Wave Theory is called the Grand Super-cycle. In turn, each Grand Super-cycle can be subdivided into eight Super-cycles (five Impulse and three Corrective waves), each is then divided into eight cycles or waves. This process continues to embrace Primary, Intermediate, Hourly, Minute, and sub-Minute waves.

Wong [17] and Prechter and Frost [15], [16] described the basic principles of Elliott Wave Theory. They observed that the theory interprets market actions in terms of recurrent price

structures. Basically, market cycles are composed of two major types of Waves: Impulse Wave (denoted by numbers) and Corrective Wave (denoted by letters). For every impulse wave, the structure can be sub-divided into five waves (1-2-3-4-5), while for corrective wave, the structure is sub-divided into three waves (A-B-C). An impulse wave moves in the same direction as the trend of the next larger size, while a corrective wave moves against the trend of the next larger size. In the next stage, the basic patterns of five- and three-wave structures link to form an increasingly larger size (next level) of five- and three-wave structures. An important feature of Elliott Wave is that they are fractal in nature. This implies that the market structure is built from similar patterns on a larger or smaller scale. Therefore, the waves can be counted on a long-term yearly market chart as well as short-term hourly market chart. Figure 1 describes the impulse and corrective wave patterns of various size classes.

Figure 1
Impulsive and Corrective Wave Forms of the Security Price Movements



{[1], [2]} represent first two of Grand Supercycle Impulse Waves. Each Grand Supercycle is broken down into Supercycle Waves with five Supercycle Impulse Waves {(1), (2), (3), (4), (5)} and three Supercycle Corrective Waves {(A), (B), (C)}. Each Supercycle Wave is further broken down into five Cycle Impulse Wave {1, 2, 3, 4, 5} and three Cycle Corrective Waves {A, B, C}. The process of sub-division can be continued to provide Primary, Intermediate, Hourly, Minute, and Sub-Minute waves.

Rules for Wave Count

Based on the market pattern (an excellent of the wave count is provided in [19]), one can identify the 'point of beginning' in terms of wave count. As the market pattern is interpreted as relatively simplistic, there are several rules for valid counts: (1) Wave 2 should not break below the

beginning of Wave 1, (2) Wave 3 should not be the shortest wave among Waves 1, 3, and 5., (3) Wave 4 should not overlap with Wave 1, except for Waves 1, 5, A, or C of a higher degree, (4) Rule of Alteration: Waves 2 and 4 should unfold in two different waveforms.

Wave Forms in Impulse Wave

The basic five-wave structure (1-2-3-4-5) is based on the main trend of the market. If the main trend of the market is up, then wave 3 is higher than wave 1. Similarly, wave 5 is higher than wave 3 and wave 4 does not correct below the top of wave 1. On the other hand, if the main trend of the market is down, wave 3 is lower than wave 1, wave five is lower than wave 3, and wave 4 does not correct above the bottom of wave 1. There are three major types of wave form in Impulse Wave: (a) Extended Wave: Among waves 1, 3, and 5, only one would be unfolded into extended wave (i.e., the wave further subdivides into five waves). 'Extension' implies that the wave is elongated in nature and sub-waves are conspicuous in relation to waves of higher degree, (b) Diagonal Triangle at Wave Five (5): Sometimes the momentum at Wave 5 is so weak that the 2nd and the 4th sub-waves overlap with each other and evolved into diagonal triangle. The wave is usually a terminal wave (sometimes called a wedge), emanating from the 5th wave and can be subdivided into three corrective sub-waves (a-b-c). Upon completion, there is usually a strong move in the counter direction, (c) Fifth (5th) Wave Failure: In some other circumstances, the Wave 5 is so weak that it cannot even surpass the top of Wave 3, causing a double top at the end of the trend. It further indicates a strong and/or prolonged move in the counter direction.

Wave Forms in Corrective Wave

Corrective wave represents a wave form that moves counter to the direction of the main trend of the market. It subdivides into three smaller waves (A-B-C). Waves A and C move against the market's main trend. On the other hand, wave B moves in the direction of the main trend of the market, but subdivides into three sub-waves (a-b-c). Corrective wave forms are rather complicated, but basically can be categorized into six major wave forms.

Zigzag, a corrective A-B-C wave pattern composed of 5-3-5 sub-wave structure. In this corrective wave pattern, the B wave retraces only a part of wave A and wave C moves below the terminal point of wave A. Waves A and C can be subdivided into five impulse sub-waves, while wave B can be subdivided into three corrective sub-waves (often called a double zigzag).

Flat, a corrective A-B-C wave pattern composed of 3-3-5 sub-wave structure, with 'B' equals 'A' (B = A). In this wave pattern, wave B retraces all of wave A, while wave A subdivides into three corrective sub-waves. Wave C may not terminate beyond the terminal point of wave A.

Irregular, a corrective A-B-C wave pattern composed of 3-3-5 sub-wave structure, with 'B' longer than 'A' (B > A). In this wave pattern, wave B retraces more than the whole of wave A, while wave A subdivides into three corrective sub-waves. Wave C terminates beyond the terminal point of wave A.

Horizontal Triangle, a corrective five-wave triangular pattern composed of 3-3-3-3-3 sub-wave structure (often expressed by A-B-C-D-E pattern). The pattern often develops after a

strong move in the market. In this wave pattern, five successive corrective patterns are further subdivided into three corrective sub-waves.

Double Three, this corrective (A-B-C)⊗(A-B-C) wave pattern is composed of any two forms from above and are linked by a ⊗ corrective wave. The form is a prolonged (larger) corrective wave formed by combining two separate corrective waves. The ⊗ corrective wave usually moves in the direction of the main trend and can be subdivided into three corrective sub-waves.

Triple Three, this corrective (A-B-C)⊗(A-B-C)⊗(A-B-C) wave pattern is composed of any three forms from above, linked by two ⊗ corrective waves. The pattern is the largest possible corrective wave that can be formed by combining three separate corrective waves.

The attractiveness of Elliott Wave Analysis lies in its conclusiveness. Three impulse wave forms and six corrective wave forms are conclusive in nature. Once investors can identify which wave form is going to unfold in the future market movements, the prediction of the future market action can be done accurately. However, the knowledge of the market historical wave patterns and experiences in wave count are of paramount importance for accurate prediction.

One of Elliott's most significant discoveries is that because markets unfold in sequences of five and three waves, the number of waves that exist in the stock market's patterns reflects the Fibonacci sequence of numbers (0, 1, 1, 2, 3, 5, 8, 13, 21, 34, etc.). It is an additive sequence that nature employs in many processes of growth and decay, expansion and contraction, progress and regress. Because this sequence is governed by a ratio, it appears throughout the price and time structure of the stock market, apparently governing its progress.

The real problem with the Elliott Theory lies with its interpretation and correctly labeling and counting the waves. Indeed, every wave theorist has at some time or another become entangled with the question of where one wave ends and another starts. As far as Fibonacci time spans are concerned, it is extremely difficult to use the principle as the sole basis for forecasting although these periods recur frequently. There are no indications whether time spans based on these numbers produce tops-to-tops, bottoms-to-tops, or something else. The permutations seem to be almost infinite.

The Elliott Wave is clearly a very subjective tool. Its subjectivity in itself can be dangerous to follow because the market is very subjective to emotional influences. For that reason, the weight given to Elliott interpretations are usually limited by the investor's experience in analyzing Elliott Wave charts of the market. On a positive note, however, an understanding of Elliott waves brings a sense of historical perspective of the securities markets even without using the analysis as a trading technique. The principle reemphasizes the common knowledge that markets never go in one direction forever.

APPLICATIONS OF THE FIBONACCI SEQUENCE AND ELLIOTT WAVE THEORY: TIMING PREDICTIONS OF THE EQUITY PRICE MOVEMENTS

Analysis of Historical Movement of the U.S. Stock Market

As an application of the Elliott Wave Principle, table 2 shows the historical movement of the U.S. stock market between 1916 and 1976 and indicate that the stock market historical peaks and

market bottoms clearly follow Fibonacci sequence. The market experience shows how Fibonacci cycles and Elliott waves can be effectively used to recognize the historical pattern of the stock movements over a long period of time.

TABLE 2
Time Spans Between Stock Market Peaks and Troughs (1916-1976)

Starting Year	Position	Ending Year	Position	Length of Cycle (Years)
1916	T	1921	B	5
1919	T	1924	B	5
1924	B	1929	T	5
1932	B	1937	T	5
1956	T	1961	T	5
1961	T	1966	T	5
1916	T	1924	B	8
1921	B	1929	B	8
1924	B	1932	B	8
1929	T	1937	T	8
1938	B	1944	T	8
1949	B	1957	B	8
1960	B	1968	T	8
1962	B	1970	B	8
1916	T	1929	T	13
1919	T	1932	B	13
1924	B	1937	T	13
1929	T	1942	B	13
1949	B	1962	B	13
1953	B	1966	B	13
1957	B	1970	B	13
1916	T	1937	T	21
1921	B	1942	B	21
1932	B	1953	B	21
1949	B	1970	B	21
1953	B	1974	B	21
1919	T	1953	B	34
1932	B	1966	T	34
1942	B	1976	T	34

TABLE 2 Time Spans Between Stock Market Peaks and Troughs (1916-1976)				
Starting Year	Position	Ending Year	Position	Length of Cycle (Years)
1919	T	1974	B	55
1921	B	1976	T	55
Indicators: Market Tops (T), Market Bottoms (B).				

The table shows that the Grand Supercycle waves of historical stock market peaks and troughs follow the eleventh number in the Fibonacci Sequence (55 years). The wave is subdivided into Supercycle waves of 34 years (the tenth number in the Fibonacci sequence). The process continues by subdividing stock market movements into twenty-one years, thirteen years, eight years, and five years respectively. Once the pattern is recognized, similar analysis can be performed to understand monthly, weekly, or daily movements of the stock market.

Analysis of the Value Line Futures

Eng [2] provided an excellent example of setting up and maintaining Fibonacci sequence for trading stocks. The analysis is complimented by strict applications of the Fibonacci ratios to the analysis of the Value Line Futures from October 2 to December 16, 1985. Table 3 provides the results and the predictive accuracy of the strict applications of the Fibonacci Ratios.
The quick application is based on the following formula:

Projection = (X x R) +S

Where, X is the absolute value of the distance covered in one swing, R is the Fibonacci Ratio (0.618,1.618, 2.618 etc.), and S is the starting point of any major swing. The above formula only shows a representative expression and the formula's variables are randomly selected within the framework of the viable parameters. Therefore, the projected expression is dependent upon the nature of the specific market swing.

TABLE 3 Analysis of the Value Line Futures (October 2, 1985 - December 16, 1985)	
Projection: Projection = (X x R) + S	
Projection (Formula Value)	Actual Value (Date)
(a x 1.382) +188.65 = 195.97	196.00 (10-17-1985)
(a x 6.182) + 196.00 = 192.75	192.70 (10-28-1985)
(½c½x 4.5000) + 192.70 = 207.55	207.55 (11-12-1985)
-(d x 0.382^2) + 207.55 = 205.38	205.30 (12-03-1985)
-(d x $.618^{1/2}$) + 188.65 = 207.54	207.55 (11-12-1985)

Actual Swing Tops and Bottoms with Absolute Distance Covered			
Date	High	Low	Distance Covered
10/2/85	193.95		Starting Distance
10/8/85		188.65	- 5.30 (a)
10/17/85	196.00		+ 7.35 (b)
10/28/85		192.70	- 3.30 (c)
11/12/85	207.55		+ 14.85 (d)
12/3/85		205.30	- 2.25 (e)
12/16/85	216.65		+ 11.35 (f)
Note: X is the absolute value of the distance covered in one swing. R is the Fibonacci Ratio (0.618, 1.618, 2.618 etc.). S is the starting point of any major swing.			

Eng [2] described the prerequisites for the traders to utilize the sequence in predicting the equity price movements. To begin using Fibonacci Sequences, every trader needs to have two things already set up, namely: 1) a price chart that has been running for some time, and 2) one or more main trading techniques already in use. Both of these ingredients are necessary, since Fibonacci techniques are used exclusively for the confirmation of signals which a trading system generates. The complete trading is performed in the following five steps: first, is choosing the Market Event to Predict; Traders choose the market (equity, foreign exchange, futures etc.) they want to predict. This can be any necessary occurring part of a market cycle, usually top side or bottom side reversals or breakouts. Second is the Two Occurrences of the Event; If the chart has already been started, traders probably already have two occurrences of the phenomenon they are seeking to predict (reversal or breakout). Otherwise, they should wait until they have two confirmed instances of that phenomenon. It is best to wait for four or five days, or whatever interval is necessary so that no amount deviation can make the perception of this occurrence wrong. Third, is Taking the Interval as Base Interval; Once traders can locate the two events with certainty, vertical lines should be drawn through the exact time instant on the chart where the events occurred. Then the interval between these two lines should be measured. The distance (length) of the interval represents the base interval (e.g., if the interval between two market bottoms is 21 days, then 21 days is the base interval length). Fourth, is the Calculating and Plotting the Fibonacci Intervals from the Base Interval; The original interval is for twenty-one (21) days and it would be multiplied by one (a Fibonacci ratio) by the traders to get the next interval length. It would make the room for drawing the second line (marking the end of the first interval length just calculated). Using a table of successive Fibonacci ratios (provided in Table 1), the next Fibonacci ratio is calculated as the multiplication of twenty days and the next Fibonacci number (21 H 1). The third line could then be drawn (marking the end of the second interval length just calculated), 21 days beyond the second one. The fourth line is going to represent 42 days beyond the third line (21 H 2, since 2 is the next Fibonacci ratio number) in the series. The fifth line will represent 63 days (42 H 1.5000) beyond

the fourth line and so on. Fifth, is Using the Fibonacci Intervals to Confirm A Main Method; Once a series of interval lines are plotted into the reasonable future, the completed chart is said to be ready for prediction. The idea is to wait until the main method has signaled or predicted the phenomenon as foreseen by the lines. A confirmation of coincidence or near-coincidence of the pattern would signal a strong validation of the predictive power of Fibonacci series.

CONCLUSION

The study describes the details of the Fibonacci sequence and the Elliott Wave and their underlying principles. The basic system outlined in this paper is utilized to show the historical pattern of the stock market and how the market tops and market bottoms can be explained through Elliott waves. Using Elliott waves as a tool to predict securities price movements, the trading example indicates how a carefully constructed system can generates profits, even under quite volatile conditions. Most of the losses are generated during the contraction-trend movements, but are kept quite low. The profits generated during the trend are themselves quite large, and more offsetting than any losses.

The example confirms that the profits are likely to be greater, the longer the time-period is used for trading. For the individual investors, greater insights into the markets can be gained just by trying to develop a personalized trading system. It is clear from the example that the profitability is likely to be greater by a genuine understanding of how markets behave, and by the use of the Golden Ratio to determine the price objectives. The analysis, in turn, encourages patience while the natural forces evolve and bring confidence to the investors that the expectations are going to be fulfilled. These are the primary advantages of goal setting in securities trading. In conclusion, the paper provides a survey of findings in describing the use of mathematical series (Fibonacci sequence and Elliott Wave Principles) and their underlying principles to predict future security price movements. In the period of astronomical stock market rises (as it has been experienced in 1999) and market falls (testimonial to the experience of 2000), a discussion of the use of mathematical series in stock price prediction seems timely and appropriate.

REFERENCES

Balan, R. (1989). Elliott Wave As Applied to Foreign Exchange markets. Geneva, Switzerland: *The Wave Analyst Inc*.

Eng, William F. (1997). Technical Analysis of Stocks, Options & Futures. *Homewood, IL: Irwin Professional Publishing Inc*.

Erman, W. (1999). Log Spirals on the Markets and In Nature. *Technical Analysis of Common Stocks & Commodities*, February: 16-34.

Fibonacci Trader Review. http://www.fibonaccitrader.com/review/fibonaccireview.htm

Fibonacci: New Age Trading Techniques. http://www.natt.org/new.htm

Fischer, R. (1993). Fibonacci Applications & Strategies for Traders: Unveiling the Secret of the Logarithmic Spiral. *New York, NY: J. Wiley & Sons, Inc.*

Garland, T.H. (1987). Fascinating Fibonaccis: Mystery and Magic in Numbers. *Irving, CA: Dale Seymour Inc.*

Gately, E. (1998). Forecasting Profits Using Price & Time. *New York, NY: J. Wiley & Sons, Inc.*

Hartle, T. (1997). Fibonacci Trader Product Review. *Stock & Commodities Magazine*, November: 1-15.

Krausz, R. (1998). New Gann Swing Charist Dynamic Fibonacci Channels. *Fibonacci Trader Journal*, Vol. 1, No. 1: 1-8.

Miner, R.C. (1998). Dynamic Trading: Dynamic Concepts in Time, Price, and Pattern Analysis with Practical Strategies for Traders and Investors. *Greenville, SC: The Traders Press Inc.*

Murphy, J. (1996). The Visual Investor, How to Spot Market Trends. *New York, NY: J. Wiley & Sons, Inc.*

Plummer, T. (1989). Forecasting Financial Markets: The Psychological Dynamics of Successful Investing. 3rd Edition. *Boston, MA: Kogan Page Inc.*

Plummer, T.(1997). The Psychology of Technical Analysis. *Boston, MA: McGraw Hill, Inc.*

Prechter, R. R. & A. J. Frost (1978). Elliott Wave Principle, Expanded Edition. *New Haven, CT: New Classics Library.*

Prechter, R. R., & A. J. Frost (1998). Elliott Wave Principle 101. http://www.elliottwave.com

Wong, P. C., 1999. Elliott Wave Theory. http://netvigator.com

Woodson, D. Woodson Wave Report http://www.galaxymall.com/finance/stockmarket/fibonacci.html

Working Demo of the Elliott Wave Principle. http://www.prognosis.nl/downwork.html

APPLICATION OF GORDON'S CONSTANT-GROWTH DIVIDEND VALUATION MODEL TO ESTIMATING RETIREMENT FUNDING REQUIREMENTS

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ABSTRACT

Since the advent of 401(k) and similar defined contribution retirement plans the number of defined benefit plans has declined. As a consequence, workers are increasingly responsible for both estimating and investing to meet their retirement income objectives. Specifically, they need to estimate how much retirement income they will require in addition to expected Social Security benefits to ensure their long-term financial well-being. This paper examines the use of Gordon's Constant-Growth Dividend Valuation Model to estimate the accumulation needed at retirement to provide a desired level of income.

Estimating the accumulation needed at retirement generally requires present value calculations incorporating actuarial as well as expected investment return and inflation estimates. Estimates of life expectancies are changing and may change much more rapidly as the results of stem cell and other cutting edge research are integrated into medical treatments. Furthermore, the Bureau of Labor Statistics' little-known CPI-E index indicates inflation for the elderly is rising faster than for the rest of the population.

Gordon's Constant-Growth Dividend Valuation Model is a simple yet powerful tool that can be used to estimate the accumulation needed to fund retirement, taking into account inflation and extended life expectancies.

INTRODUCTION

To estimate the accumulation needed at retirement to fund retirement income, typical deterministic planning models utilize discounted cash flow calculations incorporating actuarially projected life expectancies, estimates of future portfolio growth rates, and inflation projections. Such calculations are complex and often costly. To obtain such estimates some people seek advice from financial planners. Others may purchase financial software or use Internet computer models. These options entail costs, including commissions to planners, the purchase price of software, as well as an investment in time needed to understand the financial models. Also, there is a risk of making input errors that can lead to inaccurate results.

As a consequence, some people simply postpone or avoid determining how much they will need to accumulate to fund their retirements. This may have an even higher cost, namely, not having sufficient funds to retire at the desired time and therefore needing to prolong employment.

Another critical issue in retirement planning is inflation. As discussed in the literature review, the U.S. Bureau of Labor Statistics developed an experimental consumer price index (CPI) for consumers over 62 years of age, designated CPI-E (E for experimental). This index indicates that while prices as measured by the CPI rose 82 percent from December 1982 through the end of 2000, the prices as measured by the CPI-E rose 89.6 percent.

The higher cost of living for the elderly primarily is a result of the rapid increases in health-care costs. The cost of medical care has increased much more rapidly than other costs, and the elderly spend relatively more on medical care than do their younger counterparts. Furthermore, there is the potential for development of new high-priced blockbuster drugs and life-prolonging/saving medical treatments that will be utilized primarily by the elderly. Given this scenario, the elderly cannot be conservative when it comes to estimating the future impact of inflation.

Longevity also must be addressed in retirement planning. Life expectancies have increased and, consistent with the rapid advances in pharmacology and medical procedures, there is the potential that they will do so even more rapidly. This means that some (especially educated professionals who don't smoke and are exercising regularly) may live a very long time after retiring. It is useful to note that the number of elderly is increasing rapidly, even from year-to-year. Consequently, to avoid the risk of running short of funds during retirement, it is important to plan with the expectation of living for a very long time.

A simple and useful tool for estimating how much one must accumulate at retirement to support a desired income stream is Gordon's Constant-Growth Dividend Valuation Model. This paper demonstrates how the model can be easily applied to determine the retirement accumulation that is necessary to provide for a desired level of retirement income. In addition, the model allows for the incorporation of cost-of-living increases designed to compensate for the effects of inflation during retirement. Furthermore, since the model is based on providing a perpetual income stream, the results are conservative in nature (since no one lives into perpetuity) while, at the same time, providing for the contingency that rapid changes in medical care could result in unexpectedly long periods of retirement. Finally, since the model is perpetual in nature, within the limits of the IRS regulations covering the distribution of tax-deferred annuities, it can help to maintain estate values thereby providing for future generations.

LITERATURE REVIEW

Gordon's Constant-Growth Dividend Valuation model is based on the work of Myron J. Gordon (1960) in the early 1960s on the "Optimum Dividend Rate." His research also involves mathematical modeling of corporate investing, financing, and valuation (1962) as well as the theory of investment (1964).

Significant academic and public policy discussion on retirement planning has given rise to a number of studies that seek to develop improved modeling for retirement income. In an interim report on retirement planning modeling, the National Academy of Sciences [NAS] (1995) note that many of these studies fall into the "analytical" category; that is, they seek to "estimate the probabilities of specific behavior responses (e.g., increased savings, decreased work effort, increased

employer contributions to benefit plans) as a function of the characteristics of the individual or the employer, policy parameters, and other factors (e.g., interest rates)." Conversely, the NAS explains, policy models seek to inform decision makers or individuals. Such models would assess the usefulness of an analytical model for social planning, including, for example, factors such as perception of risk as it affects decision-making.

In developing improved modeling of retirement income policies, the NAS suggest several criteria to meld the analytical and policy domains, as would be applicable in the instance of Gordon's analytical model discussed in this paper. Specifically, a model that could effectively inform policy making would be "open and transparent" (easily used by analysts and provided with good supporting documentation), "easy to use" (non-programmers or mathematicians could use the model), and "portable" (readily transferable within computing and software environments)."

Bone and Mitchell (1997) point to the evident need for cost-effective, simplified modeling for retirement income by noting such factors as increased life expectancy, changes in family structure, and inadequate private and public asset accumulation. Moreover, policy discussion over Social Security funding and rising medical costs highlight the uncertainty and complexity of governmental policy and portend the rise of new laws and regulations proposed for overhaul of the nation's retirement system.

Such new policy discussion is evidenced by the experimental CPI (CPI-E). As reported by the Bureau of Labor Statistics (1996), the CPI-E calculates an experimental price index for Americans 62 years of age or older. As described in a U.S. House of Representatives press release (1999), the Consumer Price Index for Elderly Consumers Act, introduced in 1999 (and still in committee), would "help millions of American senior citizens get a fairer and more accurate annual cost-of-living adjustment, or COLA, from Social Security." Currently, adjustments to Social Security benefits are based on the CPI-W ("Wages") index.

On the legal side, early in 2001, the IRS completely changed its distribution rules for IRA owners, beneficiaries, and participants in 401(k)s and 403(b)s, among others. Reflecting a revised uniform life expectancy table, the new IRS rules allow participants tax savings from lower minimum required distributions and a greater accumulation of retirement assets that can be passed to beneficiaries.

The constellation of changes in social policy and the law affecting retirement has prompted the financial planning community to review its planning models. The search for a simple model that, for example, could account for uncertainties in the future - that is, one that does not suffer the limitations of deterministic modeling - remains the quintessential goal of planners. Kautt and Hopewell (2000) suggest that state-of-the-art computer simulation models using stochastic modeling techniques offer "above average" modeling accuracy. They note, however, that the individual planning for retirement may still be drawn to the simplified deterministic programs based on their relatively low cost and ease of operation.

Zarowin (1996) remarks that no single software package or planning technique should be relied upon in financial planning. "Tweaking" of input parameters to meet individual client expectations is critical in any planning model or process. Lee (2000) comments that "the biggest concern of financial planners is making sure the money lasts."

APPLYING GORDON'S CONSTANT-GROWTH DIVIDEND VALUATION MODEL

Gordon's Constant-Growth Dividend Valuation Model was developed as a tool to value the price of common stock. The model assumes that 1) the amount of a company's dividend for the next year, D_1, can be accurately estimated, 2) the dividend is payable at the end of the year, 3) the dividend will grow in perpetuity at a constant rate, g, and 4) g is less than the required rate of return on the common stock, k. Using the model, the price of the stock (i.e., the present value of the increasing annuity), P_o, is calculated as shown in the following equation: $P_o = D_1/(k - g)$.

If, for example, the year-end dividend for a particular company for the next year is expected to be $5.00, the required rate of return is 10 percent, and the expected dividend growth rate is five percent, then the expected value of the stock using Gordon's model would be $P_o = \$5.00/(.10 - .05) = \$100.00$.

The same model can be applied to estimate the amount needed at retirement to fund a perpetual income stream growing at a rate to compensate for the decrease in purchasing power resulting from inflation. Applying the model to this type of problem, P_o is the amount needed to fund the retirement income stream. D_1 is the retirement income to be received at the end of the first year, g is the expected rate of inflation, and k is the expected return on the amount accumulated to fund the retirement.

Applying the model is simple. Consider the following example. Suppose a person planning for retirement wanted to receive an annual retirement income of $30,000 per year (at year's end) and expected to obtain an annual return of nine percent on her/his retirement accumulation (i.e., 401(k), 403(b), individual retirement account accumulations, etc.). Furthermore, suppose she/he expected the annual rate of inflation to be three percent a year. At the start of retirement, the person would need $\$30,000/(.09 - .03) = \$500,000$.

Consider a second example. If inflation were expected to be zero, then $\$30,000/.09 = \$333,333$ would be required to fund a perpetual pension of $30,000 per year. By contrast, the present value of a 25-year annuity paying nine percent is $294,690. At the end of the 25 years, there would be nothing remaining of the $294,690. In this example, this means that accumulating an extra $38,643 ($333,333 - $294,690 = $38,643) at retirement would provide perpetual income of $30,000 per year. Furthermore, when the retiree died, the $333,333 would still remain for her/his heirs. Similar examples apply when inflation is considered.

The purpose of the model is to estimate how much one would need at retirement to support retirement income. In addition, the model could be used to estimate the amount of retirement income to withdraw each year during retirement as well as the growth of the retirement fund. Consider a third example based on the information provided in the first example. The $30,000 calculated above represents the first year's income. Based on an ongoing nine percent return and three percent inflation, for the second year, the retiree could withdraw $\$30,000(1.03) = \$30,900$, etc. With a three-percent rate of inflation, the retiree's purchasing power from this income source would remain constant. Similarly, the $500,000 would increase by three percent to $515,000 at the start of the second year, etc., thereby maintaining the original $500,000 purchasing power. Of course, the actual amount of the annual withdrawals would have to conform to Internal Revenue Service

guidelines. Finally, the retirement income figures calculated above do not include Social Security, defined benefit pension plan, or other forms of income.

ISSUES OF LONGEVITY AND INFLATION

Everyone will die at some time; no one will live into perpetuity. As shown in Table 1, however, many people are going to live a very long time. Referring to Table 1, the U.S. Census Bureau projects that by 2020 there will be some 3,153,000 people living in the United States who are over the age of 90 (235,000 who are 100 or older). The implications of these estimates are obvious: many retirees will need retirement income for extended periods of time. Furthermore, with significant advances in pharmacology and medical treatments, the Census Bureau estimates could prove to be low. It could be that many of those "middle age" workers planning to retire at 65 in 2020, for example, could live to be well over 100.

TABLE 1
Population Estimates and Projections of the United States by Age
Numbers in Thousands

AGE	2020	2010	2005	2000	1999
Under 9 Years	43354	39537	38334	38626	38889
10 to 19 Years	42370	41576	41624	39911	39296
20 to 29 Years	42404	41000	38510	36318	36235
30 to 39 Years	42348	38041	38664	41608	42272
40 to 49 Years	38807	42631	44864	42828	41624
50 to 59 Years	41216	41111	36503	31078	29321
60 to 69 Years	38294	28411	22934	20171	19961
70 to 79 Years	23348	16170	15804	16183	16100
80 to 89 Years	9635	9076	8542	7702	7442
90 to 99 Years	2918	2181	1844	1565	1491
100 Years and Over	235	129	96	68	59
Total	324929	299863	287719	276058	272690

It is interesting to note that on January 11, 2001 the Internal Revenue Service issued new regulations pertaining to the distribution of 401(k), 403(b), individual retirement account, etc., plan funds. These new regulations specify minimum distribution requirements for recipients through age 115 and beyond. The growth in life expectancies and potential for their rapid increase bespeak to using a perpetual planning model as a conservative way to prepare for retirement.

CONCLUSION

The primary advantage of using Gordon's model to estimate retirement funding needs is its simplicity. The calculations are straightforward, thereby permitting its use even by those with minimal quantitative skills. This is very important since many people have no idea how much they will need to fund their retirements. Second, since the calculations are based on a perpetuity, they are by their very nature conservative. As noted above, with life expectancies increasing it is useful to employ planning tools that are conservative. Gordon's model is designed to incorporate the potential impact of inflation. This factor adds to its usefulness.

REFERENCES

Bone, Christopher M. & Olivia S. Mitchell (1997). Building Better Retirement Income Models. *North American Actuarial Journal 1(*1*),* 1-12.

Bureau of Labor Statistics (1996). Consumer Price Indexes: Attachment F: Experimental CPI for Americans 62 Years of Age and Older. Retrieved from http://stats.bls.gov/news.release.cpi.br12396.a06.htm.

Gordon, Myron J. (1962). *The Investment, Financing and Valuation of the Corporation.* Homewood, Illinois: Richard D. Irwin, Inc.

Gordon, Myron J. (1960). *The Optimum Dividend Rate. Management Sciences: Models and Techniques.* London: Pergammon Press.

Gordon, Myron J. (1964). Security and Investment: Theory and Evidence. *The Journal of Finance, 19(*December*),* 607-618.

Internal Revenue Service (n.d.). Retrieved from http://www.irs.gov.

Kautt, Glenn & Lynn Hopewell (2000). Modeling the Future. *Journal of Financial Planning, (Oct.),* 1-9.

Lee, Shelley A. (2000). The Four Percent Solution? *Journal of Financial Planning, (April),* 1-6.

National Academy of Sciences (1995). Toward Improved Modeling of Retirement Income Policies Interim Report (1995). Retrieved from http://books.nap.edu/books/NX006151/html/index.html, 17-40.

U.S. House of Representatives (1999). Sanders, Ney Announce Legislation to Adopt Seniors' Consumer Price Index. Retrieved from http://www.house.gov/bernie/press/1999/04-20-99.html.

Zarowin, Stanley (1996). The Elusive Holy Grail. *Journal of Accountancy, (Oct.),* 1-4.

COMPETITION AND MARKET FRICTION: EVIDENCE FROM AUSTRALIAN MORTGAGE MARKETS

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ABSTRACT

This paper examines the nature and extent of price inertia in the Australian variable rate mortgage market, through an examination of the size, frequency and duration of variable mortgage rate changes, and the analysis of elasticities. This represents the first study of price stickiness of variable mortgage rates, and the first of its type using Australian data. Unlike the US style adjustable rate mortgages, Australian banks issuing variable rate mortgages have full discretion over changes in rates at any time and by any amount. If markets are frictionless, then we observe continuous pricing. However, the analysis in this paper finds that this is not the case for Australian bank variable rate mortgages, and that there is evidence of price stickiness. Further, the results show that there appear to be differences in market friction in bank variable rate mortgages relative to that of bank competitors.

INTRODUCTION

This paper examines the nature and extent of the price inertia in the Australian variable rate mortgage market. The discretionary nature of changes in Australian variable mortgage rates makes the Australian variable rate mortgage a particularly interesting product. Unlike the United States style adjustable rate mortgage, banks have full discretion over changes in the rates charged on Australian variable rate mortgages at any time and by any amount. If markets are frictionless, then we observe continuous pricing and repricing. Bank discretion over pricing on variable rate mortgages makes this unlikely. This paper finds evidence of price stickiness or market friction in the Australian bank variable rate mortgage market.

To a large extent, the discussion of market friction concerns itself with one aspect of the problem discussed in Stiglitz (1985), namely the examination of a situation in which a bank uses whatever control it has over the interest rate to increase its profits. Finance theory tells us that price is an important value indicator, as it encompasses valuable information about a particular asset, service or financial claim, and thereby provides the mechanism for the efficient allocation of resources. Inefficiencies such as market friction are not allowed to exist in this world, where prices continuously adjust to ensure market clearance.

The theoretical issue of price friction has been well examined. While there is debate about whether market friction creates inefficient resource allocation, there is widespread agreement that firms which do not adjust prices quickly are acting irrationally, unless other factors are influencing price changes (see Akerlof and Yellen, 1985, in particular). The most notable cause of sticky prices advanced is the existence of price adjustment costs, examined, for example in Barro, 1972; Sheshinski & Weiss, 1977; Mankiw, 1985; Akerlof & Yellen, 1985; and Stiglitz, 1985. The studies

show that when adjustment costs exist pricing inertia may not be either irrational or costly overall for profit maximising firms, as the costs associated with the change may be greater than any gain from a change in price.

There have been many empirical studies analysing links between price friction and other factors, such as industry type (Carlson, 1990; Simon, 1969; Primeaux & Bomball, 1974) and market concentration and power (Stigler, 1947; Hannan & Berger, 1991). However, there have been only a limited number of studies investigating evidence of price friction specifically. Blinder, 1991, suggests that while economists place a great deal of importance on price stickiness, the phenomenon itself remains poorly understood in practice, and encourages further examination of market friction.

Tests for evidence of price friction have in general used relatively simple methodologies. For example, Blinder, 1991; Carlson, 1992; and Hannan, 1994, test for price friction by analysing the number and frequency of price. The relative number of price changes indicates, according to Hannan, 1994, the extent of price friction in each of the products examined. To assess whether there is symmetry in price changes, Hannan calculates the ratio of increases to decreases, and argues that the smaller the ratio, the larger the overall price rigidity. Both Carlton, 1986, and Carlson, 1992, calculate average duration between price changes, and its standard deviation, as measures of price rigidity. As the duration increases, Carlton and Carlson argue that so does the rigidity of prices. In addition, Carlton suggests that as price friction increases, so does the standard deviation of duration.

In Berger & Udell, 1992, an OLS regression of the loan rate premium against market indicator rates is undertaken to test for the rigidity of prices. Berger & Udell use their estimated model to calculate the elasticity of the loan rate premium relative to changes in the market or indicator rate, to calculate an estimate of the price rigidity.

This paper is organised as follows. In the following section, and drawing from the lessons of previous studies, the methodology employed and data used to test for price stickiness in the Australian variable rate mortgage market is discussed. The results of the analysis are then presented covering the number, frequency and duration of rate change, the elasticity of variable mortgage rates, bank pricing behaviour and competition, price change asymmetry and costs of price adjustment. The final section summarises and offers some concluding comments.

METHODOLOGY AND DATA

Using a similar method to that employed in Hannan, 1994, and Carlson, 1992 the number and frequency of changes in bank variable mortgage rates are calculated. To provide a relative comparison, the same statistics are calculated for variable mortgages issued by both building societies and mortgage managers, the banks' main competitors. In addition, the duration to the next mortgage rate change, and its standard deviation, are calculated (as used by Carlton, 1986, and Carlson, 1992), and to gain a richer understanding of the extent of price friction in the bank variable mortgage market, the size of the variable mortgage rate changes are also analysed. Together with the number, frequency and duration of mortgage rate changes, the size data allows an assessment of the symmetry of price changes and the likelihood of the existence of any costs associated with mortgage rate adjustments.

The final analysis undertaken follows the approach of Berger & Udell, 1992, and using ordinary least squares (OLS), regresses the premium on bank housing loans against an indicator rate. This enables the calculation of an estimate of price friction. The function which forms the basis of the OLS test is:

$$p_t = (h_t - r_t) = \alpha + \beta_1 \cdot r_t + \beta_2 \cdot r_t^2 \quad (1)$$

where p_t , the variable housing loan rate premium at time t, is the difference between the variable mortgage rate, h_t , and an indicator or market rate, r_t , which influences the rate charged on variable housing loans. The combination of rt and r_t^2, allows the measurement of open-market rates and summarise credit market conditions at each t (Berger & Udell, 1992).

The variable mortgage rate data used in the analysis of the number, frequency and duration of mortgage rate changes, is Reserve Bank of Australia data for banks, building societies and mortgage managers. Monthly data is used, similar to Hannan, 1990, Carlson, 1992, Carlton, 1986 and Berger & Udell, 1992. The bank rates cover the period January 1959 to December 1996, representing 456 months. The Reserve Bank building society data runs from January 1983 to December 1996 (168 months), and the mortgage manager data from July 1993 to December 1996 (42 months). The data is analysed in accordance with data availability from the Reserve Bank of Australia, for each of the institution types. Reserve Bank of Australia data on Building Society mortgage rates is available from January 1983, and mortgage manager data from July 1993.

Coincidentally, the collection of building society rates by the Reserve Bank began at a time when the effects of the early stages of deregulation of the financial system were beginning to impact. From 1982 to 1993, many of the issues relating to deregulation had been resolved. This period saw over 30 new Australian banking authorities issued, significantly increasing competition in the retail banking market (Saunders & Lange, 1996). During this period, building societies provided the main competition for banks in the housing loan market (Allard, 1997). The close of the second period, heralds the arrival of the mortgage managers. The mortgage managers, which finance their lending through securitisation programs, offer housing loans which embody minimum interest rate setting requirements. The mortgage managers' emergence in the variable mortgage market in 1993 brought a new phase of competition that was accompanied by a surge in consumer awareness of financial products. The competition was the most intense ever faced by the Australian banks. For example, Allard, 1997, suggests that housing was almost sacred to the banks up to the 1990s, after which it opened up to almost everyone. Further, Allard reports that from the 1990s, customers increasingly exerted influence on the retail banking market in Australia, and became more responsive to bank decisions. Consequently, the three periods covered by the analysis, while corresponding to data availability for the three institutional types examined, also exhibit characteristics of different competitive environments.

To find an estimate of the elasticity of price change in the variable housing loan market, similar to that of Berger & Udell, 1992, the variable housing loan rate premiums are regressed against measures of nominal market rates. Berger & Udell, 1992, use both real and nominal market rates and find the results from both to be very similar. The use of real rates is a departure from the

norm in empirical studies, which generally use nominal rates as the dependent variable in the regression, the difference between two rates at the same point in time, does not depend on real versus nominal considerations. The use of nominal rates is also preferred as it avoids many of the mismeasurement problems associated with complications of inflation. While Berger & Udell, 1992, note that the use of nominal rates may fail to fully capture changes in credit tightness, this is not a concern of the current study, which is more interested in the elasticity of the premium to changes in the market or indicator rate.

The market indicator rate used is the 90 day bank accepted bill rate, BAB(t), which is the main indicator rate impacting the variable mortgage rate in Australia. The bank bill data was obtained from the Reserve Bank of Australia. The earliest date in this series is July 1969, and the analysis is conducted using data through to August 1999.

The 90 day bank accepted bill rate is the market rate on short dated paper on which a bank accepts full recourse. It represents the rate at which a major bank can raise 90 day financing. Anecdotal evidence for the suitability of the 90 day bill rate comes from bank executives who usually quote changes in the bill rate as the reason for mortgage rate changes.

The variable mortgage premium, PREM(t) is calculated by deducting the bank accepted bill rate from the housing loan rate at each t. Consequently, the model tested using OLS, is:

$$PREM(t) = a + b_1.BAB(t) + b_2.BAB(t)^2 + s(t) \quad (2)$$

The elasticity measure is found by using the estimated equation (2) to calculate the change in PREM of an increase in BAB by 100 basis points, using the mean values of BAB and BAB squared.

NUMBER, FREQUENCY AND DURATION OF RATE CHANGE

The results of the analysis of the changes in the bank variable mortgage rates, shown in Table 1, reveal interesting insights into the variable rate mortgage loan pricing behaviour of banks both over time and relative to competitors. Panel A of Table 1 shows the number and frequency of changes in mortgage rates by banks. During the 456 months covered by the study, the banks increased variable mortgage rates 31 times and decreased mortgage rates 30 times, and rate changes occurred on average every 7.5 months.

The results of the analysis of the each of the sub-periods, shows differences in the variable rate stickiness over time. In the 288 months of the first sub-period, the banks changed the rate 22 times, or in only 7.64 percent of the months covered. Of these changes, 18 were increases and four were decreases. On average, the rate was changed every 13 months. The speed of change increased during the second sub-period, when over the 126 months, banks made 31 changes (or 24.6 percent of months covered, 10 being increases and 21 decreases), representing a change every four months on average.

Table 1: Number and average size of change of Variable Rate Home Mortgage Rate Changes Australian Banks, Building Societies and Mortgage Managers: January 1959 to December 1996

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
Time Period	Number Of Increases	Number Of Decreases	Number Of Changes	Number Of Months	Proportion Of Changes Which Are Increases	Proportion Of Changes Which Are Decreases	Proportion Of Months In Which There Was A Change	Ratio Of Decreases In Rates To Increases	Average Duration to Change	Standard Deviation of Duration to Change	Mean Variable Mortgage Rate over period	Standard Deviation of Variable Mortgage Rates	Maximum Variable Mortgage Rate	Minimum Variable Mortgage Rate	Range of Variable Mortgage Rates
Panel A: Banks															
January 1959 to December 1982	18	4	22	288	0.8182	0.1818	0.0764	0.2222	13.0909	12.3261	7.3391	2.3689	13.50	5.00	8.50
January 1983 to June 1993	10	21	31	126	0.3226	0.6774	0.2460	2.1000	4.0645	3.9935	13.5655	2.1386	17.00	9.50	7.50
July 1993 to December 1996	3	5	8	42	0.3750	0.6250	0.1905	1.6667	5.2500	5.8296	9.6619	0.7881	10.50	8.25	2.25
Totals	31	30	61	456	0.5082	0.4918	0.1338	0.9677	7.4754	8.9060					
Panel B: Building Societies															
January 1983 to June 1993	40	64	104	126	0.3846	0.6154	0.8254	1.6000	1.2115	1.4873	13.9568	1.9634	17.20	9.50	7.75
July 1993 to December 1996	9	17	26	42	0.3462	0.6538	0.6190	1.8889	1.6154	2.5386	9.6048	0.7171	10.50	8.10	2.40
Totals	49	81	130	168	0.3769	0.6231	0.7738	1.6531	1.2923	1.8149					
Panel C: Mortgage Managers															
July 1993 to December 1996	15	19	34	42	0.4412	0.5588	0.8095	1.2667	1.2353	1.1136	8.5860	0.4835	9.16	7.60	1.56

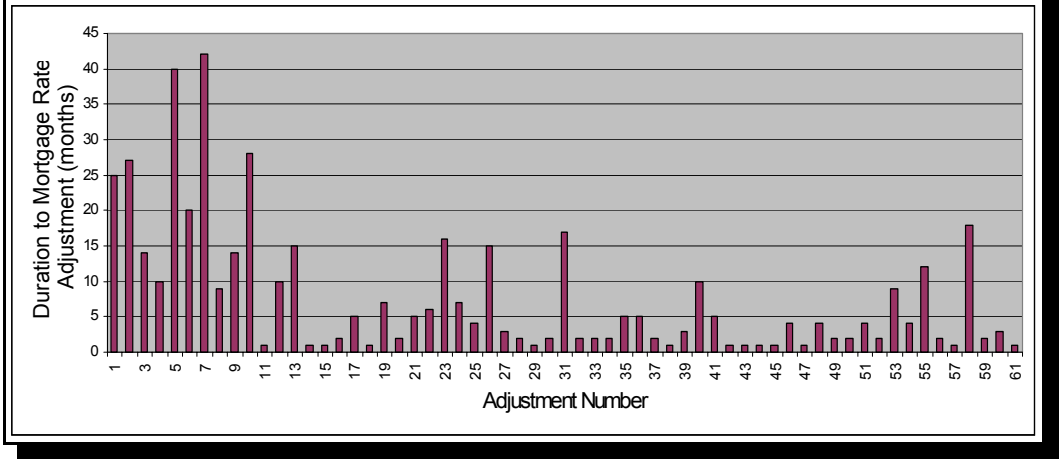
Source: Reserve Bank of Australia, and various issues of Reserve Bank of Australia *Bulletin* 1994 to 1997, Housing Loans Indicator Rates: Banks, Building Societies and Mortgage Managers.

As the table shows, there was a substantial increase in the frequency of rate changes, relative to the first sub-period. The third sub-period saw little change from the previous period, with changes

taking place every 5.25 months on average. Consequently, the analysis of the number and frequency of changes in bank variable mortgage rates suggests that price friction exists and that it has reduced over time.

Figure 1 shows the duration between variable mortgage rate changes beginning with the first change after January 1959, and ending with the last prior to December 1996. Inspection of Figure 1 reveals that the longest durations occur in the first 10 changes, all of which occur in the first sub-period. This result supports the suggestion from the number and frequency analysis, that there appears to be more rigidity in bank variable mortgage rates in the earliest sub-period relative to later periods.

Figure 1: Duration between Australian Bank Variable Mortgage Rate Adjustments, January 1959 to December 1996



ELASTICITY OF VARIABLE MORTGAGE RATES

The results of the OLS regression of the variable housing rate premium against the market indicator rate are shown in Table 2, Panel A. As suggested by Berger & Udell, 1992, the coefficients of BAB and BAB2 are difficult to interpret, and it is more meaningful to examine the summary statistic that measures the elasticity of the bank variable mortgage rate to changes in the indicator rate. The predicted change to PREM caused by an increase in BAB by 100 basis points, and its t-statistic, is shown in the last two rows of Panel A of Table 2. The predicted premium change is significant in all cases. Panel B of Table 2 shows descriptive statistics for the three variables used in the regressions.

Four regressions were undertaken. The first covered the full period of data available, from July 1969 to August 1999. The subsequent regressions covered sub-sets of this period and were established to correlate as closely as possible to those used for the number and frequency tests.

Table 2: Results of OLS Regression of Australian Bank Housing Loan Premiums against 90 day Bank Accepted Bill Rates, July 1969 to August 1999 (t statistics in brackets)

Panel A

Variable	July 1969 to August 1999	July 1969 to December 1982	January 1983 to June 1993	July 1993 to August 1999
Constant	0.0261** (4.0557)	0.0100** (1.5846)	0.0605** (5.3464)	0.0109 (0.9127)
BAB	0.0034 (0.0318)	0.1230 (1.0648)	-0.1801 (-0.9324)	0.3739 (1.0101)
BAB2	-1.9572** (-3.5696)	-2.8986** (-5.8935)	-1.6965* (-2.1519)	-2.2852 (-0.7818)
Price friction of 100 basis point increase in BAB rate	0.0011** (-39.4870)	-0.0007** (-23.1364)	-0.0009** (-20.8915)	-0.0040** (-5.1551)
Price friction relative to average PREM (%)	4.41	22.58	11.06	56.66

** significant at the 1% level * significant at the 10% level

Panel B

	PREM	BAB	BAB2
July 1969 to August 1999			
Mean	0.00310	0.10113	0.01196
Standard Deviation	0.02615	0.04157	0.00945
No. of observations	362	362	362
July 1969 to December 1982			
Mean	-0.00995	0.09899	0.01113
Standard Deviation	0.0235001	0.0364679	0.008628708
No. of observations	162	162	162
January 1983 to June 1993			
Mean	0.00706	0.12840	0.01788
Standard Deviation	0.0263864	0.0373718	0.009115582
No. of observations	126	126	126
July 1993 to August 1999			
Mean	0.02493	0.05941	0.00367
Standard Deviation	0.0085907	0.0120669	0.00152278
No. of observations	74	74	74

The results covering the entire period of data, show that the variable housing loan premium is expected to fall by 7 basis points, following a 100 basis point increase in the bank accepted bill rate. This appears to suggest only a small amount of stickiness relative to market rates, but is substantial when noted that it represents 22.6 percent of the average spread over the 90 day bank bill rate for the period examined.

Investigation of the sub-periods, however, reveals changes in price friction over time, as indicated in the analysis of number, frequency and duration of rate changes. The first period from 1969 to 1982, shows only a small amount of stickiness, 9 basis points, which indicates that the delay in rate change causes a drop in the average margin over 90 day bank bill funding by 11.0 percent. However, the extent of stickiness increases significantly in the period from January 1983 to June 1993, when a 100 basis point shock to the funding rate brought about a drop in the premium of 40 basis points, or over 56 percent. In the final period, the degree of stickiness falls, and the predicted fall in premium over the 90 day bank bill rate is 11 basis points, or 4.4% of the housing loan rate spread over the bank bill rate.

PRICING BEHAVIOUR AND COMPETITION

The analysis of elasticities provides further support for the results of the number, frequency and duration analysis, that the degree of stickiness in the Australian variable mortgage market has changed over time. Further, as the time periods examined correspond to a large extent to changing competitive regimes in the market, the degree of stickiness may also be related to market factors such as the competitive environment. To examine this aspect further, a comparison of the changes in bank variable mortgage rates and those of the building societies and the mortgage managers, was also undertaken.

Table 1 (column 3), indicates that for the period from January 1983 to June 1993, building societies (shown in Panel B) moved their variable mortgage rates more than 4 times more often than banks, a change on average every one and a quarter months. Examination of the last period results in Table 1, allows comparison of the banks price setting practices with those of both building societies and mortgage managers (shown in Panel C). In the last period examined, banks changed their variable mortgage rates eight times, on average, or just over once every five months. In contrast, building societies changed their rates every 1.6 months, on average, and mortgage managers made changes on average every one and a quarter months.

The comparison of size of the rate changes across the three institutional types, reported in Table 3, provides further support for the relative stickiness of bank variable housing rates. As housing loan rates of all three institutional types are impacted by the same market influences, the results in Table 3 show that relative to its competitors, the banks' price setting behaviour has been relatively rigid.

Inspection of Table 3 reveals that there are large differences in the size of the increases and decreases made by the banks relative to their competitors. For example, in the second period, the average increase (decrease) made by the banks was 75 basis points (55 basis points) whereas the average increase (decrease) by the building societies was only 19 basis points (20 basis points). During the final period examined, the mortgage managers' rate increases (decreases) were only 10

basis points (17 basis points) on average, relative to 20 (18) by the building societies, and 58 (60) by the banks. The t-tests (results of which are recorded at the bottom of Table 3) provide additional support for these differences.

Table 3: Comparison of distributions of increases verses decreases in variable home loan rates of banks, building societies and mortgage managers: January 1959 to December 1996

Panel A: Banks							
	Increase in rates			Decrease in rates			
Time Period	Average (% points)	Standard Deviation (% points)	Total of Increases in period (% points)	Average (% points)	Standard Deviation (% points)	Total of Decreases in period (% points)	Average Absolute Change in rates (% points)
Jan. 1959 to Dec. 1982	0.5417*f	0.4309	9.75	-0.3125 #acgh	0.1250	-1.25	0.5000
Jan. 1983 to June 1993	0.7500	0.4859	7.50	-0.5476 #	0.2034	-11.50	0.6129
July 1993 to Dec. 1996	0.5833	0.4726	1.75	-0.6000	0.1369	-3.00	0.5938
Totals	0.6129d	..	19.00	-0.5250e	..	-15.75	0.5697
Panel B: Building Societies							
Jan. 1983 to June 1993	0.1943	0.1915	7.77	-0.2047	0.2053	-13.10	0.2007
July 1993 to Dec. 1996	0.2011	0.3364	1.81	-0.1771	0.1605	-3.01	0.1854
Totals	0.1955ab	..	9.58	-0.1989ac	..	-16.11	0.1976a
Panel C: Mortgage Managers							
July 1993 to Dec. 1996	0.0984*abd	0.0670	1.48	0.1689#ac	0.1514	-3.21	0.1378a

Source: Various issues of *Reserve Bank of Australia Bulletin*, Housing Loans Indicator Rates: Banks, Building Societies and Mortgage Managers.
Tests for differences between increases and decreases within groups:
* significantly different from same period average decrease at 5% level.
\# significantly different from same period average increase at 5% level.
Tests for differences between groups:
a significantly different from long run absolute bank change at 1% level.
b significantly different from long run average increase by banks at 1% level.
c significantly different from long run average decrease by banks at 1% level
d significantly different from long run increase by building societies at 1% level.
e significantly different from long run decrease by building societies at 1% level
Tests for differences between time periods within groups:
f significantly different from period 2 average increase by banks at 10% level
g significantly different from period 2 average decrease by banks at 5% level
h significantly different from period 3 average decrease by banks at 5% level

Consequently, over the period covered by the number and frequency tests, the bank variable mortgages displayed far more price stickiness than similar products of competitors. Further, the degree of price stickiness appears to vary from increases to decreases, which leads one to ask if there are differences in price setting behaviour when rates are rising relative to rates falling.

PRICE CHANGE ASYMMETRY

Examination of Table 3 reveals that there appear to be differences in the distributions of bank variable mortgage rate increases relative to decreases. For the first two periods the mean increases are larger than the mean decreases, and in all three periods the standard deviation of the decreases in rates is less than half that of the increases. Comparison of means tests reveals that there are significant differences for both the first and second periods. However, there were no significant differences between bank increases and decreases for the third period examined.

The extent of asymmetry in bank rate increases and decreases was also tested using the regression analysis, to estimate the elasticity of the bank premium over the 90 day bank accepted bill rate to a fall in the 90 day bill rate by 100 basis points. The impact of the decrease in the market rate is then compared with the impact of an increase in rates by 100 basis points, reported earlier. The resulting elasticity calculations are shown in Table 4, below.

Table 4 reveals that a change in rates by 100 basis points does not produce a symmetrical impact on the bank premium on bank variable mortgage rates over 90 day bank accepted bills. The results for the full period, indicate that the banks would be expected to improve their spread over bank bills by more than 70 basis points after any decrease in market rates by 100 basis points, representing a substantial amount of price stickiness. This compares with a decrease in spread of only 7 basis points after an equivalent rise in the market rate.

Table 4: Results of Tests of Price Friction (t-statistics in brackets)

Period of Analysis	Price friction of 1% increase in BAB rate	Price friction of 1% decrease in BAB rate
July 1969 to August 1999	-0.0007334**	0.007105**
	(-39.487)	(-39.491)
July 1969 to December 1982	-0.000944**	0.008074**
	(-23.136)	(-23.135)
January 1983 to June 1993	-0.003958**	0.008357**
	(-20.892)	(-20.891)
July 1993 to August 1999	0.001128**	-0.0009197**
	(-5.155)	(-5.155)

** significant at the 1% level

Table 4 results show that over the first two sub-periods, delays in passing on rate decreases to customers were expected to improve bank margins by over 80 basis points, compared with a decrease of 9 basis points and 40 basis points after an increase in market rates for periods one and two, respectively.

It is interesting to see that for the final period, a failure to pass on a decrease in rates was expected to lower the bank margins by 9 basis points. Consequently, the stickiness in mortgage rates appears to have disappeared to a very large extent during the third period. This result is not surprising as the third period represents a period in which saw the rise of consumerism and

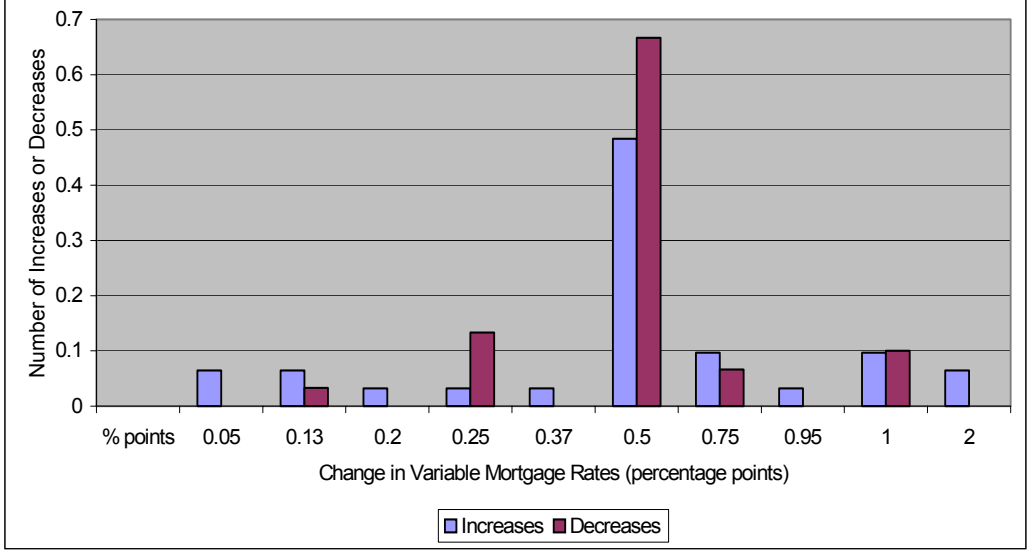
increasing consumer awareness of financial products. To a large extent this grew out of the problems created and losses incurred by consumers after the 1987 stock market crash, and the subsequent property crash in 1989-1990. The period also saw the emergence of the mortgage managers into the housing loan market, in part encouraged by the new consumer activism, creating a significant threat to bank dominance of the Australian housing loan market. The results further support the proposition that there appear to be differences in the behaviour of banks when increasing variable mortgage rates, relative to decreasing rates.

COSTS OF PRICE ADJUSTMENT

Carlton, 1986, suggests that when the proportion of small price changes is low, then there are likely to be significant costs of making any price change. Some indication of the differences in the proportion of small increases and decreases for bank variable rate mortgages is shown in Figure 2, which graphs the distribution of rate increases and decreases over the period from January 1959 to December 1996.

Figure 2 shows that most of the changes in rates have been 50 basis points or higher. Only 22.6 percent of increases, and only 16.7 percent of decreases were less than this change. As the proportion of small decreases is lower than small increases, the cost of making a decrease may be higher than the cost of making an increase. Some evidence that this is the case was gained from the analysis of elasticities, which showed that significant gains in premium over market rates could be gained by delaying price decreases, relative to price increases.

Figure 2: Distribution of Rate Increases and Decreases in Australian Variable Rate Mortgages: January 1959 to December 1976



SUMMARY AND CONCLUSIONS

The analyses of the number, frequency and duration of variable mortgage rate changes, the size and distributions of increases and decreases, and the elasticities of rate changes, reveal the existence of market friction in the Australian variable rate mortgage market.

The results suggest that in addition to the stickiness of pricing in general, there appear to be differences in price rigidities between increasing rates and decreasing rates. This suggests that banks are likely to have different decision and cost criteria when increasing mortgage rates relative to decreasing rates.

Further, there appear to be differences in the market friction in bank variable rate mortgages relative to those of their main competitors. The results suggest that the variable rate mortgages issued by Australian banks display far greater price friction than those of either the building societies or the mortgage managers. This result suggests that, while there are common market influences impacting pricing of the three groups, namely the funding rate, there may be institutional specific issues and/or other market factors impacting the decision to change rates. Because the variable mortgage rate setting is discretionary, the differences across institutional groups suggest that each has a different set of decision or cost criteria impacting changes in variable mortgage rates at any time. The results of the elasticity analysis, also suggest that the bank mortgage rate remains fixed or rigid until the decision variables reach some critical point, causing the decision to change the mortgage rate. This critical point appears to be reached at different times by each of the institutional groups. While differing administrative cost structures seem an obvious variation influencing decisions, there may be other factors impacting the costs of any change in mortgage rates in each of the individual institutions.

In support of the presence of other influences, the findings of this paper show that there have been shifts in price stickiness over time, suggesting that the banks' pricing behaviour changes over time, and in different competitive environments. As the least market friction was found during a period of increasing consumer awareness, the findings are consistent with the literature which argues that price stickiness reduces as asymmetric information in the lender's favour reduces (Carlson, 1992; and Okun, 1981), producing increased consumer responsiveness (Hannan, 1994; and Ball & Mankiw, 1995) and reduced market power (Stiglitz, 1985; Neumark & Sharpe, 1992; and Berlin & Mester, 1997).

The analysis presented in this paper, while important in itself, produces results which provide useful input into the further analysis of variable mortgage interest rate changes. As stated at the beginning of this discussion, it is the discretionary nature of the Australian variable mortgage rate that makes it particularly interesting. However, this characteristic also increases the riskiness of the product if used in any structured financing arrangements such as mortgage securitisation. Hence a better understanding of the price stickiness will provide valuable input into the development of models with allow us a better understanding of this risk.

REFERENCES

Akerlof, G. A. and J. L. Yellen (1985). A Near-Rational Model of the Business Cycle, with Wage and Price Inertia, *Quarterly Journal of Economics*, 100(4), 823-838.

Allard, T. (1997). Banking pace of change Accelerating, *Australian Financial Review*, 18 January.

Ball, L. and N. G. Mankiw (1995). Relative-price Changes as aggregate Supply Shocks, *Quarterly Journal of Economics*, February, 161-193.

Barro, R. (1972). A theory of Monopolistic Price Adjustment, *Review of Economic Studies*, 39, January, 17-26.

Berger, A. N., and T. H. Hannan (1989). The Price-Concentration Relationship in Banking, *The Review of Economics and Statistics*, 71, May, 291-299.

Berger, A. N., and G. F. Udell (1992). Some Evidence on the Empirical Significance of Credit Rationing, *Journal of Political Economy*, 5 (100) October, 1047-77.

Berlin, M., and L. J. Mester (1997). Why is the Banking Sector Shrinking? Core Deposits and Relationship Lending, Working Paper No. 96-18/R Federal Reserve Bank of Philadelphia, April 1997.

Blinder, A. S. (1991). Why are Prices Sticky? Preliminary Evidence from an Interview Survey, *American Economic Review*, 81, May, 89-96.

Carlson, J. A. (1992). Some Evidence on Lump Sum Versus Convex Costs of Changing Prices, *Economic Inquiry*, 30 (April), 322-331.

Carlson, J. A. (1990). Customer Sensitivity to Relative Prices and the Frequency of Price Changes, paper presented at the American Economic Association meeting, Washington, D. C., December.

Carlton, D. (1986). The Rigidity of Prices, *American Economic Review*, 76 September, 637-658.

Hannan, T. (1994). Asymmetric Price Rigidity and the Responsiveness of Customers to Price Changes, *Journal of Financial Services Research*, 8, 257-267.

Hannan, T. and A. N. Berger (1991). The Rigidity of Prices: Evidence from the Banking Industry, *American Economic Review*, 81, September, 938-945.

Mankiw, N. G. (1985). Small Menu Costs and Large Business Cycles: A Macroeconomic Model of Monopoly, *Quarterly Journal of Economics*, 100(2), 529-538.

Neumark, D. and S. A. Sharpe (1992). Market Structure and the Nature of Price Rigidity: Evidence from the Market for Consumer Deposits, *Quarterly Journal of Economics*, 107(2), 657-680.

Primeaux, W. J. and M. R. Bombull (1974). A Re-examination of the Kinky Oligopoly Demand Curve, *Journal of Political Economy*, 82, July/August, 851-862.

Reserve Bank of Australia, various issues, *Bulletin*, Reserve Bank of Australia, Sydney.

Saunders A. and H. P. Lange (1996). *Financial Institutions Management - A Modern Perspective*, First Australian Edition, Irwin, Sydney.

Sheshinski, E., and Y. Weiss (1977). Inflation and Costs of Price Adjustment, *Review of Economic Studies*, 44, 281-303.

Stigler, G. J. (1947). The Kinky Oligopoly Demand curve and Rigid Prices, *Journal of Political Economy*, 55, October, 432-449.

Stiglitz, J. (1985). The Causes and Consequences of the Dependence of Quality on Price, *Journal of Economic Literature*, March, 25, 1-48.

CLUSTER ANALYSIS OF THE FINANCIAL CHARACTERISTICS OF DEPOSITORY INSTITUTION MERGER PARTICIPANTS AND THE RESULTING WEALTH EFFECTS

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ABSTRACT

Cluster analysis is used to analyze the mergers of depository institutions, drawing on previous work in the non-financial sector. The majority of merger studies focus on single motivation factors or limited participant characteristics and fail to account for the heterogeneity within merger samples. This paper furthers the merger literature by separating depository institution mergers into homogeneous groups of bidders and targets based on the pre-merger financial characteristics of each. This allows the analysis of the influence of intergroup differences on the returns to both bidding and target firms. Cluster membership is analyzed and results interpreted. A test for cluster membership is performed and findings reconciled with existing merger theories.

INTRODUCTION

The merger and acquisition activity of depository institutions has increased dramatically in recent years, with various theories hypothesized regarding the cause of this action. In addition, much attention has been devoted to the merger and acquisition activities of non-financial firms, with most utilizing a cross-sectional regression analysis to explain the pre- and post-merger returns of both bidders and targets. While this method has met with much success, it does suffer from some apparent weaknesses in its explanatory power. Alternative statistical techniques, many of which are found in the non-parametric realm of tests, have been implemented in attempts to offset the drawbacks of ordinary least squares regression. In this paper cluster analysis is used to analyze the mergers of depository institutions, drawing on previous work in the non-financial sector. Mergers are separated by pre-merger financial characteristics of both bidders and targets. This insures that the within-group differences are small relative to among-group differences. This provides a homogeneous group of mergers, which is analyzed for among-group differences in returns to both parties, allowing the financial data for both bidding firms and target firms to capture potential interactions among their characteristics.

As noted earlier, the merger and acquisition activity of depository institutions can be described as at least frenzied during the decade of the 90's. Researchers attempt to explain this phenomenon through deregulation, competition, institutional efficiency, market share, product diversity and a host of other reasons. Efforts are also made to utilize non-financial institution merger

hypotheses to explain the cause and effect of this activity, with results that can be described as contradictory at best. However, considering basic differences in financial make-up and the merger process in general, there are various reasons to expect differences in merger studies targeting depository financial institutions versus non-financial institutions. As stated by Chang, Gup and Wall (1989) depository institution mergers take an extensive amount of time (which increases merger uncertainty) due to the need for regulatory approval. Also, the nature of the assets acquired differs significantly when comparing depository institutions and industrial firms. When a bidder successfully acquires a depository institution target, it is buying a set of relationships generated by the existing management rather than a set of physical assets [Baradwaj et al. (1990)]. The uncertainty related to keeping current management in place makes this type of merger fundamentally different than those of other industries. Additional differences between the industrial and bank sector addressed by Zhang (1998) include degree of regulation, degree of competition and ownership structure. Degree of regulation refers to the fact that banks exert disproportional influence on the economy as compared to non-financial firms. Thus, for reasons of financial prudence and monetary control, the bank sector and mergers between its participants are heavily regulated. Degree of competition simply refers to non-bank financial institutions' increasing presence in areas traditionally dominated by banks. As for ownership structure, bank takeovers differ in that they do not produce wealth effects on the bondholders (depositors), who receive explicit and implicit protection from the Federal Deposit Insurance Corporation. Thus, the aforementioned diverse results may be due to the various motivations of bidding firms, financial (depository) versus non-financial firm differences, or more likely, a combination of both. The majority of previous studies focus on single motivation factors or limited participant characteristics and fail to account for the heterogeneity within merger samples. This paper furthers the merger literature by separating depository institution mergers into homogeneous groups of bidders and targets based on the pre-merger financial characteristics of each. This allows the analysis of the influence of intergroup differences on the returns to both bidding and target firms.

LITERATURE REVIEW

This study is based largely on the work of Sawyer and Shrieves (1994) who analyze non-financial firm mergers between 1975 and 1987. The authors utilize the cluster analysis approach for merger differentiation to avoid weaknesses of past studies that involve the use of cross-sectional regression of merger returns on variables theorized to affect the profitability of an acquisition or tender offer to either or both firms involved. As noted by Sawyer and Shrieves potential problems with the regression approach include (1) theories other than those being tested are relevant to the sample of acquisition events used; (2) the explanatory variables have alternative interpretations; (3) the explanatory variables interact in complex and unanticipated ways; (4) the explanatory variables have nonlinear relations to merger returns; and (5) the variables included are relevant only in a subset of the observations. Thus, attempts are made to utilize their methodology, and its attractive features, to gain insight into the merger motivation of depository institutions.

Studies related to depository institution mergers and common stock returns are many and diverse, although the attention devoted to this topic pales in comparison to merger studies regarding

industrial firms. Previous works tend to focus on specific aspects of a merger, such as intrastate versus interstate, large versus small institutions, how closely held is the target versus the bidder, etc. Due to the variety of studies available, a brief survey of financial institution literature is presented to illustrate the inconclusiveness of results to date.

Among the earliest studies is Cornett and De's (1991) investigation of the stock market's reaction to the announcement of interstate bank mergers. In contrast to studies of non-financial mergers, the research finds significant positive announcement-period excess returns for both bidding and target banks. As for intrastate bank mergers, James and Weir (1983) and Desai and Stover (1985) also document positive announcement-period bidder returns.

Baradwaj, Fraser and Furtado (1990) examine hostile bank takeovers and find hostile bank acquisition announcements produce positive net wealth effects which are larger than the wealth effects of nonhostile acquisitions. Whalen's (1997) event study analysis of intracompany bank mergers reveals significant, positive average and cumulative average abnormal returns following a merger. Subrahmanyam, Rangan and Rosenstein (1997) report a negative relation between abnormal returns and the proportion of independent outside directors on the board of bidding banks.

While the majority of merger studies focus on independent gains to bidders and targets, several papers examine the consolidated abnormal returns to mergers. Hannan and Wolken (1989), Houston and Ryngaert (1994), and Pilloff (1996) find small or no average wealth creation resulting from bank mergers. These findings agree with a study by Madura and Wiant (1994). Their analysis of 152 mergers between 1983 and 1987 find negative cumulative abnormal returns for acquirers during the 36-month period following the merger announcement. However, Cornett and Tehranian (1992) not only find average merger-related gains among their sample of thirty mergers involving publicly traded banking institutions, but also conclude that weighted abnormal returns around the merger announcement are positive. These findings are consistent with the analysis by Zhang (1995) of 107 mergers taking place between 1980 and 1990, which finds a significant increase in overall value resulting from the mergers. Furthermore, Gupta, LeCompte and Misra (1997), in an examination of solvent-stock-held savings institutions from the late 1970s to the early 1990s, show losses to acquiring firms, significant earnings of target stockholders and positive wealth effects to the bidder-target pair.

The mixed results achieved by researchers point to weaknesses in current methodology. The analysis presented here attempts to expand the understanding of depository institution mergers through the use of both parametric and non-parametric methods, as discussed in the following section.

DATA AND METHODOLOGY

The initial merger sample is obtained from the Sheshunoff BankSearch Mergers and Acquisitions database utilizing completed mergers with an announcement date between January 1, 1993 and September 30, 1999. Additionally, comprehensive financial information on both bidder and target and the method of payment to target is obtained from Sheshunoff. To allow for comparability, only cash-for-stock (cash) and stock-for-stock (stock) transactions are retained in the sample. The initial sample of mergers announced and completed between 1993 and 1999 consisted

of 2,967 mergers. However, many depository institutions, especially small targets, are not actively traded on an organized exchange. Thus, the number of firms that satisfy the criteria of having continuous daily transactions was 212 Bidders and 190 Targets. Daily returns for bidders and targets are then obtained from the Center for Research in Security Prices (CRSP) database to be used in merger return calculations.

Cluster Analysis

To successfully conduct the cluster analysis, several variables are needed for each of the participants in the merger transaction to form the cluster variate. The following variables are obtained for both bidders and targets over a three-year period beginning with the most recent year-end prior to the merger announcement date unless otherwise noted:

- Natural log of total assets pre-merger;
- Return on assets;
- Return on equity
- Ratio of equity to total assets;
- Ratio of core deposits to total deposits;
- Ratio of non-performing assets to total assets;
- Ratio of operating expense to average assets;
- Efficiency ratio;
- Ratio of noninterest income to average assets;
- Price to market price one year prior;
- Number of branches;

The natural log of total assets pre-merger, or firm size, of bidders and targets has a number of interpretations. A large bidder and a small target is the most common type of depository institution merger. If one party is small relative to its minimum efficient size, economies of scale may be presented as a motivating factor. A large bidder wishing to maximize geographic coverage or market share may merge with a large target. The number of branches indicates future growth opportunities or areas of cost savings if overlapping branches are closed.

The pre-merger return on assets and return on equity are profitability measures used to separate firms based on positive or negative earnings trends, and the implications of each denote positive or negative connotations. The ratio of noninterest income to average assets is used to show a firms revenue generation by activities outside the traditional loan and investment portfolio. Targets with above average noninterest income would tend to be very attractive to bidders wishing to expand income sources.

Equity to assets is a measure of capital adequacy, both to shareholders and regulators. This is a reflection of past managerial performance and future growth opportunities. Core deposits to total deposits provides a measure of funds stability, which is desirable in both bidders and targets. Non-performing assets to total assets is included to assess asset quality, which reflects both managerial performance and local economic conditions.

The ratio of operating expenses and the efficiency ratio provide input as to how well bidders and targets manage overhead expenses. The efficiency ratio is defined as the last twelve months noninterest expense divided by interest income plus noninterest income. An above average ratio for either of these variables points to possible areas of future cost reductions, which should lead to greater efficiency for the bidding firm. Finally, the number of branches is used as a measure of relative size and market coverage for both bidders and targets.

As per Hair (1995) the data are standardized using a general form of a normalized distance function, which utilizes a Euclidian distance measure amenable to a normalizing transformation of the raw data. This process converts the data into a standard normal value with a zero mean and a unit standard deviation. This transformation, in turn, eliminates the bias introduced by differences in scales of the variables used in the analysis.

Merger Returns Methodology

The methodology used to assess statistical significance of merger returns begins with the market model as follows:

$$R_{i,t} = a_i + B_i R_{m,t} + e_{i,t}$$

where $R_{i,t}$ is the daily return on firm i's stock in period t and $R_{m,t}$ is the return on the value-weighted CRSP index in period t. Parameters a_i and B_i are estimated over the base period t = -270 to t = -21, with t = 0 the announcement date (AD) of the merger. The abnormal return for each firm, $AR_{i,t}$, is calculated for the period t = -20 to t = +20 and t = -1 to t = 1 and is given by:

$$AR_{i,t} = R_{i,t} - (a_i + B_i R_{m,t})$$

Average abnormal returns, AAR_t, for the N firms for each day (t) is calculated as:

$$AAR_t = \text{Sum } AR_{i,t} \times (1/N)$$

and the cumulative abnormal return, CAR, for any period T is calculated as:

$$CAR_T = \text{Sum } AAR_t$$

A binary variable, STOCK, is used to control for other factors that may affect the returns of mergers involved in the study. The use of this variable allows the analysis of the type of consideration used in the merger, and equals one for stock transactions and zero for cash transactions. Also, as documented by Sawyer and Shrieves in their original study, we must consider

the interaction between type of consideration and cluster membership to determine whether the clusters of mergers have differing effects on returns depending on consideration type.

The variable RELSZ is used to determine if there is an interaction effect between the type of consideration and relative bank size. It is calculated as the natural logarithm of the ratio of total assets of the target to total assets of the bidder. Sawyer and Shrieves note a working paper by Asquith, Bruner and Mullins (1987) that finds a statistically significant negative relation between bidding firm returns and the relative size of the target in stock transactions, and an insignificant, although positive, relation when cash is the type of consideration utilized.

Considering the aforementioned information the following model is estimated to determine merger returns:

$$CAR_j = a_0 + a_1RELSZ_j + a_2STOCK_j + a_3(STOCK_j \text{ x } RELSZ_j) + \text{Sum } b_iCLSTR_{ij} + \text{Sum } c_i(CLSTR_{ij} \text{ x } STOCK_{ij}) + e_j$$

where:

CAR_j = cumulative abnormal return

a_0 = intercept meant to capture the mean effect of CAR for cash transactions in the reference cluster, i.e., for observations where $CLUSTR_{ij} = 0$ for i = 1, . . ., N – 1

$a_0 + a_2$ = the estimate of the effect of stock transactions on CAR in the reference cluster where $STOCK_j = 1$ for such transactions

a_1 = effect of size on cash transactions

$a_1 + a_3$ = effect of size on stock transactions

b_i = estimate for the differential effect of cluster i on CAR (relative to the reference cluster) for cash transactions, where i = 1, . . ., N – 1

$b_i + c_i$ = estimate for the differential effect of membership in cluster i on stock transactions

Hypothesis tests for significance relating to the effect of clusters on CARs are:

Cluster effects may be present in cash deals;
H_0: $b_i = 0$ for i = 1, . . ., N – 1 (equality of cluster means in cash deals)
H_1: One or more $b_i \neq 0$

Cluster effects may be present in stock deals;
H_0: $b_i + c_i = 0$ for i = 1, . . ., N – 1 (equality of cluster means in stock deals)
H_1: One or more bi + ci ≠ 0

Cluster effects may be present across either cash or stock transactions;
H_0: $b_i = c_i = 0$ for i = 1, . . ., N – 1 (equality of cluster means in cash or stock deals)
H_1: One or more bi or ci ≠ 0

Hypothesis tests for significance relating to the effect of relative size on three-day CARs are:

Size has no effect on CARs;
H_0: $a_1 + a_3 = 0$
H_1: $a_1 + a_3 \neq 0$

Hypothesis tests for significance relating to the effect of type of consideration on three-day CARs are:

Type of consideration has no effect on CARs;
H_0: $a_3 = a_2 = c_1 = c_2 = \ldots = c_{N-1}$
H_1: One or more of the coefficients $\neq 0$

RESULTS

The cluster analysis of financial characteristics results in six distinct clusters, although only four are of usable size for the analysis. The financial highlights of these four clusters are given below with the variable means summarized in Exhibit 3.

Cluster Results

Cluster 1 (Contains 27 mergers)

There is a considerable size difference between bidders, with average assets of slightly more than $4 billion, and the targets, with average assets of slightly more than $400 million. Additionally, the average number of branches for bidders, at 177, is almost six times the number of branches (30) of the average target. Bidders exhibited greater profitability than targets; however, both bidders and targets in this cluster were relatively profitable, by traditional measures. ROAs were 1.26 percent and 1.08 percent, for bidders and targets, respectively. Bidders' ROE was 15.58 percent, while the average ROE for targets was 11.82 percent. Additionally, both bidders and targets enjoyed a relative advantage in their efficiency ratio in comparison to members of the other clusters. Overall, the financial characteristics of Cluster 1 bidders and targets would tend to support the value-maximizing hypothesis of merger activity.

Cluster 3 (Contains 28 mergers)

This cluster is characterized by the most significant size differences between bidders, with average assets of more than $51 billion, and targets, with average assets of approximately $1.25 billion. Additionally, the bidders operated over 10 times as many branches as the average target. In this cluster, the bidders exhibited a much greater profitability than the targets. The average bidder had an ROA of 1.37 percent compared to the average target's ROA of 0.95 percent. Bidders' average ROE were over 18 percent compared to the targets' average ROE of approximately 12 percent. Both bidders and targets were relatively inefficient; however, the bidders and targets both enjoyed good

non-interest income support from their operations. Overall, the financial characteristics of Cluster 3 bidders and targets would tend to support the size-maximizing hypothesis.

Cluster 5 (Contains 68 mergers)

There is a striking similarity in the financial characteristics of the bidders and targets in this cluster. The size difference between bidders and targets, with the average assets of the bidders at approximately $15 billion and the targets at just over $1 billion, is the major characteristic difference between the two groups. The other ratios are very similar between the bidders and targets, leading us to propose that these mergers tend to support the size-maximizing hypothesis.

Cluster 6 (Contains 86 mergers)

The size difference between bidders and targets is the smallest in this cluster, as measured by average assets ($4.2 billion for bidders, $442 million for targets) and number of branches (118 for bidders, 16 for targets). The bidders tend to be significantly more profitable, with average ROAs of 1.24 percent versus 0.95 percent and average ROEs of 14.86 percent versus 11.02 percent. The bidders also were more efficient and enjoyed a greater contribution of non-interest income than their targets, on average. Overall, the financial characteristics of this cluster would tend to support the improved-management hypothesis.

Return Results

In the bidder regression (Exhibit 1), relative size between the bidders and targets, as well as the form of compensation for the merger/acquisition, specifically stock transactions, are significant determinants of cumulative abnormal returns. These findings are in line with other studies and are as expected. In the target regression (Exhibit 2), there are no statistically significant determinants of cumulative abnormal returns, nor is the model statistically significant. While this outcome is surprising, it is posited that model misspecification, as well as poor variable selection for the cluster analysis, may be underlying causes. However, it should be noted that this finding is fairly consistent with the results of Sawyer and Shrieves.

Overall, bidders experienced a statistically significant positive abnormal return the day before the announcement of the merger and a statistically significant negative abnormal return on the day of the merger announcement, which lasted through the third day following the merger announcement. The bidders' negative cumulative abnormal return began over two weeks in advance of the merger announcement, with the major negative movement occurring at the announcement day and continuing well beyond the end of the evaluation period. Clusters 1 and 5 experience extremely negative cumulative abnormal returns resulting in the decline of shareholder wealth through day +20 of the merger announcement, indicating that possibly these buyers were being punished by the market for a poor purchase choice (Exhibit 4). The findings related to buyers are consistent with previous merger studies.

Exhibit 1

Buyer Regression Data:

$$CAR_j = a_0 + a_1RELSZ_j + a_2STOCK_j + a_3(STOCK_j \times RELSZ_j) + \text{Sum } b_iCLSTR_{ij} + \text{Sum } c_i(CLSTR_{ij} \times STOCK_{ij}) + e_j$$

Bidders

N	212
Adjusted R^2	0.0921
Overall F-Statistic	3.62
Probability Level	0.0006

Variable		Coefficient	t-value	P > t
INTERCEPT	a_0	-0.02043	-1.03	0.3048
RELSZ	a_1	-0.00865	-1.43	0.1553
STOCK	a_2	-0.00610	-0.29	0.7689
STOCK*RELSZ	a_3	0.00166	0.26	0.7955
CLSTR1	b_1	0.00575	0.74	0.4587
CLSTR3	b_2	-0.00478	-0.27	0.7877
CLSTR5	b_3	-0.03513	-2.08	0.0392
CLSTR*STOCK3	c_1	0.00092	0.05	0.9631
CLSTR*STOCK5	c_2	0.01977	1.10	0.2730

TESTS:

	F value	Pr > F
$b_1 = 0$:	0.55	0.4587
$b_2 = 0$:	0.07	0.7877
$b_3 = 0$:	4.31	0.0392
$b_2 + c_1 = 0$:	0.17	0.6781
$b_3 + c_2 = 0$:	6.37	0.0124
$b_2 = c_1 = 0$:	0.12	0.8846
$b_3 = c_2 = 0$:	5.34	0.0055
$a_1 + a_3 = 0$:	11.57	0.0008
$a_1 = a_3 = c_1 = c_2 = 0$:	0.46	0.7655

NOTE: Cluster number one contained only stock purchases. Therefore, the last term in the above model sums to N-2 rather than N-1 as would normally be the case. Cluster number six was used for the reference cluster in the regression and clusters two and four were omitted from the regression due to their small size.

Shareholders of targets, as expected, are the relative beneficiaries of the resulting wealth effects, experiencing positive abnormal returns at the announcement of the merger. Their positive cumulative abnormal returns commenced with the merger announcement and continue well beyond the end of the evaluation period (Exhibit 6). When evaluating the individual bidder and target cluster abnormal and cumulative abnormal returns, the relationships that are observed from the combined data analysis are still present; however, it is interesting to observe the relative differences between the four clusters as shown in the graph. Shareholders of banks in clusters 2, 5, and 6 are especially benefitted by their mergers. Overall, the reaction of the market in rewarding the targets' shareholders is consistent with previous merger findings.

Exhibit 2

Target Regression Data

$$CAR_j = a_0 + a_1 RELSZ_j + a_2 STOCK_j + a_3(STOCK_j \times RELSZ_j) + \text{Sum } b_i CLSTR_{ij} + \text{Sum } c_i(CLSTR_{ij} \times STOCK_{ij}) + e_j$$

	Targets
N	190
Adjusted R^2	0.0075
Overall F-Statistic	1.15
Probability Level	0.3276

Variable		Coefficient	t-value	P > t
INTERCEPT	a_0	0.23561	1.54	0.1257
RELSZ	a_1	-0.01666	-0.52	0.6062
STOCK	a_2	-0.07721	-0.49	0.6232
STRELSZ	a_3	0.00479	0.14	0.8883
CLSTR4	b_1	-0.19317	-1.95	0.0532
CLSTR5	b_2	-0.21611	-2.17	0.0312
CLSTR6	b_3	-0.14609	-1.04	0.2999
CLSTOCK4	c_1	0.16848	1.55	0.1240
CLSTOCK5	c_2	0.20623	1.99	0.0481
CLSTOCK6	c_3	0.09863	0.66	0.5120

TESTS:

	F value	Pr > F
$b_1 = 0$:	3.79	0.0532
$b_2 = 0$:	4.72	0.0312
$b_3 = 0$:	1.08	0.2999
$b_1 + c_1 = 0$:	0.30	0.5847
$b_2 + c_2 = 0$:	0.12	0.7332
$b_3 + c_3 = 0$:	0.81	0.3702
$b_1 = c_1 = 0$:	2.04	0.1325
$b_2 = c_2 = 0$:	2.42	0.0922
$b_3 = c_3 = 0$:	0.94	0.391
$a_1 + a_3 = 0$:	1.19	0.2764
$a_1 = a_3 = c_1 = c_2 = c_3 = 0$:	1.43	0.214

NOTE: Cluster number two was used for the reference cluster in the regression and clusters one and three were omitted from the regression due to their small size.

Exhibit 3: Resulting Clusters Based on Financial Characteristics						
CLUSTER #	1	2	3	4	5	6
FREQ	27	1	28	2	68	86
BUYER						
BTA (000)	4,073,000	28,346,099	51,136,035	1,454,248	14,946,683	4,197,501
BNLTA	15.22	17.16	17.75	14.19	16.52	15.25
BROA	1.26	15.26	1.37	0.52	1.13	1.24
BROE	15.58	14.51	18.60	6.72	14.94	14.86
BEA	8.60	10.88	7.33	7.83	7.58	8.38
BCDTD	0.00	0.00	0.86	0.98	0.94	0.92
BNPAA	0.60	NA	1.37	4.21	1.08	0.71
BOEAA	2.95	25.24	3.59	4.24	3.94	2.87
BER	58.07	43.38	62.51	78.02	68.69	58.69
BNIIAA	1.24	21.65	1.67	1.30	1.86	1.06
BPPL	146.54	200.05	196.69	477.14	151.39	170.12
BNB	176.62	508.00	1029.74	47.00	289.10	117.75
TARGET						
TTA (000)	404,335	408,399	1,226,898	198,789	1,088,161	442,413
TNLTA	12.91	12.92	14.02	12.20	13.90	13.00
TROA	1.08	0.76	0.95	0.80	0.93	0.95
TROE	11.82	7.43	11.58	8.88	11.61	11.02
TEA	9.94	9.00	8.63	7.91	8.28	8.95
TCDTD	0.42	0.00	0.91	0.96	0.89	0.89
TNPAA	0.65	0.06	1.65	4.13	1.82	0.89
TOEAA	2.81	1.40	3.08	3.38	3.04	2.88
TER	63.38	58.00	65.08	76.30	67.54	66.13
TNIIAA	0.73	0.05	1.05	0.61	0.80	0.71
TPPL	146.54	200.05	196.69	477.14	151.39	170.12
TNB	30.15	6.00	112.04	6.50	53.30	15.58

FREQ Number of banks in cluster
TA (000) Total assets in thousands of dollars pre-merger
NLTA Natural log of total asset pre-merger
ROA Return on assets
ROE Return on equity
EA Ratio of equity to total assets
CDTD Ratio of core deposits to total deposits
NPAA Ratio of non-performing assets to total assets
OEAA Ratio of operating expense to average assets
ER Efficiency ratio
NIIAA Ratio of non-interest income to average assets
PPL Ratio of price to market price 1 year prior to date (target purchase price/lag(tp))
NB Number of branches

Exhibit 4

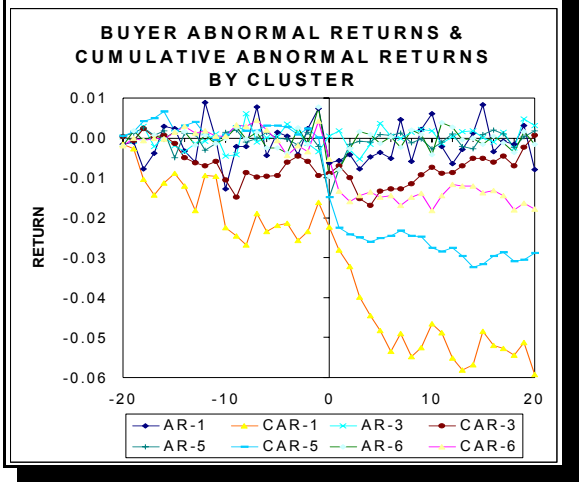


Exhibit 5

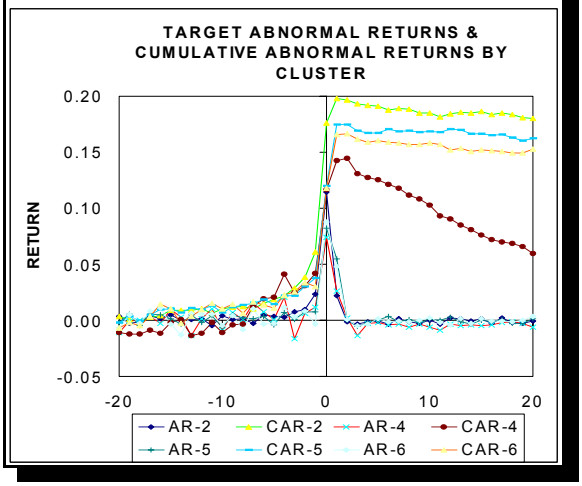
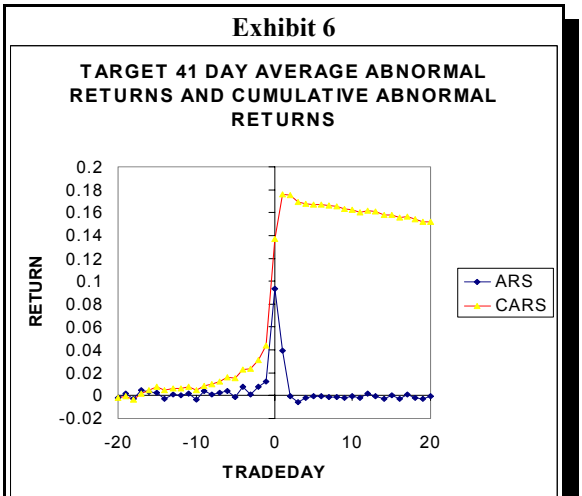


Exhibit 6



CONCLUSIONS

The merger and acquisition activity of depository institutions increased dramatically during the 1990s, with various theories hypothesized regarding the cause of this marked increase. Previous studies, generally, have focused on single factors based on the researchers' preconceived ideas regarding the motivation for mergers. Given the number of merger theories, studies based on one motivating factor may not be able to identify results that validate an alternative. To avoid this problem, this paper separates depository institution mergers into homogeneous groups of bidders and targets based on the pre-merger financial characteristics of each by using the non-biased method of cluster analysis. The resulting wealth effects accruing to both buyers and targets are as expected,

buyers generally lose and targets gain, and are consistent with previous studies of this type. The magnitude of the gains and losses vary from cluster to cluster indicating that there are combinations of characteristics which result in "better" or "worse" mergers. However, it is important to note that this paper is a work in progress. While some of findings support existing merger theories, others are marginal at best. The investigation will continue with added results forthcoming.

REFERENCES

Asquith, P., R.F. Bruner &D.W. Mullins. (1987). Merger returns and the form of financing. Unpublished manuscript.

Baradwaj, B.G., D.R. Fraser & P.H. Furtado. (1990). Hostile bank takeover offers. *Journal of Banking and Finance, 14,* 1229-1242.

Berger, A.N., W.C. Hunter & S.G. Timme. (1993). The efficiency of financial institutions: A review and preview of research past, present, and future. *Journal of Banking and Finance, 17,* 221-249.

Brown, S.J. & J.B. Warner. (1985). Using daily stock returns: The case of event studies. *Journal of Financial Economics, 14,* 3-31.

Chang, D., B. Gup & L. Wall. (1989). Financial determinants of bank takeovers. *Journal of Money, Credit, and Banking,* 524-536.

Cornett, M.M. & S. De (1991). Common stock returns in corporate takeover bids: Evidence from interstate bank mergers. *Journal of Banking and Finance, 15*, 273-295.

Cornett, M.M. & H. Tehranian. (1992). Changes in corporate performance associated with bank acquisitions. *Journal of Financial Economics, 31*, 211-234.

Curry, T.J. & J.T. Rose. (1997). Thrift strategies after FIRREA: A cluster analysis of high-performance institutions. *Journal of Economics and Business, 49*, 223-238.

Desai, A. & R. Stover. (1985). Bank holding company acquisitions, stockholder returns and regulatory uncertainty. *Journal of Financial Research, 8*, 145-156.

Gupta, A., R. LeCompte & L. Misra. (1997). Acquisitions of solvent thrifts: Wealth effects and managerial motivations. *Journal of Banking and Finance, 21*, 1431-1451.

Hair, J.F., R.E. Anderson, R.L. Tatham & W.C. Black (1995). *Cluster Analysis, Multivariate Data Analysis*. Englewood Cliffs, NJ: Prentice Hall.

Hannan, T.H. & J.D. Wolken. (1989). Returns to bidders and targets in the acquisition process: Evidence from the banking industry. *Journal of Financial Services Research, 3*, 5-16.

Houston, J.F. & M.D. Ryngaert (1994). The overall gains from large bank mergers. *Journal of Banking and Finance, 18*, 1155-1176.

James, C. & P. Weir (1983). Returns to acquirers and competition in the acquisitions market: The case of banking. *Journal of Political Economy, 95*, 355-370.

Lee, D. (1998). The gains from takeover deregulation: Evidence from the end of interstate banking restrictions. *Journal of Finance, 53*, 2185-3001.

Madura, J. & K.J. Wiant. (1994). Long-term valuation effects of bank acquisitions. *Journal of Banking and Finance, 18*, 1135-1154.

Malatesta, P. & R. Thompson. (1985). Partially anticipated events: A model of stock price reactions with an application to corporate acquisitions. *Journal of Financial Economics, 14*, 237-250.

Pettway, R.H. & T. Yamada. (1986). Mergers in Japan and their impacts upon shareholders' wealth. *Financial Management, 15*, 43-52.

Pilloff, S.J. (1996). Performance changes and shareholder wealth creation associated with mergers of publicly traded banking institutions. *Journal of Money, Credit and Banking, 28*, 294-311.

Sawyer, G.M. & R.E. Shrieves. (1994). Stockholder returns among homogeneous groups of mergers. *Journal of Financial Research, 17*, 45-63.

Scanlon, K.P., J.W. Trifts & R.H. Pettway. (1989). Impacts of relative size and industrial relatedness on returns to shareholders of acquiring firms. *Journal of Financial Research, 12*, 103-112.

Subrahmanyam, V., N. Rangan & S. Rosenstein. (1997). The role of outside directors in bank acquisitions. *Financial Management, 26*, 23-37.

Trifts, J. & K. Scanlon. (1987). Interstate bank mergers: The early evidence. *Journal of Financial Research, 10*, 305-311.

Whalen, G. (1997). Wealth effects of intraholding company bank mergers: Evidence from shareholder returns. *Managerial Finance, 23*, 91-107.

Zhang, H. (1995). Wealth effects of U.S. Bank Takeovers. *Applied Financial Economics, 5*, 329-336.

Zhang, H. (1998). U.S. evidence on bank takeover motives: A note. *Journal of Business Finance and Accounting, 25*, 1025-1032.

MUTUAL FUNDS' RISK ADJUSTED PERFORMANCE

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ABSTRACT

Using data provided from Value Lines Mutual Fund Survey, this research extends the current knowledge on the performance of mutual funds by using the Modigliani and Modigliani (1997) M2 measure. Previous research measures performance with an excess return (Return minus risk-free rate) or return divided by risk measure. This research also includes international funds, which have been left out of many studies. We examine the M2 in terms of the fund type, size, turnover, longevity of management, fees and load. We find that the aggressive growth funds provide the highest risk-adjusted returns of the mutual fund types examined. The other variables that affect the risk-adjusted mutual fund return are the percent invested in stock and cash equivalents.

INTRODUCTION

From the first one created in the 1920's to the thousands that are available today, mutual funds are a popular investment vehicle. When investors look at mutual funds, they need to consider two characteristics, risk and return. In an ideal world, there would be high returns with no risk. Unfortunately, that's not how the investment world works. All too often, risk is often mentioned in terms of the classification of the fund (aggressive growth, growth, income, balanced, and international are categories often used). Mutual funds are split into different objective categories to suit each investor's needs. For example, a retired person will be interested in income preservation with lower risk while a college student would seek out aggressive growth higher risk.

Once mutual funds are classified by their objectives, it is ranked on how its return compares to the other funds in the category. Whether a fund is miss-classified, or the reward-to-risk performance of a fund, usually isn't considered.

In order for investors to increase returns, they need to increase risk. But with greater risk there's a possibility of taking a greater loss. There are several ways to adjust performance for risk. First, we can use the Sharpe Ratio:

$$(R_p - R_f)/ \sigma$$

Where,

R_p = Return on the (Risky) Portfolio
R_F = Return on the Risk-free Rate
σ = Standard deviation of the risky portfolio.

I.e., the Sharpe Ratio measures the Excess return (return on the portfolio minus the risk-free rate of return) per unit of risk, with the standard deviation of the risky portfolio used as the measure of risk. With the Sharpe ratio, the higher the index value, the better the portfolio. A negative index number can only result from a return on the portfolio below the risk-free rate of return.

The second measure is the Treynor Ratio. The Treynor Ratio is similar the Sharpe Ratio, but it uses beta as a measure of risk:

$$(R_p - R_f)/ \beta$$

Where,

R_p, R_f are the return on the portfolio and the Risk-free rate (as before), and
β = The systematic risk measure

In general, the higher the Treynor Ratio, the better the portfolio. However, negative results need to be carefully interpreted. Beta, the measure of systematic risk can be negative as well as positive. Thus a negative number could be the result of a very well diversified portfolio.

A third measure of risk-adjusted performance is M^2 (M-squared) by Modigliani and Modigliani (1997). M^2 takes the opportunity cost of a risky portfolio to adjust portfolios to a risk level of an unmanaged benchmark, such as the S&P 500:

$$M^2 = (\sigma_{index}/\sigma_p)*(R_p-R_f) +R_f$$

Where,

σ_{index} = Standard deviation (volatility) of unmanaged benchmark
σ_p = Standard Deviation (volatility) of risky portfolio
R_p, R_f are the return on the portfolio and the Risk-free rate (as before), and

The Risk Adjusted Performance is measured with basis points, thus one is able to compare one fund's performance against other funds. Like the Sharpe Ratio, M^2 uses the portfolio's standard deviation as the measure of risk. The only difference between the Sharpe Ratio and M^2 is the use of basis points as the measurement units. M^2 aims to answer the question, "Am I being fully compensated for the risk that I am taking on?" As Hopkins and Akins (1999) state, the risk that investors are concerned with is volatility, specifically, the volatility of the portfolio compared to the volatility of a stated benchmark. With M^2 we can make this comparison.

Several studies have examined mutual fund returns. Werner (2000) examines the performance of aggressive growth, growth, growth and income, and balanced funds. He finds that lower net return achieved by mutual funds is caused by non- stock holdings of the funds, expenses and transaction costs. Blake and Morey (2000) find that funds rated low by Morningstar generally do have relatively low future performance but funds rated the highest by Morningstar don't outperform funds in the next to highest or median categories. Rao (2001) examines the impact of distribution fees. DiBartolomeo and Witkowski (1997) find that 40% of mutual funds are misclassified, 9% seriously so. They cite ambiguity of classification systems and competitive

pressures as the major reasons for misclassification. Kim, Shukla, and Tomas (2000) agree that a majority of mutual funds are misclassified (with a third seriously misclassified), but they disagree that fund managers are gaming their objectives (deviating from stated objectives in order to achieve a higher ranking).

DATA

Data was provided by the October, 1999 Value Line Mutual Fund Survey. Our data set includes all mutual funds categorized as either an aggressive growth, balanced, foreign, growth, growth and income, or income fund by the Value Line Mutual Fund Survey. To be included in the sample, the fund must have been in existence for at least ten years and complete information on the fund must be available. This study covers the returns over the October 1989 to October 1999 period. We choose this period because it includes the recession of 1990-1991 as well as the bull market of the late 1990s. We examined the following variables in this study:

M^2	The Modigliani and Modigliani M^2 measure of risk adjusted return. Return for each fund was calculated as the ten-year average return, based on the ten-year total return, and the ten-year standard deviation for the fund and the S&P 500.
TURN	the percentage average yearly turnover of the portfolio.
STOCK	The percentage of the portfolio kept in stocks.
CASH	The percentage of the portfolio kept in money market securities
EXP	The average annual expense ratio for the firm. This ratio (expressed as a percentage of the total return) is the amount the management firm charges the mutual fund shareholders for administrative, research, and trading expenses.
MGMT	The percentage charged the fund holder for management fees.
TEAM	A dummy variable, 1 if team managed, 0 otherwise representing whether or not the fund was managed by a group (team) or a single manager.
TEN	Tenure. For funds managed by an individual, the number of months that individual has been in charge of the fund.
12b-1	The percentage charged by the fund for this fee.
LOAD	A dummy variable, 1 if no-load, 0 if load representing whether or not the fund charge a sales fee (load) to the investors in the fund.
MAXLOAD, MINLOAD, REDEMPT, DEFERRED	For Load funds, the percentage charged in each of these categories.
AG	A Dummy variable, 1 if an aggressive growth fund, 0 otherwise.
BA	A Dummy variable, 1 if a balanced fund, 0 otherwise.
FO	A Dummy variable, 1 if a foreign fund, 0 otherwise.
GR	A Dummy variable, 1 if a growth fund, 0 otherwise.
IN	A Dummy variable, 1 if an income fund, 0 otherwise.

Table 1 provides the descriptive statistics for the variables, M^2, TEN, LOAD, TURN, STOCK, CASH, EXP, MGMT, and 12b-1. Table 2 provides the descriptive statistics for M2 for each type of mutual fund.

Table 1
Descriptive Statistics for Data Set

	M^2	Ten	Load	Turn	Stock	Cash	Exp	Mgmt	12B-1
Mean	0.031	85.617	0.580	0.747	0.873	0.045	0.012	0.673	0.203
Standard Error	0.000	3.923	0.023	0.042	0.009	0.003	0.000	0.011	0.013
Median	0.032	62.000	1.000	0.580	0.947	0.030	0.011	0.680	0.170
Mode	0.033	43.000	1.000	0.580	0.000	0.000	0.010	0.750	0.000
Std. Deviation	0.006	75.047	0.494	0.908	0.191	0.068	0.006	0.230	0.275
Kurtosis	11.912	3.819	-1.902	139.161	9.065	77.546	65.917	3.324	2.418
Skewness	-2.434	1.555	-0.326	9.264	-2.815	6.655	5.446	0.619	1.725
Minimum	-0.015	1.000	0.000	0.000	0.000	-0.098	0.000	0.000	0.000
Maximum	0.041	495.000	1.000	15.280	1.030	0.985	0.089	1.960	1.000
Count	474	366	474	474	474	474	474	474	474
Largest(1)	0.041	495.000	1.000	15.280	1.030	0.985	0.089	1.960	1.000
Smallest(1)	-0.015	1.000	0.000	0.000	0.000	-0.098	0.000	0.000	0.000
Confidence (95%)	0.001	7.714	0.045	0.082	0.017	0.006	0.001	0.021	0.025

RESULTS

Our first investigation is the hypothesis that there will be no differences in M^2 between the types of mutual funds. To test this, a two-tailed Z-test is used. Table 3 presents the finding for this set of results. With the exception of the exception of the growth fund/foreign fund pairing, all of the results were significant. Thus an investor can see that the risk adjusted return will differ depending on the type of fund one chooses to invest. Somewhat surprisingly, aggressive growth funds have the highest M^2, followed by the foreign and growth funds, and then by the growth and income, income, and balanced funds. It is somewhat surprising that the aggressive growth funds do have a better risk-adjusted performance than the growth funds, because this is the category where the most risk is taken. The performance of the market in the 1996 - 1999 period may have skewed these results a bit. However, none of the categories provided a risk-adjusted return that was higher than investing in a risk-free security.

Table 2: M^2						
	AG	BA	FO	GI	GR	IN
Mean	0.035996	0.022511	0.032702	0.029751	0.032513	0.025683
Standard Error	0.000362	0.000587	0.000242	0.000446	0.000262	0.001222
Median	0.036187	0.022163	0.032554	0.030488	0.032818	0.027869
Standard Deviation	0.002429	0.004149	0.001512	0.004109	0.003819	0.007917
Kurtosis	-0.449057	0.599028	3.536058	21.190113	15.655587	18.164681
Skewness	-0.408445	0.265406	1.321643	-4.007569	-3.024015	-4.021193
Range	0.009988	0.021287	0.007420	0.030967	0.031267	0.046053
Minimum	0.031224	0.012103	0.030126	0.004145	0.006985	-0.014858
Maximum	0.041212	0.033390	0.037546	0.035112	0.038253	0.031194
Count	45	50	39	85	212	42
Largest(1)	0.041212	0.033390	0.037546	0.035112	0.038253	0.031194
Smallest(1)	0.031224	0.012103	0.030126	0.004145	0.006985	-0.014858
Confidence (95%)	0.000730	0.001179	0.000490	0.000886	0.000517	0.002467

To further examine these results we conducted a series of regression analysis. The first regression used all 474 funds and examined the M^2 in terms of the variables TEAM, LOAD, TURN, STOCK, CASH, EXP, MGMT, 12B-1, AG BA, FO, GR, and IN. Thus we choose all the variables that were pertinent to all of the funds. As Table 4 shows, this regression, significant at the five-percent level, has an adjusted R-squared of .55. However, the only variables to be significant are CASH, and the dummy variables for type of fund: AG, BA, FO, GR, and IN. Those variables with a negative relationship with M^2 are TEAM, LOAD, IN, and BA. These results could be expected. Funds that are managed by committee, or charge their shareholders a sales fee, should do worse than other funds. Also, the Balanced and income fund invest in many types securities with lower rates of return (and less risk.) However, there are some surprising results. Though the cash variable is insignificant, many investors would expect that putting more of the assets into money market securities would reduce the returns. These results suggest that the risk-reducing attributes of cash investments outweigh their drag on returns. Another surprise was the coefficient for EXP. Though this variable is insignificant, it is counter to the usual advise of selecting funds with lower fees. Perhaps the fees charged by some managers are justified by their ability to find optimal investments.

Table 3
Results of Z-tests for d

	AG/BA				
z	19.0683*				
P(Z<=z) two-tail	0				
z Critical two-tail	1.9600				
	AG/FO	*BA/FO*			
z	7.2489*	-15.7788*			
P(Z<=z) two-tail	4.23E-13	0			
z Critical two-tail	1.9600	1.9600			
	AG/GI	*BA/GI*	*FO/GI*		
z	10.8459*	-9.8277*	5.6652*		
P(Z<=z) two-tail	0	0	1.47E-08		
z Critical two-tail	1.9600	1.9600	1.9600		
	AG/GR	*BA/GR*	*FO/GR*	*GI/GR*	
z	7.7657*	-15.5671*	0.5185	-5.3382*	
P(Z<=z) two-tail	8.22E-15	0	0.6041	9.41E-08	
z Critical two-tail	1.9600	1.9600	1.9600	1.9600	
	AG/IN	*BA/IN*	*FO/IN*	*GI/IN*	*GR/IN*
z	8.1109*	-2.3407*	5.6135*	3.1279*	5.4656*
P(Z<=z) two-tail	4.44E-16	0.0192	1.99E-08	0.0018	4.63E-08
z Critical two-tail	1.9600	1.9600	1.9600	1.9600	1.9600

* Significant at 5% level.

Table 4
Regression involving all 474 funds

Regression Statistics						
Multiple R	0.75283					
R Square	0.56675					
Adjusted R Square	0.55450					
Standard Error	0.00374					
Observations	474					
ANOVA						
	df	SS	MS	F	Significance F	
Regression	13	0.00842	0.00065	46.28751*	4.63E-75	
Residual	46					
	473	0.01486				
	Coefficients	Std Error	t Stat	P-value	Lower 95%	Upper 95%
Intercept	0.01804	0.00135	13.34443*	1.44E-34	0.01539	0.02070
TEAM	-0.00088	0.00379	-0.23292	0.81593	-0.00834	0.00657
LOAD	-0.00045	0.00044	-1.02399	0.30638	-0.00130	0.00041
TURN	0.00011	0.00024	0.45107	0.65215	-0.00036	0.00058
STOCK	0.01209	0.00115	10.52786*	2.29E-23	0.00984	0.01435
CASH	0.00388	0.00278	1.39595	0.16340	-0.00158	0.00934
EXP	0.04588	0.04525	1.01390	0.31116	-0.04304	0.13481
MGMT	0.00043	0.00090	0.47759	0.63317	-0.00134	0.00220
12b-1	0.00038	0.00081	0.46308	0.64353	-0.00122	0.00197
AG	0.00560	0.00077	7.29767*	1.29E-12	0.00409	0.00711
GR	0.00258	0.00057	4.52999*	7.53E-06	0.00146	0.00370
IN	-0.00311	0.00078	-4.00997*	7.08E-05	-0.00463	-0.00159
BA	-0.00363	0.00082	-4.44880*	1.08E-05	-0.00523	-0.00202
FO	0.0021	0.0008	2.6705*	0.00784	0.00057	0.00372

* Significant at 5% level.

Table 5
Single Manager Funds

Regression Statistics						
Multiple R	0.75599					
R Square	0.57152					
Adjusted						
R Square	0.55570					
Standard Error	0.00370					
Observations	366					
ANOVA						
	df	SS	MS	F	Significance F	
Regression	13	0.00641	0.00049	36.11602*	6.7357E-57	
Residual	352	0.00481	1.3658E-05			
Total	365	0.01122				
	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%
Intercept	0.01385	0.00182	7.61595*	2.43E-13	0.01028	0.01743
TEN	-9.0E-06	2.67E-06	-3.3801* 2	0.00081	-1.43E-05	-3.78E-06
LOAD	-0.0003	0.0005	-0.71191	0.47699	-0.00131	0.00061
TURN	0.0002	0.0003	0.76502	0.44477	-0.00030	0.00069
STOCK	0.0170	0.0016	10.77648*	0.00000	0.01388	0.02008
CASH	0.0101	0.0031	3.24224*	0.00130	0.00397	0.01620
EXP	0.0269	0.0496	0.54223	0.58800	-0.07061	0.12437
MGMT	0.0007	0.0010	0.67016	0.50320	-0.00131	0.00266
12B-1	0.0008	0.0009	0.91021	0.36334	-0.00092	0.00250
AG	0.0054	0.0008	6.77103*	0.00000	0.00384	0.00699
GR	0.0024	0.0006	3.79809*	0.00017	0.00115	0.00361
INC	-0.0025	0.0009	-2.82922*	0.00493	-0.00432	-0.00078
BAL	-0.0024	0.0010	-2.36857*	0.01840	-0.00440	-0.00041
FOR	0.0019	0.0009	2.21188*	0.02762	0.00022	0.00367

* Significant at 5% level.

Table 6
Load Fund Results

Regression Statistics						
Multiple R	0.81367					
R Square	0.66206					
Adjusted R Square	0.63635					
Standard Error	0.00358					
Observations	199					
ANOVA						
	df	SS	MS	F	Significance F	
Regression	14	0.00462	0.00033	25.74855*	4.12E-36	
Residual	184	0.00236	1.28E-05			
Total	198	0.00698				
	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%
Intercept	0.01899	0.00405	4.68341*	5.47E-06	0.01099	0.02699
STOCK	0.01076	0.00172	6.26243*	2.61E-09	0.00737	0.01415
CASH	0.00857	0.00356	2.40830*	0.01701	0.00155	0.01559
EXP	0.14693	0.07854	1.87076	0.06297	-0.00803	0.30188
MGMT	0.00044	0.00174	0.25273	0.80076	-0.00299	0.00387
12B-1	0.00173	0.00143	1.21567	0.22567	-0.00108	0.00454
AG	0.00276	0.00389	0.70910	0.47916	-0.00492	0.01043
GR	0.00024	0.00384	0.06145	0.95107	-0.00734	0.00781
INC	-0.00678	0.00388	-1.74821	0.08210	-0.01443	0.00087
BAL	-0.00689	0.00393	-1.75451	0.08101	-0.01464	0.00086
FOR	-0.00106	0.00397	-0.26781	0.78915	-0.00890	0.00677
MAXLOAD	0.00027	0.00024	1.11358	0.26691	-0.01463	0.00074
MINLOAD	-0.00069	0.00089	-0.77531	0.43915	-0.00245	0.00107
REDEMPT	0.00122	0.00120	1.01323	0.31228	-0.00116	0.00360
DEFFERED	-0.00001	0.00032	-0.02753	0.97807	-0.00064	0.00062

* Significant at 5% level.

A second regression was done for the 366 funds managed by a single manager. It is often suggested that investors should look at the experience of the fund manager. If this is important, tenure, the length of time a manager has been in place with the fund, should be important. For this regression we used the same variables as the first, with the exception of using TEN in place of TEAM. Table 5 provides these results and shows that the equation is significant. Tenure, along with stock, cash, the variables for fund type are significant. The relationship for tenure is, however, a very slight negative relationship. This suggest that either it is the total experience possessed by a fund manager, not just the time at a particular fund, or perhaps some fund managers may have stayed too long. CASH and STOCK both have positive affects on M2. This suggests that it is the including other investments (such as bonds) decreases the risk-adjusted returns for a fund. Other variables that have a negative relationship with M^2 are LOAD, IN, and BA, though LOAD is insignificant.

Last, we looked at load funds and the how the various sales fees (load) will affect the risk-adjusted return. Thus, we added variables MAXLOAD, MINLOAD, REDEMPT, and DEFERRED to the analysis, while deleting TEN. As seen in Table 6 the regression equation is significant at the five percent level. However, none of the variables relating to the load fees are significant. The only significant variables in this equation are STOCK and CASH. And, as in the previous equation, both have a positive affect on M^2. Though insignificant, MINLOAD and DEFERRED have slightly negative effects on M^2 and MAXLOAD and REDEMPT have slightly positive effects.

CONCLUSION

We examined the returns for 474 mutual funds classified as either aggressive growth, balanced, foreign, growth, growth and income, or income funds. Using M^2 as the measure of risk-adjusted return, we found that aggressive growth funds provide the highest risk-adjusted return. The other variables that affect the risk-adjusted mutual fund return are the percent invested in stock and cash equivalents. These results suggest that investors only need to examine the percent of the assets invested in stock and cash, as well as the type of fund to be sure that they're getting the best results for the amount of risk they're willing to take.

REFERENCES

Blake, C. R. & M. R. Morey. (2000). Morningstar Ratings and Mutual Fund Performance, *Journal of Financial and Quantitative Analysis, 35* (Sept), 451-483.

DiBartolomeo, D. & E. Witkowski. (1997). Mutual Fund Misclassification: Evidence Based on Style Analysis, *Financial Analysts Journal, 53* (September/October), 32-43.

Kim, M., R. Shukla & M. Tomas. (2000). Mutual Fund Objective Misclassification, *Journal of Economics and Business, 52* (Jul/Aug), 309-323.

Malkiel, B. (1995). Returns From Investing in Equity Mutual Funds, *Journal of Finance, 50,* 549-572.

Modigliani, F. & L. Modigliani. (1997). Risk-Adjusted Performance, *Journal of Portfolio Management,*

Payne, T. H., L. Prather & B. William. (1999). Value Creation and the Determinants of Equity Fund Performance, *Journal of Business Research, 45* (May), 69-74.

Rao, S. P. U. (2001). Economic Impact of Distribution Fees on Mutual Funds, *American Business Review, 19* (Jan), 1-5.

Werner, R. (2000). Mutual Fund Performance, *Journal of Finance, 55*(August), 1655-1695.