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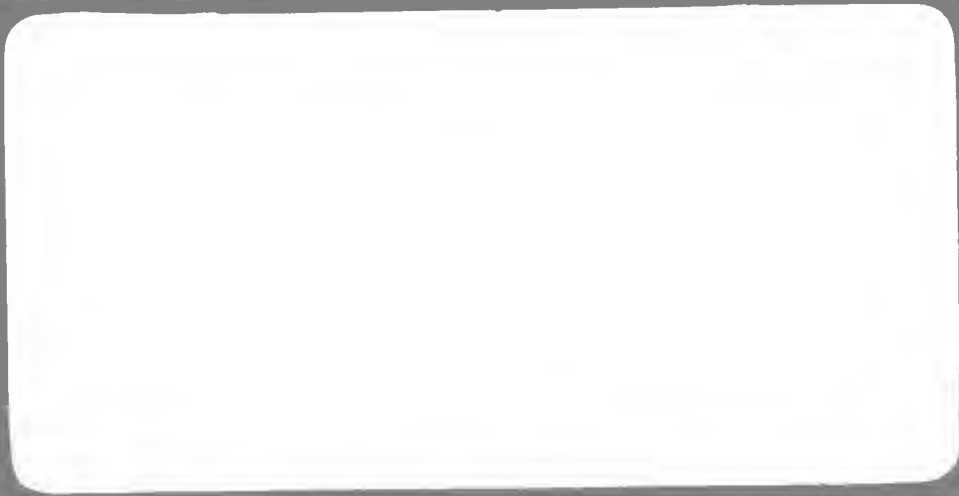
COMMERCIAL BANK FINANCIAL POLICIES AND THE EFFECT OF
ON MARKET-DETERMINED MEASURES OF RISK

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Summary:

This paper investigates the relationship between certain accounting measures that purport to reflect a firm's risk and two market-based measures of risk. The firms examined are commercial banks and bank holding companies. Some commonly used ratios to indicate risk in banking are capital to total assets, loans to deposits, liquid assets to total assets, and loan losses to total loans. These and other measures are included in multiple regression equations using systematic risk (beta) and total risk (standard deviation of return) as dependent variables. Results indicate that the accounting measures do explain from 25% to 43% of the variation in the market-based risk measures for banks. Signs of the estimated coefficients are usually consistent with expectations, supporting the conventional views of the usefulness of these ratios in measuring the riskiness of a bank.



Commercial bank management, through decisions about uses and sources of funds, determines expected return and an associated level of risk for the owners of the bank's common stock. The results of these management decisions influence investors' expectations which are then reflected in the price of the common stock. The nature of the connection between management decisions and stock price is of interest to the management that is trying to maximize the wealth of the bank's shareholders. Stock price is influenced by the investor's consideration of both expected return and risk. Thus the connection between management decision making and the risk of the common stock investment is a subject of importance.

A previous study by Beighley, Boyd and Jacobs [1975] (BBJ) examined the relationship between financial leverage and stock price for 113 bank holding companies (BHC). The focus of the BBJ study is on one management decision, the degree of financial leverage to employ, and attempts to isolate the sensitivity to this measure exhibited by equity investors. BBJ use the average level of the common stock price (3 month average) as a dependent variable. However, this does not capture the true measure of the benefit to the investor, which is the return on the investment in the common stock. To get a measure of return, the change in the stock price and the associated dividend paid must be considered. The BBJ results say that for the given sample of bank holding companies, the higher a bank's degree of financial leverage at a point in time, the lower is the bank's stock price (after controlling for bank size, earnings growth, dividends and loan losses). It says nothing about the behavior of the bank's stock price over time, or the return to the investor from holding the bank's stock.

In our study the effect of a bank's financial leverage, as well as measures of other management decisions, on the riskiness of the investment in the bank's stock is examined. Rather than using stock price as a dependent variable, we use two measures of the riskiness assigned to a bank's stock by "the market", or by the equity investors in that common stock. This enables us to identify, for each market measure of risk, how management decisions affect these risk assessments.

In section I the idea of risk in a commercial bank will be examined, and two market-determined measures of a bank's risk are introduced. Other studies of market-determined risk and accounting measures are reviewed in section II. The following sections explain the accounting measures that are expected to influence a bank's risk and present empirical measures of the degree of association between accounting data and market-determined risk measures. The final section contains a summary and some conclusions.

I. Risk in Commercial Banking

An investor in the common stock of a commercial bank has some expectation of the return on his investment as well as the risk of this investment. The riskiness of the investment is the chance that the return will not turn out to be what is expected. The hypothesis that is to be tested in this study is that this risk, or the investor's perception of the risk, is strongly affected by the bank management's decisions that are reflected in its financial statements. For example, bank A (for aggressive) may have an asset portfolio that embodies a high level of credit risk--a high percentage of loans, few U.S. government securities. Further Bank A may

employ a high degree of financial leverage (low level of equity capital) and, perhaps, rely heavily on borrowed funds to finance assets. Bank C (for conservative) may hold relatively high levels of U.S. government securities and relatively riskless loans, have a high level of equity capital, a stable deposit base, and not rely heavily on borrowed funds.

The above measures, and other similar measures, are accounting statement values that reflect management decisions which affect the amount of risk undertaken by a bank. A conventional view of risk would certainly hold that bank A is riskier than bank C. Therefore any overall measure of risk should be higher for bank A than for bank C. Some previous research has been conducted using these accounting data to determine default risk or to predict the occurrence of default or failure.¹ Statistical models have been used to identify those accounting measures whose values will indicate to the regulatory authority that default is likely and closer attention is required. The concepts of risk used in this study include default risk, but also encompass all other risks that come to bear on the equity investment of the shareholders. That is, the risk referred to here is the riskiness of owning the bank's common stock. Thus we shall use market-determined measures of risk that are derived from portfolio theory.

Over the last decade, Sharpe [1964] and others have extended the earlier work of Markowitz [1959] to a simplified portfolio model and to a capital asset pricing model which determines the equilibrium prices of all securities. Markowitz defined the riskiness of a

¹See, for example, Meyer and Pifer [1970], Sinkey [1975] and Sinkey and Walker [1975].

portfolio of securities in terms of the variance of the portfolio's returns $[\sigma^2(R_p)]$. For a diversified portfolio composed of a large number of securities, a security's contribution to the risk of the portfolio is measured by its average covariance with all other securities in the portfolio, not its variance. According to the diagonal model of Sharpe, the return on a security (R_i) can be written as:

$$R_i = \alpha_i + \beta_i R_m + \epsilon_i \quad (1)$$

where R_m is the return on all securities (hereafter referred to as the market return), ϵ_i is the security specific factor which is independent of R_m , and α_i and β_i are the intercept and slope associated with the linear relationship.

The model asserts that the return on a security is composed of two factors, a systematic component ($\beta_i R_m$) which reflects common movement of the security's return with the market return and a security specific factor ($\alpha_i + \epsilon_i$) which reflects that portion of the security's return which is independent of the market-wide return. The total risk of the security, $\sigma^2(R_i)$, as measured by the variance can be written as

$$\sigma^2(R_i) = \beta_i^2 \sigma^2(R_m) + \sigma^2(\epsilon_i) \quad (2)$$

The first term is called the systematic risk of the security and measures the security's sensitivity to market-wide events and can not be diversified away. The second term is called the specific or diversifiable risk because that risk can be driven to zero through diversification. Thus, the only relevant risk of a security to a risk averse investor who holds a

diversified portfolio is the systematic risk. The beta coefficient (β_i) bears a direct relationship to the concept of covariance. In particular β_i is the risk of the security relative to the risk of the market portfolio, or

$$\beta_i = \frac{\text{Cov}(R_i, R_m)}{\sigma^2(R_m)}$$

where $\text{Cov}(R_i, R_m)$ is the covariance of security i 's returns with the market return and $\sigma^2(R_m)$ is the variance of the market return.

In this study we used both systematic risk, β_i , and total risk, $\sigma^2(R_i)$, as the market-determined risk measures. Since total risk includes both the systematic risk and the specific risk of a bank, we would expect financial ratios to explain a larger portion of the total risk than the systematic risk. From equation (2) it is evident that both measures of risk are positively related to each other. However, two banks with the same β_i will not necessarily have identical total risk if their specific risks are different. Differences in the specific risk may be due to the differences in some of the financial policies or events, such as liquidity position or loan losses.

Sharpe and others have extended the earlier work on portfolio analysis to the capital asset pricing model. In this model the equilibrium expected return on a security is linearly dependent upon the beta coefficient.

$$E(R_i) = R_f + \beta_i [E(R_m) - R_f] \quad (3)$$

where E is the expectation operator, R_f is the risk-free interest rate and other terms are defined previously. Note that diversifiable risk $[\sigma^2(\epsilon_i)]$ does not enter into the pricing of capital assets, since that component can be eliminated through diversification.

Empirical estimates of α_i and β_i can be obtained from a time series, least square regression of the following form:

$$R_{it} = \alpha_i + \beta_i R_{mt} + e_{it} \quad (4)$$

where R_{it} and R_{mt} are realized returns for security i and the market in month t , respectively and e_{it} is the disturbance term. The β_i 's are estimates of the β for each firm. The value of β (or its estimate, b) will vary among firms. This reflects differing investor expectations about the relationship between each firm's return and the market return. Each β then is a market measure which incorporates all information about the firm as digested by market participants. It must be pointed out that there is no "good" or "bad" β value. A high β merely indicates a firm whose returns are more volatile with respect to return on the market portfolio.

The question being examined in this paper is to what extent are the commercial bank decisions as reflected by their accounting statement data impounded or reflected in the β and $\sigma(r)$ measures? We are interested in examining the degree of influence that different accounting measures have on a bank's risk measures. For example, is it the case that the degree of financial leverage employed strongly influences a bank's risk measures, or is liquidity or the credit risk of its assets a more important determinant of the risk measures? Following a review of previous research

the methodology employed to address these questions is explained and empirical results are presented.

II. Previous Research

Besides the BBJ study cited earlier where the focus is on stock price, there exist a number of studies investigating the effects of firm financial policies on the risk of the firm. A pioneering study by Beaver, Kettler and Scholes [1970] examines the relationship (using simple correlation) between a firm's market-determined β and single indicators of financial policy. They discover significant correlations between β and dividend payout, financial leverage and an "accounting β " which measures the covariability of a firm's earnings with the earnings of all firms. In addition, this study specifies the market β as a function of several accounting measures for the purpose of forecasting the market β . Hamada [1972] investigates the relationship between β and financial leverage while Lev [1974] devises an operating leverage variable which has some explanatory power.

There exists a group of studies that use a multivariate approach to the explanation of β . A variety of explanatory variables are used to measure the riskiness of the firm's common stock that comes from the firm's financial decisions. Balance sheet and income statement data are utilized as explanatory variables in a multiple regression equation with β as the dependent variable. In a study by Logue and Merville [1972] return on assets, asset size, and financial leverage variables appear with significant coefficients. Melicher [1974], using a sample of electric

utilities finds asset size, payout ratio, return on common equity, market activity, the ratio of net plant to total capital, and financial leverage to explain from 33% to 41% of the variation in β .

No comparable research has been conducted for commercial banks. Besides the Beighley, Boyd and Jacobs study of BHC's cited earlier there is a separate study by Beighley [1977] that uses the same sample as BBJ but relates, instead of stock price, an estimate of the risk premium on the BHC's outstanding debt issues to various financial measures. Several financial leverage measures, asset size, and, for some equations, loan losses, are found to have significant coefficients.

III. Methodology

The sample utilized in this study consists of all firms in the COMPUSTAT Quarterly Bank data tape which had continuous data over the period 1972 through 1976. A total of 95 commercial banks and bank holding companies were qualified and included in the sample. For each bank the beta was estimated by using equation (4) where R_{it} and R_{mt} are the monthly percent changes in the price of security i (common stock of bank i) and the market portfolio, respectively. The beta, β_i , was estimated using the ordinary least square regression method. The market portfolio was approximated by the value weighted portfolio of all stocks listed on the NYSE. For each common stock the standard deviation of monthly price changes was used as a measure of total risk of the security, $\sigma(R_i)$. For each bank, the following financial ratios were computed using quarterly data for the period 1972 through 1976 (20 quarters).

1. Dividend payout ratio (POR), measured by average cash dividends during 1972-76 divided by average earnings available for common stockholders. The rationalization for using payout ratio as an explanatory variable rests on the well-known phenomenon of dividend stabilization; firms are reluctant to change drastically, and, in particular, to cut dividends once a certain level has been established. Consequently firms with a high degree of earnings variability will probably distribute a lower percentage of earnings than more stable firms. Therefore, we expect an inverse relationship between dividend payout ratio and both the beta (systematic risk) and the standard deviation of monthly price changes (total risk).
2. Leverage (LEV), measured by stockholders' equity divided by total assets. This ratio is important for the banking industry because of the high degree of financial leverage used by commercial banks. Because a higher degree of leverage increases financial risk, we expect an inverse relationship between the equity to total asset ratio and both systematic and total risk.
3. Coefficient of variation of deposits (CVDEP), measured by the standard deviation of total deposits divided by the mean of total deposits over the 1972-76 period. Deposits are by far the most important source of funds for commercial banks. The more volatile the deposits, the more likely will nondeposit borrowings need to be utilized to finance the asset portfolio and thus the more volatile may be the



earnings of the firm. Therefore, a positive relationship between this ratio and systematic and total risk will be expected.

4. Coefficient of variation of earnings per share (CVEPS), measured by the standard deviation of the earnings per share divided by the mean earnings per share. The standard deviation of EPS is a widely used accounting risk measure and we expect to see a positive relationship between this risk and the market determined risk measures (both systematic and total risk).
5. Loan to deposit ratio (L/D). A bank's loan portfolio contains the most risky assets held by a bank. In addition, the higher the loan to deposit ratio, the less are the holdings of liquid and cash assets and thus the more exposed the bank is to possible liquidity problems. Thus for both credit risk and illiquidity risk reasons the loans to deposit ratio should be positively related to total and systematic risk.
6. Loan loss experience (LOSS), measured by the provision for loan loss divided by total loans. This is a more direct measure of the riskiness of the loan portfolio as estimated by bank management. Other things equal, a higher loss provision reflects a higher degree of expected loss in the loan portfolio. Therefore, this ratio is expected to be positively related to both risk measures.
7. Liquidity (LIQ) as measured by the ratio of cash and due from plus U.S. Treasury securities to total assets. This is a somewhat inadequate but a quite standard measure of liquidity, or the ability to absorb net cash outflows that occur for any reason. The greater this

ratio, the greater the bank's ability to absorb cash drains in the short run and thus the less is the risk of illiquidity. For this reason a negative relationship between this ratio and both risk measures is expected.

These ratios are taken as accounting measures that reflect management decisions. To minimize the "window dressing" problem of financial statements, each ratio is the average of the 20 quarters from the years 1972-1976. In this way the "average" management decisions over this period are reflected, rather than the specific ratio value for just one point in time. The use of average ratios does, however, result in a loss of information. Substantial variation in individual accounting values is lost when averages are used. It is felt that this loss of information is acceptable in order to circumvent the problems inherent in using data as of a single point in time. The five years chosen are the most recent years for which complete financial data are available on the COMUSTAT Quarterly Bank data tape.

These average ratios, which are proxies for the management decisions are used as variables to explain the riskiness of the bank as measured by the market over the 1972-76 period. Table 1 presents the average value of each of these ratios for the 95 bank sample and indicates the expected relationship between each ratio and the risk measures. These expected relationships are a priori expectations based on the bivariate relationships only. Since multiple regression will be used to estimate the coefficients of these ratios the expected signs may not be realized.

TABLE I

Average Values and Expected Signs of
Variables to be Used in Multiple Regressions

<u>Variable</u>	<u>Average Value</u>	<u>Expected Relationship With Risk Measures</u>
POR	.432	-
LEV	.058	-
CVDEP	.172	+
CVEPS	.204	+
L/D	.694	+
LOSS	.0013	+
LIQ	.229	-

Multiple regression is used to estimate the relationship between these accounting measures and the market determined risk measures. Specifically, the following regression equations were estimated using the ordinary least squares method:

$$\text{Beta}_j = \alpha_0 + \alpha_1 X_{1j} + \alpha_2 X_{2j} + \alpha_3 X_{3j} + \alpha_4 X_{4j} + \alpha_5 X_{5j} + \alpha_6 X_{6j} + e_j \quad (5)$$

$$\text{and } \sigma(R_j) = \gamma_0 + \gamma_1 X_{1j} + \gamma_2 X_{2j} + \gamma_3 X_{3j} + \gamma_4 X_{4j} + \gamma_5 X_{5j} + \gamma_6 X_{6j} + \epsilon_j \quad (6)$$

where X_{ij} 's denote different accounting measures for the j th firm, beta_j is the systematic risk measure and $\sigma(R_j)$ is a measure of total risk for the j th firm.

IV. Results

In the spirit of Beaver, Kettler and Scholes [1970] let us first examine the direction and strength of the relationship between the market measure of risk and individual measures of financial policy. Table II presents correlations among all the ratios defined previously and the two measures of risk, β and $\sigma(R)$. For example the top row of Table II indicates that the payout ratio is negatively correlated with beta; that is, the larger the percentage of earnings paid out as dividends, the lower the beta risk measure. Likewise, for the leverage variable, the higher the bank's equity as a percentage of total assets, the lower the risk measure. The remaining ratios, except for liquidity (LIQ), exhibit the expected sign but are not statistically significant at the 5% level (absolute values below .200). For the total risk measure, $\sigma(R)$ (see row 2 in Table II) all correlations have the expected sign and are significant.

The lower portion of the correlation matrix in Table II indicates the degree of association among the financial ratios. In general these ratios are not highly correlated with one another, indicating that different facets of risk are being proxied. However, four of these correlations are significantly different from zero. This presents the problem of multicollinearity in the models to be estimated via multiple regression. Multicollinearity increases the standard errors of the estimated coefficients (lowering the t-values) and may cause some coefficient values to appear to be not significantly different from zero. This makes difficult the identification of individual financial policies which impact on the risk measures.

The correlations in the lower portion of Table II tend to support some of the relationships between the ratios and various types of risk proposed in section III. For example, the loan to deposits ratio (L/D) is negatively correlated with the liquidity ratio (LIQ) and positively correlated with the loan loss ratio (LOSS). This indicates the ability of L/D to proxy both liquidity and credit risk. In a similar vein the variability of earning per share (CVEPS) is positively related to LOSS, since a larger provision for loan losses taken in anticipation of higher loan losses reduces reported income.

These correlations indicate only bivariate relationships. They do not control for the effects of two or more ratios on risk at the same time. A multivariate analysis is accomplished using multiple regression. The coefficient estimates from these regressions are presented in Table III. Here we are able to observe the effect of any one financial ratio

TABLE II

Correlation Matrix of Dependent and Independent Variables

	β	$\sigma(R)$	POR	LEV	CVDEP	CVEPS	L/D	LOSS	LIQ
β	1	.756	-.313	-.204	.372	.015	.159	.036	.003
$\sigma(R)$		1	-.309	-.222	.391	.331	.218	.320	-.209
POR			1	-.015	-.250*	-.058	.132	.120	-.005
LEV				1	-.184	-.072	-.077	.044	-.253*
CVDEP					1	.069	-.088	.147	.160
CVEPS						1	.029	.444*	-.103
L/D							1	.193	-.588*
LOSS								1	-.159
LIQ									1

*Significantly different from zero at the 0.05 level.

while simultaneously accounting for the effects of the other ratios. When beta is used as the risk measure, the set of financial ratios explain about one quarter of the variability in beta among the 95 banks. The ratios that have significant coefficients as well as signs that are expected are the payout ratio (POR), the variability of deposit sources of funds (CVDEP), and the loan to deposit ratio (L/D). The other ratios, with the exception of LIQ, have the expected signs but are not statistically significant at the 5% level.

When total risk, $\sigma(R)$ is used as the dependent variable all estimated coefficients have the expected sign and all but one are statistically significant at least at the 10% level. This set of ratios explains 43% of the variability in total risk among the 95 banks. The fact that financial ratios explain a larger portion of the total risk than the systematic risk is not surprising. Total risk includes both the systematic risk and the specific risk of a bank. Some of the financial ratios, e.g. liquidity ratios, are expected to affect mostly the specific risk rather than the systematic risk.

The results of this study compare favorably with those of other studies. The Logue and Merville (1972) study, hereafter L&M, examines nonfinancial industries and obtains results that are comparable to those reported here. When the dependent variable is β the coefficient signs for POR and LEV are the same in the L&M study as reported here. For banks, however, the payout ratio coefficient is

TABLE III

Estimated Coefficients***

Independent Variable (financial ratios)	Dependent Variable (risk measure)	
	β	$\sigma(R)$
POR	-1.004** (-2.81)	-0.058** (-3.08)
LEV	-2.45 (-1.17)	-0.258** (-2.36)
CVDEP	1.36** (2.92)	0.079** (3.24)
CVEPS	-0.149 (- .31)	0.047* (1.85)
L/D	0.912** (2.07)	0.022 (0.93)
LOSS	3.425 (0.08)	4.694** (1.99)
LIQ	0.385 (0.56)	-0.066* (-1.83)
CONSTANT	0.609 (1.17)	0.095** (3.51)
\bar{R}^2	.26	.43

*Significant at the 10% level

**Significant at the 5% level

***Numbers in parentheses are t-statistics.

significant while for nonfinancial firms it is not.² This indicates the importance of dividend clienteles among holders of bank stocks. Similarly a measure of liquidity was not significant and had the wrong sign in both the L&M study and the present study. However, when included in the total risk model the LIQ coefficient has the expected negative sign and is significantly different from zero at the 0.10 level.

The Beighley, Boyd and Jacobs (1975) study, hereafter BBJ, focused on banks but developed models to explain share price rather than risk. Still some similarities exist between the BBJ and the present study. BBJ found that the level of dividends exerted a positive effect on share price, consistent with the finding here that a higher dividend payout ratio is associated with lower risk measures. Increased leverage and higher loan losses impact negatively on share price in BBJ while these two measures lead to higher measures of both systematic and total risk in this study. However the coefficients of LEV and LOSS are only significant in the total risk model indicating that these are firm specific risk factors and do not significantly affect the bank's systematic risk.

V. Summary and Conclusions

This study has investigated the relationship between financial policies of commercial bank and two market-determined measures of

²L&M also estimated a model for 4 separate industries. For one industry, the electronics-electrical supplies industry (22 firms), the coefficient of the dividend payout ratio was negative and significantly different from zero. In general most of the coefficients were not significant when industries were estimated separately.

risk. Financial policies are proxied by average balance sheet and income statement data over the period 1972-1976 for 95 commercial banks and bank holding companies. Accounting data measures of financial leverage, liquidity, dividend payout ratio, loan loss experience and variability in earnings and deposits are used. These are related to a measure of systematic risk (β) and total risk ($\sigma(R)$), also calculated for the same 5-year period. Bivariate and multivariate relationships are examined.

As independent variables used to explain β , the coefficients of the dividend payout ratio, variability of deposits and the loan to deposit ratio are significant. In explaining total risk the coefficients of the dividend payout ratio, a financial leverage measure, variability of deposits and earnings, a loan loss measure and a liquidity measure are all significant.

These results reveal the nature and the degree of impact that certain financial decisions have on bank's market-determined risk measures. This knowledge is an important input for managers whose objective is maximization of shareholder wealth. Achievement of this objective is vitally affected by the level of risk undertaken by the bank and its impact on share price.

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