

The Causal Relationship Between Bank Capital and Profitability

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Abstract: The relationship between capital structure and return on equity is examined. It is shown that for banks in the U.S., for the relatively less regulated 1983 to 1989 period as well as the more highly regulated 1996 to 2002 period, there is a positive relationship between financial leverage and the return on equity. The analysis is extended to determine the relationship between return on assets and equity capital. The evidence supports the hypothesis that there is a positive relationship between equity capital and return on assets.

Relevance to Practice: Previous empirical evidence for U.S. banks had indicated a perverse negative relationship between financial leverage and the return on equity for the 1983 to 1989 period. The cause of such an association was attributed to a reputation effect for large banks who adopted an aggressive capital structure. These contrary findings coupled with regulations on improving equity capital adequacy from the Basel II accord supported the efforts to promote a reduced capital structure risk posture by banks. However, these opposite results conflicted with traditional thought from the DuPont analysis wherein, when operating profitability is positive, increased financial leverage augments the return on equity. Thus, banks continue to have an incentive to ratchet up their financial leverage so as to increase the returns to stockholders albeit with increased financial risk.

Key Words: Banks, Capital Profitability

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The relationship between capital structure and return on equity is of considerable importance to all firms. The banking industry is especially sensitive to changes in financial leverage due to their low level of equity capital to total assets. In addition, the capital structure of banks is highly regulated.

One such regulator is the Federal Deposit Insurance Corporation (FDIC) insuring the retail deposits of banks. This makes the FDIC the bank's largest potential credit risk holder. Prior to the passage of the Federal Reserve Deposit Insurance Corporation Improvement Act (1991) deposit insurance was a flat rate. Subsequently, deposit insurance pricing was tied to a reserve standard reflecting past bank performance as opposed to a forward-looking risk measure. Thus, banks have an incentive to increase their risk through both riskier loans and greater financial leverage to increase their return to equity. The purpose of this paper is to examine the relationship between bank capital and operating returns, specifically return on equity and return on assets.

Marcus (1984) noted that regulatory changes raising (reducing) barriers to competition can increase (decrease) the value of bank charters. To the extent bank charter value is lost when a bank fails the bank has an incentive to lessening the likelihood of bankruptcy by strengthening its capital structure using infusions on equity capital. Keeley (1990) argued that the high failure rate of banks during the 1980s can be attributed to risk-taking incentives provided by fixed-rate deposit insurance. Berger (1995) examines the relationship between bank equity capital and accounting return on equity from 1983 to 1989. He found an anomalous positive causal relationship attributed to bankruptcy costs reflected in borrowing rates. Several recent studies including Flannery and Sorescu (1996), Jagtani, Kaufman and Lemieux (2002), Morgan and Stiroh (2001), Evanoff and Wall (2001) and Sironi (2001) found evidence that subordinated debt credit spreads reflect bank risks, but these studies are primarily used to support the role of market-based mechanisms in regulatory monitoring.

Hypothesis

In achieving a return on equity firms employ a variety of techniques and strategies. One such strategy is capital structure. Essentially, a company can adopt high or low financial leverage. Given a constant positive return on assets (net profit divided by total assets) the greater the equity multiplier (total assets divided by total stockholder's equity) the more is the return on equity from the DuPont Model. That is, banks have an incentive to minimize the amount of equity invested in order to maximize their return on equity. This intended result assumes there is no interaction between financing and the operating performance of the corporation. Thus hypothesis one states:

H₁: Financial leverage is positively related to the return on equity,

On the other hand, a high financial leverage position is coupled with high financial risk. Much of the assets of banks are intangible such as human resources, client network, correspondent affiliations and reputation.

This accumulation of organizational capital is at risk of loss if the firm enters into financial distress. Thus, to protect this reputation capital and to project an image of financial strength the firm decreases financial risk by taking on a low financial leverage posture. That is, the financing decision is intertwined with the operations of the bank. The higher level of business risk associated with high ROA is coupled with lower financial risk through lower financial leverage by having a higher amount of capital. Thus, hypothesis two states:

H₂: Financial leverage is negatively related to the return on assets,

In the aftermath of the savings and loans industry debacle the banking industry in the U.S. experienced an increase in regulation in the early 1990s such as evidenced by the passage of the FDIC Improvement Act. The intent of this legislation was to require banks to have stronger capitalization through injections of equity. Moreover, banks were given incentives to reduce their risky loan (assets) portfolios with relatively less ominous capital requirements. Therefore, our third hypothesis is that the relationship between ROE, ROA and capital would change comparing the later 1996-2002 period to the earlier 1983-1989 period will moderate due to the diminished management prerogatives caused by the heightened regulatory scrutiny and control. Thus:

H₃: Hypothesis One and Two will diminish in the later (1996-2002) period compared to the earlier (1983-1989) period,

Data and Methodology

Data was collected from the Federal Reserve Bank quarterly CALL reports for the December 1982 through December 1989 period and the December 1996 through December 2002 period. Annual measures of capital (defined as the quarterly average value of equity divided by assets), return on equity (ROE, defined asset income divided by average equity) and return on assets (ROA, defined as net income divided by total assets) were collected for each of the two time periods. The earlier and later time periods had 87,928 and 59, 623 observations respectively. The raw data is utilized in the regressions as well as two alternative techniques to handle negative and close to zero capital. We transformed capital values less than one percent to be one percent to avoid nonsensical interpretations of negative capital and values close to zero. In addition, we

merely eliminated those observations of capital that were not above zero in another iteration of regression analysis. Correlation between values of capital and ROE may reflect a feedback loop from performance to capital. That is, bank capital may increase (decrease) as profits strengthen (weaken) due to the relative rise (drop) in retained earnings. We regress ROE on two periods of lagged values of ROE and capital with time and bank-specific dummy variables.² Thus, the regression equation is:

$$ROE_t = \alpha + \beta_1 Cap_{t-1} + \beta_2 Cap_{t-2} + \beta_3 ROE_{t-1} + \beta_4 ROE_{t-2} + \beta_i D_i + \varepsilon_t, \quad (1)$$

Where Cap is bank capital, ROE is return on equity, $t-1$ is the first period lag, $t-2$ is the second period lag, D_i is the time and bank-specific dummy variable, α, β are coefficients

Furthermore, we categorized the banks into ROE groups with ten percent intervals (from -20% to 40%) and conducted two-sided maximum likelihood Tobit estimate regression analysis to account for data truncation biases implied by our grouping method. Thus, equation 2 is:

$$ROE = \alpha + \beta_1 Cap_{t-1} + \beta_2 Cap_{t-2} + \beta_3 ROE_{t-1} + \beta_4 ROE_{t-2} + \varepsilon_t, \quad (2)$$

The results of these two equations address hypothesis one that financial leverage is positively related to the return on equity.

To analyze the relationship between the return on assets and capital we execute a two-sided maximum likelihood Tobit estimate regression categorizing the data into one percent groups ranging from -3% to 3% and two thick tails (left tail -100% to -3%; right tail 3% to 100%). The equation becomes

$$ROA = \alpha + \beta_1 Cap_{t-1} + \beta_2 Cap_{t-2} + \beta_3 ROA_{t-1} + \beta_4 ROA_{t-1} + \varepsilon_t, \quad (3)$$

In order to address the impact of performance and size on realized capital values, we reconstructed our causality tests using the same Tobit regressions of ROE on two periods of lagged values of capital, ROE the change in capital, and the log of assets lagged one period. This is represented by:

² Two periods of lags were chosen: i) because banks issue relatively small amounts of longer-term debt and thus the impact of capital lagged more than two periods on current period debt costs can be expected to be small, and; ii) the data strongly suggest that the coefficients are driven by autocorrelation in capital values and that the longer lags provide little additional information. Regressions coefficients on lagged ROE and capital were estimated using deviations in the variables from their bank-specific mean values, rather than specifying individual dummies for each bank. See Berger (1995) for an exposition of this technique.

$$ROE = \alpha + \beta_1 Cap_{t-1} + \beta_2 Cap_{t-2} + \beta_3 ROE_{t-1} + \beta_4 ROE_{t-2} + \beta_5 \Delta Cap_{t-1} + \beta_6 \Delta Cap_{t-2} + \beta_7 Size_{t-1} + \varepsilon_t \quad (4)$$

Results

Observing Table 1, focusing on the cumulative effect of capital on ROE represented by the sum of the coefficients on the 2 lagged capital values, under Berger's adjustment method we find that capital and ROE are positively related. However, eliminating the data with negative capital values changes the sign of the capital/ROE relationship from positive to negative. The difference in the results reflects the differences in mean ROE values across the methods and is driven by the impact of large negative values of income associated with negative capital values in the raw data. Under Berger's method, these data points produce outlying negative ROE values that are allied with small values of capital (1%), and which result in the positive capital/ROE regression result. In the raw data, the same negative capital values tend to be linked with very large positive ROE values, and the sum of the capital coefficients in the raw data regression is large and negative. Contrasting the 1996-2002 period (panel B) to that of the 1983-1989 (panel A) era it would appear this negative capital/ROE relationship has abated. Consequently, these results support hypothesis one which states that financial leverage is positively related to return on equity and hypothesis three which states the hypothesis one relationship will diminish in the later (augmented regulations) period versus the earlier period.

Table 2 shows the results of the two-sided maximum likelihood Tobit estimate regressions.³ The coefficients patterns are quite similar across the data sets other than for the lowest ROE groups. Note that for the lowest ROE cell in the 1983-1989 period (panel A), the relationship between capital and ROE is strongly positive. For both time periods the ROE/capital relationship is generally decreasing with ROE other than for high performing groups. The sum of the coefficients on capital turn negative in the 0% to 10% range. The anomalies in these results (relative to the pure financial leverage effect) are that as ROE values become high, the relationships between ROE and capital should decrease monotonically, increases and becomes positive for the best performing banks. However, for the worst performing banks the ROE/capital relationship is positive in the 1983-1989 period whereas it is negative during the 1996-2002

³ In addition to the Tobit analysis we ran OLS regressions on the data. The results were qualitatively the same in all cases, and the coefficients on capital in one period lag models were remarkably close to the sum of the capital coefficients in the two period lag models. In addition, information criteria suggest that the two period lag models provide little additional information content relative to one period lag models. Note that the lowest and highest ROE groups were bounded in order to insure convergence in the Tobit procedure.

period.⁴ This outcome bolsters hypothesis one. Moreover, comparing the two time periods the differential results uphold hypothesis three.

Causality tests of bank capital on ROA are shown in Table 3. In general, the relationship between capital and ROA is increasing in ROA. For the poorest performers it is strongly negative whereas in the best performers it is strongly positive. Hence, there is support for hypothesis two stating that financial leverage is negatively related to the return on assets. Nonetheless, the empirical evidence across the ROA segments is mixed when comparing the two time periods. Accordingly, hypothesis three can be neither fully supported nor refuted.

Table 4 presents evidence on the effect of performance and size on capital amounts. The inclusion of lagged values of the change in capital and the log of assets has relatively little impact on the parameter pattern, other than the poorest performers in the 1983-1989 period (from Panel A) for which the inclusion of lagged values of the change in capital cause the sign on the capital/ROE coefficient to change from positive to negative, consistent with the results of our ROA causality tests. There is little to suggest that the capital/ROE relationship was significantly different between the turbulent 1980s and the stable period around the turn of the century.

Conclusions

We have demonstrated that for banks in the U.S. there is a positive relationship between financial leverage and the return on equity for both the 1983-1989 and the 1996-2002 periods. Nevertheless, the results are sensitive to data measurement issues. Furthermore, the proportionality of financial leverage to return on equity appears to have been more or less maintained between the later more regulated time period as opposed to the earlier freer period. Moreover, when viewing the return on assets relationship a similar pattern as the return on equity to capital relationship is observed. That is, ROA is inversely related to financial leverage. Again, there seems to be a dearth of evidence to sustain the notion that the 1996-2002 period is different than the 1983-1989 period. Bank performance has been robust to the regulatory environment that they have faced.

⁴ Note that results in the tails of the ROE distribution should be interpreted with caution given the relatively large ranges of ROE values and low values of parameter significant statistics reflecting the small sample size.

Table 1

OLS Full Sample Results

$$ROE_t = \alpha + \beta_1 Cap_{t-1} + \beta_2 Cap_{t-2} + \beta_3 ROE_{t-1} + \beta_4 ROE_{t-2} + \beta_i D_i + \varepsilon_x$$

	Panel A 1983 - 1989						Panel B 1996 - 2002	
	Raw Data		Berger		Cap. > 0		Cap. > 0	
Capital ₁	-13.0604	(-1.53)	2.1867	(13.91)	-1.8952	(-.48)	-.3846	(-21.22)
Capital ₂	6.3593	(.89)	-.0494	(-3.83)	.7730	(.24)	.1067	(6.71)
ROE ₁	-.2506	(-75.88)	.2224	(34.38)	-.0530	(-34.11)	.2833	(63.45)
ROE ₂	-.2125	(-1.66)	-.1509	(-20.65)	-.0466	(-.77)	-.0414	(-9.90)
D _{83/96}	.0485	(.16)	.0443	(8.15)	.0309	(.22)	.0020	(3.14)
D _{84/97}	-.1445	(-.57)	.0342	(7.54)	-.1308	(-1.13)	.0041	(6.33)
D _{85/98}	-.1707	(-.68)	.0213	(4.71)	-.1495	(-1.29)	-.0004	(-.63)
D _{86/99}	-.2259	(-.89)	-.01716	(-3.78)	-.1895	(-1.63)	.0017	(2.46)
D _{87/00}	.5353	(2.10)	-.0204	(-4.45)	-.0392	(-.33)	.0027	(3.96)
D _{88/01}	-.0123	(-.05)	-.0313	(-6.70)	-.1609	(-1.35)	-.0116	(-16.58)
D _{89/02}	-.0042	(-.02)	-.0214	(-4.54)	-.0192	(-.16)	.0004	(.53)

Notes: Coefficients with t-statistics in brackets

Table 2

Stratified ROE Results

$$ROE = \alpha + \beta_1 Cap_{t-1} + \beta_2 Cap_{t-2} + \beta_3 ROE_{t-1} + \beta_4 ROE_{t-2} + \varepsilon_t$$

Panel A: 1983 – 1989

	α	β_1	β_2	β_3	β_4	$\beta_1 + \beta_2$	Obs.
$-1 \leq ROE < -.2$	2.1978 (4.87)	12.1673 (9.80)	-10.4933 (-5.73)	1.1328 (16.40)	.3172 (3.91)	1.674	3,858
$-.20 \leq ROE < -.10$	-.0684 (-1.00)	-.1823 (-.37)	.3081 (.54)	.1564 (1.19)	.0146 (.34)	.1258	2,224
$-.10 \leq ROE < 0$	.2529 (1.90)	1.5633 (4.90)	-.8700 (-1.37)	.4173 (4.08)	-.1140 (-1.12)	.7933	4,314
$0 \leq ROE < .10$	.1374 (22.42)	.1469 (3.00)	-.2346 (-4.48)	.1329 (23.44)	.0588 (-11.32)	-.0877	25,579
$.10 \leq ROE < .20$	.1426 (141.83)	-.5230 (-25.20)	.0870 (4.43)	.1371 (53.71)	.0581 (17.57)	-.4360	44,205
$.20 \leq ROE < .30$	-.0216 (-.24)	-.9811 (-3.77)	.7473 (2.05)	-.0106 (-.32)	-.0347 (-1.05)	-.2338	5,917
$.30 \leq ROE < .40$	-.6069 (.49)	-1.6433 (-1.39)	1.6620 (.87)	-.2713 (-.60)	-.0730 (-.38)	-.0187	532
$.40 \leq ROE < 1$	-3.5956 (-5.02)	7.4364 (2.81)	-4.2517 (-2.43)	-.4952 (-2.06)	-.4229 (-1.03)	3.1847	202

Panel B: 1996 – 2002

	α	β_1	β_2	β_3	β_4	$\beta_1+\beta_2$	Obs.
$-1 \leq \text{ROE} < -.2$	3.4669 (1.09)	-.7411 (-.14)	-1.0717 (-.21)	3.6118 (1.37)	-.7736 (.86)	-1.8128	330
$-.20 \leq \text{ROE} < -.10$	-.0013 (-.01)	1.3908 (1.69)	-.8042 (-.68)	-.1008 (-.41)	-.1468 (-.56)	.5867	284
$-.10 \leq \text{ROE} < 0$	.1805 (1.76)	1.0115 (4.81)	-.5197 (-1.43)	.4791 (4.62)	.1847 (3.05)	.4918	1,191
$0 \leq \text{ROE} < .10$	.0868 (46.02)	-.1787 (14.30)	.0514 (-2.22)	.3033 (32.21)	.0881 (10.33)	-.1273	21,188
$.10 \leq \text{ROE} < .20$	.1008 (95.63)	-.4909 (-26.84)	.1795 (4.57)	.2937 (55.58)	.1548 (39.76)	-.3561	30,872
$.20 \leq \text{ROE} < .30$	.1098 (7.57)	-.6538 (-3.90)	.5485 (3.47)	.2299 (6.51)	.0596 (1.97)	-.1053	4,767
$.30 \leq \text{ROE} < .40$	.2175 (6.17)	.3876 (1.58)	-.4423 (-1.59)	.1552 (9.08)	.0927 (1.70)	-.0547	713
$.40 \leq \text{ROE} < 1$	-1.5846 (-4.95)	.5246 (.44)	1.1491 (.93)	.7374 (2.20)	1.0287 (2.97)	1.6737	245

Table 3

Tobit Stratified ROA Results

$$ROA = \alpha + \beta_1 Cap_{t-1} + \beta_2 Cap_{t-2} + \beta_3 ROA_{t-1} + \beta_4 ROA_{t-1} + \varepsilon_t$$

Panel A: 1983 – 1989

	α	β_1	β_2	β_3	β_4	$\beta_1 + \beta_2$	Obs.
$-1 \leq ROA \leq -.03$	.8761 (19.44)	-.1782 (-.54)	-.5600 (-1.49)	1.9414 (7.38)	-.0261 (-.08)	-.7382	2,151
$-.03 \leq ROA \leq -.02$	.0653 (.55)	-.0451 (-.07)	-.1022 (-.16)	1.1044 (.99)	-.4360 (-1.50)	-.1473	1,297
$-.02 \leq ROA \leq -.01$	.0262 (.67)	-.1873 (-1.47)	.0934 (.62)	.5715 (1.02)	-.1253 (-.45)	-.0939	2,456
$-.01 \leq ROA \leq 0$	.0327 (2.32)	.0011 (.01)	.0354 (.30)	.9968 (4.27)	-.1176 (-.76)	.0465	5,482
$0 \leq ROA \leq .01$	.0102 (37.57)	-.0024 (-.53)	-.0153 (4.34)	.3169 (38.15)	.1004 (20.56)	-.0177	36,010
$.01 \leq ROA \leq .02$	.0048 (32.12)	.0277 (14.53)	.0071 (3.49)	.2323 (.5065)	.0419 (9.69)	.0348	37,332
$.02 \leq ROA \leq .03$	-.0141 (-1.59)	.0444 (1.58)	.0397 (1.44)	.2813 (16.19)	-.0755 (-1.37)	.0841	2,708
$.03 \leq ROA \leq 1$	-.4873 (-10.41)	.2616 (1.84)	.1646 (1.07)	.9068 (8.58)	.2199 (2.31)	.4264	390

Panel B: 1996 – 2002

	α	β_1	β_2	β_3	β_4	$\beta_1+\beta_2$	Obs.
$-1 \leq ROA \leq -.03$	.8002 (4.70)	-.3383 (-.56)	-.2953 (-1.56)	1.6127 (1.24)	.4815 (.56)	-.6336	171
$-.03 \leq ROA \leq -.02$	.0448 (.17)	.0197 (-.02)	.2803 (.12)	-1.0460 (-.29)	.9657 (.25)	-.3000	144
$-.02 \leq ROA \leq -.01$	-.0067 (-.82)	-.0286 (-.75)	.0260 (.63)	.1694 (1.76)	-.0469 (-.46)	-.0024	323
$-.01 \leq ROA \leq 0$	.0572 (2.32)	-.0904 (-.74)	.0482 (.39)	.9211 (3.01)	.4875 (1.75)	-.0422	1,196
$0 \leq ROA \leq .01$	.0123 (32.56)	-.0016 (-.40)	-.0182 (-4.85)	.1686 (19.71)	.0029 (1.26)	-.0198	20,501
$.01 \leq ROA \leq .02$	.0055 (51.31)	.0022 (1.54)	.0007 (.48)	.3842 (64.39)	.1387 (33.94)	.0029	33,363
$.02 \leq ROA \leq .03$	-.0009 (-.36)	-.0012 (-.33)	.0096 (1.56)	.2331 (14.20)	.3501 (17.21)	.0084	3,116
$.03 \leq ROA \leq 1$	-.9395 (-19.30)	.4027 (2.30)	.4571 (2.61)	1.7144 (13.26)	.0995 (.71)	.8598	821

Table 4: Modified Causality Tests

$$ROE = \alpha + \beta_1 Cap_{t-1} + \beta_2 Cap_{t-2} + \beta_3 ROE_{t-1} + \beta_4 ROE_{t-2} + \beta_5 \Delta Cap_{t-1} + \beta_6 \Delta Cap_{t-2} + \beta_7 Size_{t-1} + \varepsilon_t$$

Panel A: 1983 – 1989

	α	β_1	β_2	β_3	β_4	β_5	β_6	β_7	$\beta_1 + \beta_2$	Obs.
$-1 \leq ROE < -.2$	3.168 (3.66)	9.618 (3.79)	-10.176 (-3.26)	1.122 (15.94)	.375 (3.60)	2.278 (1.44)	2.964 (1.52)	-.073 (-1.38)	-.989	3802
$-.20 \leq ROE < -.10$	-.184 (-1.78)	.873 (.81)	-.466 (-.54)	.146 (1.20)	.006 (.13)	-.565 (-.97)	-.423 (-1.00)	.009 (.80)	.407	2192
$-.10 \leq ROE < 0$	.155 (.76)	3.01 (2.25)	-2.071 (-1.68)	.379 (4.31)	-.119 (-1.28)	-.859 (-1.20)	-.333 (-.82)	.004 (.24)	.939	4256
$0 \leq ROE < .10$	.074 (6.27)	.536 (10.10)	-.554 (-10.27)	.141 (16.22)	.041 (4.81)	-.214 (-5.60)	-.013 (-.51)	.005 (5.04)	-.018	25,314
$.10 \leq ROE < .20$	.106 (31.14)	-.739 (-16.71)	.327 (7.73)	.137 (42.60)	.058 (16.73)	.115 (6.68)	.006 (1.02)	.0032 (11.89)	-.412	43,651
$.20 \leq ROE < .30$	-.022 (-.21)	-2.957 (-3.36)	2.54 (2.86)	-.001 (-.03)	-.019 (-.59)	.826 (2.64)	.022 (.15)	.0003 (.08)	-.417	5,853
$.30 \leq ROE < .40$	-.274 (-.30)	3.146 (.70)	-2.345 (-.62)	-.187 (-.70)	-.086 (-.62)	-2.275 (-1.17)	-.256 (-.18)	-.005 (-.11)	.801	522
$.40 \leq ROE < 1$	-2.915 (-.63)	-3.058 (-.37)	4.397 (.50)	-.354 (-.83)	-.287 (-.56)	3.920 (1.39)	1.683 (.40)	.0067 (.38)	2.807	200

Panel B: 1996 – 2002

	α	β_1	β_2	β_3	β_4	β_5	β_6	β_7	$\beta_1+\beta_2$	Obs.
$-1 \leq \text{ROE} < -.2$	6.793 (1.40)	2.847 (.38)	-3.896 (-.62)	3.583 (1.84)	-.740 3.38	-2.816 (-.62)	.252 (.09)	-.324 (-1.23)	-1.049	324
$-.20 \leq \text{ROE} < -.10$	.021 (.23)	2.335 (2.22)	-1.45 (-1.36)	-.062 (-.40)	-.103 (-.61)	-.857 (-1.41)	-1.021 (-1.71)	-.011 (-.06)	.880	243
$-.10 \leq \text{ROE} < 0$	.065 (.35)	1.026 (4.74)	-.461 (-1.31)	.462 (4.46)	.162 (1.78)	-.075 (-.29)	-.173 (-.58)	.008 .51	.565	1,172
$0 \leq \text{ROE} < .10$	.031 (5.57)	-.150 (-3.71)	.044 (.61)	.317 (25.78)	.088 (9.55)	-.016 (.61)	-.0001 -.63	.005 (9.41)	-.106	20,795
$.10 \leq \text{ROE} < .20$	.076 (29.21)	-.569 (-32.21)	.278 (13.92)	.287 (-32.21)	.115 (40.84)	.040 (3.89)	-.011 (-2.10)	.0021 (10.56)	-.291	30,350
$.20 \leq \text{ROE} < .30$	.117 (5.36)	-1.333 (-9.44)	1.271 (7.59)	.239 (6.82)	.072 (2.51)	.512 (6.04)	.115 (2.52)	-.001 (-.59)	-.062	4,707
$.30 \leq \text{ROE} < .40$	.181 (2.80)	.246 (.55)	-.295 (-.70)	.151 (8.61)	.088 (1.63)	.082 (.37)	.012 (.07)	.003 (.79)	-.049	703
$.40 \leq \text{ROE} < 1$	-1.034 (-1.49)	-.425 (-.19)	2.078 (1.08)	.779 (2.20)	1.084 (2.79)	.455 (.39)	-.565 (-.57)	-.051 (-.82)	1.623	241

References

- Berger, A.N. (1995), “The Profit-Structure Relationship In Banking – Tests Of the Market-Power and Efficient-Structure Hypothesis”, *Journal of Money, Credit and Banking* 19, 404-431.
- Berger, A.N. (1995), “The Relationship Between Capital and Earnings In Banking”, *Journal of Money Credit and Banking* 27, 432-456.
- Berger, A.N., R.J. Herring and G.P. Szego (1995), “The Role of Capital In Financial Institutions”, *Journal of Banking and Finance* 19, 393-430.
- Black, F., and M. Scholes (1973), “The Pricing of Options and Corporate Liabilities”, *Journal of Political Economy* 81, 637-659.
- Chamberlain, G. (1982), “Multivariate Regression Models for Panel Data”, *Journal of Econometrics* 18, 5-46.
- Coase, R. H. (1937), “The Nature of the Firm”, *Economica* 4, 386-405.
- Cornell, B. and A.C. Shapiro (1987), “Corporate Stakeholders and Corporate Finance”, *Financial Management* 16, 5-14.
- Demsetz, R.S., M.R. Saidenberg, and P.E. Strahan (1996), “Banks with Something to Lose: The Disciplinary Role of Franchise Value”, *Federal Reserve Bank of New York Economic Policy Review* 2, 1-13.
- Evanoff, D.D., and L.D. Wall (2001), “Sub-debt Yield Spreads as Bank Risk Measures”, *Journal of Financial Services Research* 20, 121-145.
- Flannery, M.J. (1994), “Debt Maturity and the Deadweight Cost of Leverage: Optimally Financing the Bank Firm”, *American Economic Review* 1, 320-331.
- Flannery, M.J., and S.M. Sorsescu (1996), “Evidence of Bank market Discipline in Subordinated Debenture Yields: 1983-1991”, *Journal of Finance* 51, 1347-1377.
- Flannery, M.J. (2001), “The Faces of Market Discipline”, *Journal of Financial Services Research* 20, 107-119.
- Hutchison, D.E. (2000), “Stock Repurchase Programs: Economic Principles”, *Bank Accounting and Finance* 13, 35-41.

- Jagtiana, J., G. Kaufman, and C. Lemieux (2002), "The Effect of Credit Risk on Bank and Bank Holding Company Bond Yields: Evidence from the Post-FDICIA Period", *Journal of Financial Research* 25, 559-571.
- Keeley, M.C. (1990), "Deposit Insurance, Risk, and Market power in Banking", *American Economic Review* 80, 1183-1200.
- Marcus, A.J. (1984), "Deregulation and Bank Financial Policy", *Journal of Banking and Finance* 8, August, 559-565.
- Merton, R.C. (1973), "The Theory of Rational Option Pricing", *Bell Journal of Economics and Management Science* 4, 141-183.
- Merton, R.C. (1977), "An Analytic Derivation of the Cost of Deposit Insurance Loan Guarantees", *Journal of Banking and Finance* 1, 3-11.
- Morgan, D.P., and K.J. Stiroh (2001), "Market Discipline of Banks: the Asset Test", *Journal of Financial Services Research* 20, 195-108.
- Sironi, A. (2001), "An Analysis of European Banks' SND Issues and its Implications for the Design of a Mandatory Subordinated Debt Policy", *Journal of Financial Services Research* 20, 233-266.