Understanding the Channels of Bank Value Creation During Times of Crisis: Deconstructing ROA

Wan-Jiun Paul Chiou
Northeastern University
Central Michigan University

Robert L. Porter
Quinnipiac University

Ben J. Sopranzetti
Rutgers University – New Brunswick

An understanding of the performance channels that have the greatest impact on financial institution value is important for the banking industry as well as their regulators. To analyze these channels during a financial crisis is especially important. In this paper, we deconstruct bank operating performance (ROA) into five specific channels and study whether the major findings change due to bank size and other factors. Our empirical results demonstrate that higher margins improve performance but a higher provision for loan and lease losses reduces the performance metric. The market penalized bank holding companies for an emphasis on traditional intermediation and rewarded banks that engaged in more diversified activities. We also find a difference in the impact of loan losses on bank value. Other evidences show that large banks seem to be punished more severely by the market if they do not operate efficiently. We also show the analysis including the Troubled Asset Relief Program (TARP).

INTRODUCTION

Since well before the advent of the financial crisis, there has been increasing concern about all aspects of the banking sector; not the least of which is the impact of bank operating performance on shareholder value. Though the literature has established that high operating performance is associated with greater value for shareholders, the specific channels through which performance drives shareholder value have not yet been well documented. There seems to be a strong consensus among researchers that return on assets (ROA) is an important measure of bank operating performance, and that ROA is associated with bank shareholder value. However, ROA is an aggregate measure of a bank's ability to generate profits, given the amount of assets that it carries on its books. As an aggregate measure, it conflates the specific operating channels that drive bank value, and offers little insight as to how the impact of these channels may vary by bank characteristics. An understanding of the performance channels that have the greatest impact on financial institution value is important for the banking industry. To analyze these channels during a financial crisis is especially important in order to determine appropriate business strategies for such an environment. In the analysis, we also take into account the impact of the government policy (such

as Troubled Asset Relief Program, TARP) in our evaluation. Our results should also be of interest to bank regulators to assist in the formulation of public policy relating to the soundness of our financial system.

Our study differs from the previous studies in several ways. First we formally deconstruct bank operating performance (ROA) into five specific channels. The first two involve the bank's ability to generate revenue from assets (asset turnover); specifically, we examine the impact of both interest income turnover and non-interest income turnover. The greater the revenue from each of these activities per dollar of bank assets, the better the bank's performance. The third and fourth channels involve the bank's ability to maximize *profit* from interest related revenues (interest contribution margin). For any given level of revenue, high spread contributions lead to higher profits and enhanced performance. The fourth channel is the ability to generate profit from non-interest related revenues (non-interest contribution). High non-interest contributions also lead to higher profits, and hence performance. The final channel is the bank's ability to manage the tradeoff between loan pricing and loan quality (loan loss contribution). It is possible for banks with high-quality loans to outperform banks with high-risk loans on a risk-adjusted basis. This paper examines the impact of each of these five channels on bank value, and thus provides additional insight than what might be obtained from simply looking at ROA.

Second, our study examines how the impact on bank shareholder value from each of these five channels, changes with firm size during the financial crisis. The nature of the interaction between ROA and size on firm value has been studied, but the drivers of ROA, and hence bank value, may (and do) vary with bank size. Our results using the data during financial crisis period yield important insights that are otherwise obfuscated by the use of ROA.

Third, this paper takes into account potential interactions among the five channels that drive bank performance. We referred above to the trade-off between loan quality and the amount of revenue generated by the loan portfolio. Also, the amount of non-interest revenue can be a reflection of the extent to which a bank has diversified from its traditional product offerings.

The paper is arranged as follows. Section II presents a review of the extant literature. Section III presents the deconstruction of pre-tax operating profit into its five component parts. Section IV presents the data. Section V motivates the empirical model and provides results. Lastly, Section VI concludes.

LITERATURE REVIEW

The literature on bank performance is long and voluminous. However, there is limited work that focuses on the specific performance channels that actually create value for a bank. We present here a small sample of recent articles that we feel are relevant to our particular study. Rasiah (2010) provides a detailed literature review regarding theories on determinants of profitability of commercial banks.

Saunders and Schumacher (2000) examine the determinants of bank net interest margins. The determinants discussed are subsumed in ROA, but in this article the authors decompose bank margins into a regulatory component, a market structure component and a risk premium component. They conclude that regulatory restrictions in the form of deposit interest rate limits, reserve requirements and bank capital ratios have a significant impact on bank net interest margins. The policy implications of these results are straightforward. The level of interest rate volatility is also positively related to bank interest margins and should be considered in the development of a country's macroeconomic policies.

Hughes et al (2001) investigates the impact of capital structure and risk-taking on scale economies in banking. The authors combine two distinct streams of literature. First are studies focused on moral hazard without consideration of the production function, and second, are studies focused on the microeconomics of bank production without any consideration of the related risk. The conclusion is that scale economies, often used as a basis for bank mergers, do exist, but they are influenced by the level of risk the bank assumes. Effective analysis of scale economies are, therefore, discovered only by incorporating capital structure and risk into a model of bank production.

Using Tobin's Q, along other measures of financial performance, Hughes et al (2003) report that asset sales, i.e. being acquired, result in improvements in performance. Asset acquisitions, on the other hand, are associated with worse performance. The authors also present evidence of management entrenchment

at many U.S. bank holding companies. Further, entrenched management is associated with higher levels of managerial ownership and better growth opportunities but poorer financial performance and smaller asset size. For bank holding companies (BHCs) without entrenched management, both asset acquisitions and asset sales are associated with improved performance. The authors conclude that while scale and scope economies are probably driving forces of consolidation in the banking industry, not all mergers and acquisitions that lead to larger banks are value-enhancing.

Calomiris and Nissim (2007) argues that bank holding companies cannot be valued by the same tools and techniques used for non-financial firms. The authors then develop a valuation model for bank holding companies that combines the income streams from asset and liability levels with the income streams from non-interest related activities such as investment banking. The model employs value-to-book ratios as the primary approach to valuing bank holding companies. The results from the model explain a large amount of the cross-sectional variation in the actual market-to-book values of the sample firms.

Using financial soundness indicators, Akhter and Daly (2009) considers the strengths and weaknesses of financial intermediaries on an international basis. Their panel-data econometric analysis identifies the strong influence of the business cycle, inflation, effective foreign exchange rates and the size of the industry on bank capital adequacy. The authors also conclude that these same factors, along with the macroeconomic environment, are major determinants of bank profitability. Interestingly, they argue that the return on assets is the preferred profitable measure in lieu of return on equity.

Tregenna (2009) focuses on the relationship between concentration in the banking industry and bank profitability. The time period studied is from 1994 to 2005 and represents the generally profitable period leading up to the recent financial crisis. The author finds very high profits for U.S. banks during this period but raises questions about the soundness or reliability of these results. In any case, she finds a highly significant relationship between concentration and profitability. She then reports that the improvement in profitability was a structural result rather than the simple results of individual banks own market power. This is then interpreted as evidence that the improved profitability came at the expense of non-banking sectors of the economy rather than the redistribution of profits within the banking sector.

Albertazzi and Gambacorta (2010) investigates how bank activity is affected by corporate income taxes. Employing both theoretical and empirical perspectives, the authors' results show that the corporate tax rate is associated with higher interest rates on loans, a reduction in loan volume, but no impact on deposit levels. The results also document the ability of banks to shift 90% of their income tax burden to customers. We note that an analysis of pre-tax profitability is, therefore, appropriate.

Hughes and Mester (2010) provide a review of the empirical measurement of banking performance. They discuss both the structural approach to bank efficiency measurement and the non-structural approach. In particular they identify what they refer to as newer research where bank managers are modeled as maximizing their utility, which is a function of market value and risk.

Jordan et al (2011) look at the impact of various performance ratios on bank market-value to book-value ratios from the taking of TARP funds during the recent banking crisis. The authors conclude that higher x-efficiency, higher net interest margins, higher capital ratios and higher non-interest income are associated with higher ratios of market-to-book value. On the other hand, the receipt of TARP funds and lower asset quality are associated with lower market-price to book-value ratios.

Cole and White (2012) consider the effectiveness of traditional bank soundness measures, i.e. the components of "CAMELS", in identifying weak banks during the most recent financial crisis. Their conclusion is that the traditional proxies included in the CAMELS rating system were important determinants of bank failures in 2009. The authors also found that bank investments in mortgage-backed securities had little impact on the likelihood of failure.

Kupiec and Lee (2012) use pretax ROA to determine the factors that explain performance differences among community banks during the period between 1994 and 2011. After controlling for economic conditions in the bank's local market, they find improved ROAs are associated with high loan-to-asset ratios, good loan underwriting standards and low funding costs. In addition, they find that ROAs generally increase with size up to about $1 billion in assets, but tend to diminish beyond that. Finally,

they report that local market knowledge is a significant benefit since large loan concentrations outside of the bank's local market result in lower ROAs during their sample period.

DECONSTRUCTION OF PRE-TAX RETURN ON ASSETS

Our goal is to review the performance of bank holding companies during the financial crisis of 2007-2008 and the subsequent recession. We want to use return on assets as the primary measure of BHC performance. However, the ways in which BHCs utilize their assets to generate operating profit differ from the ways employed by their non-financial counterparts. For a BHC, operating profit includes the results of their funding decisions while most non-financial firms segregate operating results from the results of financial decisions. In addition, the amount of assets a non-financial firm employs is almost exclusively a function of the amount of revenue, or sales, that the firm is generating. Bank holding companies are different. While interest income is a function of the amount of assets employed, banks also generate a significant amount of non-interest income that is unrelated to the assets employed. Finally, we note the emphasis non-financial firms place on cash flow compared with net income. This is because depreciation of fixed assets can be a significant expense for non-financial firms. On the other hand, depreciation is relatively insignificant to BHCs where fixed assets are quite small in relation to total assets.

A consequence of these factors is that bank financial statements fundamentally differ from those of non-financial firms. Due to these differences we want to develop a distinctive methodology to analyze the elements of bank operations that ultimately determine bank performance. We start with the traditional calculation of the DuPont formula for return on assets and return on equity. In its most straight forward form the DuPont formula holds that a firm's return on equity is a function of the firm's return on assets and an equity multiplier. In turn, its return on assets is a function of the firms' profit margin and total asset turnover. In summary,

$$ROE = PM \times TATO \times EM, \tag{1}$$

where PM is profit margin, TOTA total asset turnover ratio, and EM equity multiplier. That is

$$ROE = \frac{\text{Net Income}}{\text{Net Sales}} \times \frac{\text{Net Sales}}{\text{Assets}} \times \frac{\text{Assets}}{\text{Equity}} \quad . \tag{2}$$

We now deconstruct this formulation in order to apply a similar approach more directly to the results of bank holding companies. First, we do not want to include the impact of taxes on earnings in our study. Taxes tend to affect all bank holding companies (BHCs) in a similar manner and, historically, they have not been a very significant factor in determining bank profitability. Further, tax effects are at least partially exogenous to bank performance since they are based on the tax rate, a primarily political decision.

Second, we note that capital adequacy is an extremely important topic in today's supercharged post-crisis environment. Regulators and legislators, as well as bank senior management, are involved in the determination of appropriate capital levels. Dividend policy and share buy-back considerations are also intimately integrated into these decisions. It is clear, then, that this decision process is substantially different from a BHC's day-to-day operational considerations. Therefore, we also do not want to include the impact of leverage in our analysis. The final result is that our performance measurement needs to be focused on a BHC's pretax return on assets in lieu of its after-tax return on equity.

$$PTROA = \text{Pretax Income/Assets} = \frac{\text{Pretax net operating income}}{\text{Total operating revenue}} \times \frac{\text{Total operating revenue}}{\text{Total Asset}}, \tag{3}$$

The right-hand-side terms can be further deconstructed into:

$$\frac{\text{Pretax net operating income}}{\text{Total operating revenue}} = \frac{\text{Interest Income - Interest Expense}}{\text{Total operating revenue}}$$

$$+ \frac{\text{Noninterest Income - Noninterest Expense}}{\text{Total operating revenue}} - \frac{\text{Provision for Loan Losses}}{\text{Total operating revenue}}, \quad (4)$$

and

$$\frac{\text{Total operating revenue}}{\text{Total Asset}} = \frac{\text{Interest Revenue}}{\text{Assets}} + \frac{\text{Non - interest Revenue}}{\text{Assets}}. \quad (5)$$

We now define the following terms:

1. Interest Contribution Margin

$$\text{ICM} = \frac{\text{Int. Rev - Int. Expense}}{\text{Total Rev}}, \quad (6)$$

This represents the volume of earning assets employed and the interest rate spread contribution to pretax ROA.

2. Non-interest Contribution Margin

$$\text{NCM} = \frac{\text{Non Int. Rev - Non Int. Expense}}{\text{Total Rev}}, \quad (7)$$

This represents the contribution to pretax ROA from non-interest earning activities.

3. Loan Loss Contribution

$$LLC = \frac{\text{Provision for Loan Loss}}{\text{Total Rev}}, \quad (8)$$

This represents the impact on pretax ROA from the income statement charge for future loan losses.

4. Interest Revenue Turnover

$$IRT = \frac{\text{Interest Rev}}{\text{Assets}}, \quad (9)$$

This represents the volume of interest revenue generated from the assets employed.

5. Non-interest Revenue Turnover

$$NRT = \frac{\text{Non Int. Rev}}{\text{Assets}}, \quad (10)$$

This represents the non-interest revenue generated from both asset and non-asset related activities.

As a result we wind up with the following deconstruction of pretax return on assets (PTROA):

$$PTROA = (ICM + NCM + LLC) \times (IRT + NRT) \quad (11)$$

The variables defined above and included in equation (11) are the key drivers of pretax return on assets and therefore represent the variables we wish to study.

DATA

We obtain our accounting data for bank holding companies from Federal Reserve reports FR Y-9C for the quarters ending December 2006 to June 2009. The FR Y- 9C report is required from all BHCs with assets over $150 million and contains uniform information on consolidated balance sheet accounts, a year-to-date income statement, plus supplementary information. We obtain our market price and shares outstanding data for the same periods from the Center for Research in Security Prices (CRSP) data files. We match the RSSD identification number for each BHC found in the FR-Y-9C to CRSP's PERMNO in order to merge the accounting data with the market data. This is accomplished by employing Wharton's WRDS data system. In order to eliminate the impact of outlier observations we delete any observations that are more than three standard deviations away from the mean. Table 1 displays the descriptive statistics for the sample BHCs in our analysis. Since these variables do not follow normal distribution, we apply a non-parametric Spearman's method to measure their correlations in Panel B.

We have used the data from the end of 2006 to March 2009 to capture the period of the most recent banking crisis and the attendant recession in the United States. A summary timeline for the crisis includes the following observations. Housing prices peaked in early 2006 and started to decline. We now know the bottom in housing prices was finally reached in 2012. The actual bursting of the housing bubble is generally considered to have taken place in mid-2007. The start of the financial crisis is, likewise, normally associated with the liquidity problems of Countrywide Financial during the summer of 2007 and ultimately with the bailout of Countrywide required in September of 2007. Other significant events during the crisis period include job cuts and the closing of their subprime mortgage operations by Washington Mutual in December 2007. The National Bureau of Economic Research has defined the start of the recession as also in December 2007. In March 2008 Bear Stearns effectively collapsed due largely to their subprime mortgage operations. They were taken over by J P Morgan Chase. IndyMac failed in July 2008 and on September 7 the U.S. government took over Fannie Mae and Freddie Mac. Lehman Brothers was unable to find a buyer that could solve their liquidity problems and filed for bankruptcy protection over the week-end of September 13-14. During the following week Bank of America purchased Merrill Lynch and the Fed made the highly unusual decision to bailout AIG. By the end of the month J P Morgan Chase had also purchased Washington Mutual.

In sum, the period starts with the identification of problems in the subprime mortgage market and includes the failure and bailout of various financial institutions, the adoption of non-traditional policy tools by the Fed, and the start of the great recession. The resultant sample includes 2,981observations with a range of quarterly observations from 276 to 328.

TABLE 1
SUMMARY STATISTICS

This table reports the mean of number of sample banks (*N*), ratio of market value over book value (*M/B*), natural logarithm of book value of asset (*BVA*), profit margin (*PM*= net income/total operating revenue), the ratio of Tier 1 capital to risk based assets (*Tier*1), the interest contribution margin (*ICM* = (Interest Income – Interest Expense) / Total Operating Revenue), interest contribution margin (*NCM*= (Noninterest Income – Noninterest Expense)/Total Opting Revenue), loan loss contribution margin (*LLC*= Provision for Loan Loss / Total Operating Revenue), spread (*Spread* = (Interest Income/Earning Assets) – (Interest Expense/Interest-bearing Liability)), Interest Revenue Turnover (IRT= Interest Revenue/ Total assets), and Non-interest Revenue Turnover (NRT= Non-interest Revenue/Total assets) in each quarter from 4th quarter in 2006 to 1st quarter in 2009 and all sample banks. We also report the standard deviation (SD) of in each quarter and all sample banks. Except M/B, FME, SIZE, and N, all other numbers are in percentage. We also reported the statistics of banks of different quantile of M/B value. Panel B presents the correlations among the variables. We show Pearson's correlations as bold text in the right upper half and Spearman's rho in the left lower half.

Panel A: All banks

Quarter		M/B	PM	Tier1	ICM	NCM	LLC	Spread	IRT	NRT	FME	SIZE	N
06Q4	Mean	1.098	14.11	8.86	46.28	-22.77	2.27	3.81	5.94	1.46	11.3	14.9	328
	SD	0.138	6.44	2.95	10.39	10.51	3.64	0.91	0.79	3.21	2.6	1.6	
07Q1	Mean	1.086	12.40	8.82	43.51	-22.56	2.10	0.95	1.60	0.39	11.2	15.0	315
	SD	0.151	11.46	2.96	9.82	13.99	2.90	0.25	0.39	0.93	2.6	1.6	
07Q2	Mean	1.078	12.09	8.79	43.50	-22.58	2.43	1.89	3.14	0.77	11.3	14.9	320
	SD	0.167	10.93	2.91	9.13	14.73	3.51	0.44	0.40	1.93	2.7	1.6	
07Q3	Mean	1.066	12.01	8.74	43.72	-22.31	3.24	2.82	4.71	1.11	11.2	15.0	300
	SD	0.153	10.72	3.02	8.66	9.75	5.52	0.64	0.59	2.83	2.9	1.6	
07Q4	Mean	1.040	10.89	8.58	44.62	-23.75	4.47	3.71	6.14	1.39	11.3	14.9	307
	SD	0.134	7.35	2.94	12.41	11.05	5.54	0.84	0.85	3.86	2.9	1.6	
08Q1	Mean	1.033	7.64	8.41	45.10	-24.89	8.29	0.91	1.46	0.37	11.4	15.0	285
	SD	0.107	23.76	2.99	8.78	24.83	11.39	0.22	0.20	0.91	3.0	1.6	
08Q2	Mean	1.010	3.64	8.43	46.63	-27.86	11.16	1.83	2.81	0.73	11.9	15.0	285
	SD	0.106	34.49	3.21	9.03	33.78	13.59	0.41	0.34	1.92	4.9	1.6	
08Q3	Mean	1.028	-0.47	8.26	47.37	-26.96	13.17	2.73	4.13	1.05	15.6	15.1	278
	SD	0.107	32.32	3.29	9.05	29.74	14.54	0.62	0.53	2.81	4.6	1.6	
08Q4	Mean	1.001	-5.73	8.71	48.08	-30.15	16.64	3.53	5.32	1.31	12.1	15.0	287
	SD	0.076	33.50	3.49	9.00	28.76	17.29	0.81	0.72	3.45	4.7	1.6	
09Q1	Mean	0.975	-12.48	8.98	50.19	-34.67	26.94	0.86	1.21	0.32	11.2	15.0	276
	SD	0.062	98.66	3.61	11.79	41.94	66.93	0.25	0.22	0.63	4.0	1.6	
ALL	Mean	1.043	5.82	8.67	45.82	-25.67	8.70	2.32	3.68	0.90	11.8	15.0	2,981
	SD	0.132	37.33	3.14	10.11	24.20	23.68	1.27	1.86	2.55	4.3	1.6	

Panel B: Correlation of efficiency measures

	M/B	*BVA*	*TME*	*ECE*	*PM*	*AME*	*NII*	*Tier1*	*IIEA*	*NAL*	*SM*	*EM*	*LLM*	*Spread*
M/B		**0.078****	**0.003**	**0.175****	**0.136****	**0.572****	**0.745****	**0.624****	**0.032**	**-0.237 ****	**-0.165****	**0.204****	**-0.140****	**0.084****
BVA	0.089**		**-0.026**	**0.015**	**0.008**	**0.044***	**0.110****	**-0.167****	**-0.071****	**-0.066****	**-0.329****	**0.218****	**0.063****	**-0.056****
TME	-0.119**	-0.043*		**-0.030**	**-0.034**	**0.028**	**-0.004**	**0.001**	**0.048****	**-0.040***	**0.028**	**-0.041***	**0.009**	**0.042***
ECE	0.703**	0.124**	-0.192**		**0.987****	**0.086****	**0.057****	**0.137****	**0.051****	**-0.578****	**0.080****	**0.699****	**-0.845****	**0.079****
PM	0.690**	0.117**	-0.069**	0.978**		**0.070****	**0.049****	**0.129****	**0.039***	**-0.542****	**0.072****	**0.699****	**-0.842****	**0.060****
AME	0.223**	0.008	-0.032	0.142**	0.128**		**0.608****	**0.531****	**0.655****	**-0.087****	**-0.200****	**0.152****	**-0.082****	**0.632****
NII	0.217**	0.414**	0.099**	0.219**	0.232**	0.116**		**0.803****	**-0.054****	**-0.066****	**-0.304****	**0.179****	**-0.040***	**-0.033**
Tier1	0.023	-0.344**	-0.134**	0.090**	0.071**	0.036*	-0.159**		**-0.002**	**-0.113****	**-0.036**	**0.106****	**-0.119****	**0.029**
IIEA	0.142**	-0.080**	-0.035	0.071**	0.058**	0.952**	-0.100**	0.046*		**-0.037***	**0.070****	**0.007**	**-0.072****	**0.937****
NAL	-0.611**	-0.025	0.054**	-0.570**	-0.565**	-0.119**	-0.177**	0.030	-0.050**		**-0.041***	**-0.299****	**0.640****	**-0.079****
SM	0.065**	-0.258**	-0.126**	0.170**	0.155**	-0.061**	-0.311**	0.324**	0.046*	0.075**		**-0.302****	**-0.037***	**0.263****
EM	0.297**	0.467**	-0.035	0.438**	0.441**	0.127**	0.500**	-0.188**	-0.020	-0.265**	-0.508**		**-0.403****	**-0.027**
LLM	-0.569**	0.149**	0.015	-0.567**	-0.573**	-0.120**	-0.043*	-0.035	-0.080**	0.700**	0.107**	-0.156**		**-0.071****
Spread	0.190**	-0.052**	-0.046*	0.150**	0.137**	0.919**	0.023	0.083**	0.942**	-0.064**	0.252**	-0.065**	-0.045*	

** indicates correlation is significant at the 0.01 level and * indicates correlation is significant at the 0.05 level.

In light of this background, we now review the data found in Table 1. As noted above, our dependent variable is the ratio of market-value to book-value for the BHCs in our sample. The ratio declines in an almost monotonic sequence over the entire period. This, of course, is not at all surprising given the problems that confronted the banking industry during this crisis period. Clearly, stock market investors lost confidence in the industry. It is interesting to note that the one exception to the monotonic decline in the market-to-book ratio occurred at what could be considered the worst quarter of the crisis, the third quarter of 2008. Perhaps this simply reflects a new expectation by the market that the government will do whatever is required to support the financial system.

The BHC profit margin shows a truly monotonic decline during the sample period. Again, this is not surprising. Consistent with the financial environment, the profit margin actually turns negative in the third quarter of 2008 and continues to worsen for the rest of the period. Leverage/capital adequacy as measured by both the ratio of total assets to total equity and the Tier 1 capital ratio hits the high/low point during the third quarter of 2008. However, by the first quarter of 2009 (the end of the sample period) both ratios were essentially back to their starting levels.

We turn now to our primary explanatory variables. The interest contribution margin declines early in the sample period but then turns around and actually winds up higher at the end of the period than it was at the beginning of the period. This pattern is consistent with BHCs benefitting from the dramatic decline in interest rates resulting from Fed policy. The non-interest contribution margin is consistently negative. This is in line with the way BHCs report their operating profit. Interest income minus interest expense represents net interest income. However, non-interest expense includes all operating expenses associated with generating the interest income, including salaries and benefits, etc. As a result, when non-interest expense is subtracted from non-interest income alone it should not be surprising that the result is negative. In addition, it would be logical to see a difference between large banks that have extensive non-traditional fee generating activities and small banks that have fees based largely on traditional banking activities such as deposit accounts. For all of the BHCs in our sample we see some improvement early in the sample period but then a worsening of results for the balance of the period. This worsening could be attributed to the lower level of interest rates since the denominator in this ratio is total operating revenue, including both interest income and non-interest income.

The loan loss contribution margin starts at 2.27% and climbs quite steadily to 26.94%. Note that while this ratio appears with a positive sign, this simply reflects the presentation of the provision for loan loss as a positive number on the income statement. The large increase in this ratio is again a clear reflection of the financial crisis engulfing all BHCs. The increases in the provision for loan losses are most pronounced starting after the fourth quarter of 2007.

When we turn our attention to our turnover ratios we find a great deal of volatility. For the interest revenue turnover this reflects the countervailing forces of higher earning assets and lower levels of interest rates. For the non-interest revenue turnover, the factors reflect the fee generating activities that do not require balance sheet assets to support the activities.

METHODOLOGY AND EMPIRICAL RESULTS

Econometric Considerations

Our study is to analyze the cross-sectional differences in the performance of bank holding companies over the financial crisis period. Accordingly, we employ an unbalanced panel data approach and choose a pooled regression model. This setting will grant more flexibility in determining the relation between the variables over the financial crisis period. In addition, there can be arbitrary to decide the observed variables to characterize fixed effect and/or random effect without sound theoretical background. It is not unrealistic to assume that any latent heterogeneity can be averaged out. Therefore we apply ordinary least squares to estimate the impact of the variables on bank value. To further control the impact of bank size on our conclusion, we employ quantile regression.

The Validity of the Deconstruction of PTROA

We begin with an analysis of the empirical validity of the theoretical deconstruction of Pre-tax Return on assets, as delineated by Equation 11. To this end, we test the following empirical specification.

$$PTROA_i = \alpha + \beta_1 ICM_i + \beta_2 NCM_i + \beta_3 LLC_i + \beta_4 IRT_i + \beta_5 NRT_i + \varepsilon_i \quad , \tag{12}$$

where PTROA is the bank's pre-tax return on assets; ICM is the interest contribution margin; NCM is the Non-interest Contribution Margin; and LLC is the Loan and Lease Loss Contribution Margin. We expect that the sign on ICM's coefficient should be positive. Higher margins should unequivocally lead to better financial performance. The expected sign on the NCM coefficient should also be positive. Since bad loans and leases are detrimental to a bank's financial performance, the expected sign on the LLC coefficient is negative. We also include proxies for the efficiency of interest-related and non-interest-related activities, Interest Revenue Turnover (IRT) and Non-interest Revenue Turnover (NRT), respectively. The expected signs of the coefficients on IRT and NRT are positive, higher revenue, regardless of whether it is from interest or non-interest related activities, should have a positive impact on pretax ROA (unless the respective margins are negative, of course).

Table 2 presents the results of the PTROA regression. The adjusted R^2 is 85.7%, thus our proposed deconstruction explains the lion's share of PTROA. All of the variables have the expected sign. Both ICM and NCM are positive and significant, implying, correctly, that a higher margins lead to higher pretax return on assets. The coefficient on LLC is, as expected, negative and significant, indicating that loan losses are deleterious to profitability. The coefficients on IRT and NRT are positive and significant.

TABLE 2
REGRESSION OF PTROA ON ITS DECONSTRUCTION

	ALL	
	Coeff	*p*-value
C	-0.008	0.000
ICM	0.051	0.000
NCM	0.050	0.000
LLC	-0.053	0.000
IRT	0.183	0.000
NRT	0.209	0.000
Adj R-Sq	0.857	

The Impact of PTROA on Tobin's Q

Next we demonstrate that pretax return is indeed a driver of bank financial market performance. We include a proxy for leverage, FME, total assets divided by equity, as a control variable in the empirical specification. The specification is as follows:

$$M / B_i = \alpha + \beta_1 PTROA_i + \beta_2 FME_i + \varepsilon_i \tag{13}$$

We understand that EQ (13) is an incomplete specification. The goal here is to parsimoniously demonstrate that PTROA does indeed have an impact on bank performance. We will more fully develop the specification later, by deconstructing PTROA and including proper control variables. Table 3 presents the results. As expected, the coefficient of PTROA is positive and significant. The coefficient to FME is also positive and significant. Both operating performance and leverage are positively related to bank value.

TABLE 3
REGRESSION OF M/B ON PTROA

	ALL	
	Coeff	*p*-value
C	0.999	0.000
PTROA	3.321	0.000
FME	0.001	0.005
Adj R-Sq	0.193	

A Deeper Look at What Specific Drivers of PTROA Are Responsible for Tobin's Q

The results demonstrate that PTROA is an important driver of bank financial performance during the crisis period. As discussed above, however, PTROA is, in turn, driven by five different factors. Consequently, we replace PTROA with its deconstruction, with the goal of better understanding which of the specific channels is most responsible for the relationship between pretax ROA and bank financial performance. The empirical specification is as follows:

$$M / B_i = \alpha + \beta_1 ICM_i + \beta_2 NCM_i + \beta_3 LLC_i + \beta_4 IRT_i + \beta_5 NRT_i + \varepsilon_i \ . \tag{14}$$

M/B is our measure of the value-added by bank management and is similar to Tobin's Q. We calculate it as the ratio of the market value of the bank's assets to the book value of its assets. It is expected that the sign on IMC's coefficient should be positive. Higher margins should unequivocally lead to better financial performance. NCM is the Non-interest Contribution Margin. The expected sign on the NCM coefficient should also be positive. LLC is the Loan and Lease Loss Contribution Margin. Since bad loans and leases are detrimental to a bank's financial performance, the expected sign on the LLC coefficient is negative. We also include proxies for the efficiency of interest-related and non-interest-related activities, Interest Revenue Turnover (IRT) and Non-interest Revenue Turnover (NRT), respectively. The signs on the coefficients for these last two variables are difficult to predict a priori since there may be a relationship between these variables and a bank's size. We will control for size in a following specification.

Table 4 presents the regression results. As can be seen, the empirical specification seems to explain 45% of the changes in M/B cross-sectionally. The explanatory variables are significant, at the 1% level. The coefficients on ICM, NCM and LLC have the expected sign, (positive, positive, and negative, respectively). Higher margins, whether they be from interest or non-interest related activities, enhance market value, while higher loan losses are detrimental to market value. The coefficient on IRT is negative and significant, while the coefficient on NRT is positive and significant. This is an interesting result. During the crisis period, the market seems to punish firms that had a larger portion of their revenues coming from interest-related activities, and reward those firms that had a larger proportion of their revenues coming from non-interest related activities.

TABLE 4
REGRESSION OF M/B ON A DECONSTRUCTION OF PTROA

M/B is Tobin's Q. ICM is the interest contribution margin. NCM is the Non-interest Contribution Margin. LLC is the Loan and Lease Loss Contribution Margin. IRT is Revenue Turnover and NRT is Non-interest Revenue Turnover.

	ALL	
	Coeff	*p*-value
(Constant)	0.942	0.000
ICM	0.454	0.000
NCM	0.292	0.000
LLC	-0.148	0.000
IRT	-0.708	0.000
NRT	1.983	0.000
Adj R-Sq	0.450	

Controlling for Size, Leverage, and TARP Funding

We are concerned that the extent to which a bank is involved with non-interest related activities may be related to either its leverage or its size, so we examine the following specification which controls for it. The leverage proxy, FME, is measured as the ratio of total assets to total equity capital; it is in effect, an equity multiplier. The size proxy, SIZE, is the natural logarithm of the book value of assets. Lastly, since the existence of Troubled Asset Relief Program (TARP) funding might have been viewed negatively by the market, we include the dummy variable, TARP, that indicates whether the bank obtained TARP funding. The empirical specification is as follows:

$$M/B_i = \alpha + \beta_1 ICM_i + \beta_2 NCM_i + \beta_3 LLC_i + \beta_4 IRT_i + \beta_5 NRT_i + \beta_6 TARP_i + \beta_7 FME_i + \beta_8 SIZE_i + \varepsilon_i \quad (15)$$

The results of the analysis of the above model are presented in Table 5. We include full sample results as well as results for subsamples representing the smallest 10% of banks and the largest 10% of banks, since we expect that there might be interesting differences at the extremes. The coefficient of ICM is positive and significant in each of the panels. The coefficient estimates for the small and large bank subsamples are not statistically different from one another. Not surprisingly, the coefficient on NCM is also positive and significant in the full sample. Here however, there is a striking difference in the size of the coefficient estimates for small versus large banks, with the latter being almost two times are large as the former. The coefficient on LLC is negative and significant in the full sample; however it is positive and not significant for the smallest banks, and is big, negative, and significant for large banks. Large banks seem to be particularly punished by the market if they had an abundance of loan losses. The coefficient on IRT is negative for the full sample, as well as the small and large subsamples. Once again, there is a statistically significant difference in the magnitude of the coefficients, with the coefficient for large banks being almost 50% larger than that for small banks.

Interestingly, the coefficient on TARP is nowhere statistically significant; although it is negative for both the full sample and for the smallest banks, and is positive for the largest banks. Leverage seems to have a statistically significant, positive, and uniform, impact on bank value. Lastly, in the full sample and for the smallest banks, bank size seems to have very little impact on value, with positive coefficients that are not statistically significantly different from zero. The story is different, however, for large banks. The coefficient on the SIZE variable is negative and significant almost at the 1% level.

TABLE 5
REGRESSION OF M/B ON A DECONSTRUCTION OF PTROA

M/B is Tobin's Q. ICM is the interest contribution margin. NCM is the Non-interest Contribution Margin. LLC is the Loan and Lease Loss Contribution Margin. IRT is Revenue Turnover and NRT is Non-interest Revenue Turnover. FME, is measured as the ratio of total assets to total equity capital; it is in effect, an equity multiplier. SIZE, is the natural logarithm of the book value of assets. Lastly, TARP is an indicator variable that indicates whether the bank obtained TARP funding.

	ALL		10%		90%	
	Coeff	*p*-value	Coeff	*p*-value	Coeff	*p*-value
C	0.864	0.000	-0.055	0.862	1.115	0.000
ICM	0.522	0.000	0.433	0.000	0.404	0.000
NCM	0.316	0.000	0.264	0.000	0.473	0.000
LLC	-0.156	0.000	0.033	0.431	-0.565	0.000
IRT	-0.831	0.000	-0.588	0.001	-0.855	0.000
NRT	2.373	0.000	1.305	0.004	1.527	0.000
TARP	-0.002	0.235	-0.006	0.301	0.010	0.121
FME	0.005	0.000	0.005	0.000	0.006	0.000
SIZE	0.0001	0.901	0.070	0.004	-0.010	0.011
Adj R-Sq	0.500		0.509		0.574	

CONCLUSION

This study examines the relationship between the drivers of bank operating performance and shareholder value. Pretax return on assets is deconstructed into its component parts, and when these parts are used to model bank performance, the ensuing model explains over 85% of the actual results. The results verify that pretax return on assets is a significant driver of a bank holding company's ratio of market value of assets to book value of assets, our proxy for firm performance.

The results demonstrate that higher margins improve performance, regardless of whether they are derived from interest related or non-interest related activities. The results also indicate that a higher provision for loan and lease losses reduces the performance metric. However, when one looks at the asset turnover variables, one finds the interesting result that during the crisis period the sign on the interest turnover variable was negative while the non-interest turnover variable was positive. A possible explanation of this result is that the market penalized bank holding companies for an emphasis on traditional intermediation and rewarded banks that engaged in more diversified activities.

The results indicate a difference in the impact of loan losses on bank value. The coefficient on loan losses is negative and significant in the full sample, but it is positive and not significant for the smallest banks, and is large, negative, and significant for large banks. Thus, large banks seem to be punished more severely by the market if they had an abundance of loan losses. Lastly, in the full sample and for the smallest banks, bank size seems to have very little impact on value, with positive coefficients that are not statistically significantly different from zero. The story is different, however, for large banks, where the coefficient on the bank size is negative and significant almost at the 1% level. Interestingly, the coefficient on TARP is never statistically significant, but it is negative for the both the full sample and for the smallest banks, and it is positive for the largest banks.

REFERENCES

Akhter, S, and Daly, K., (2009). Bank health in varying macroeconomic conditions: A panel study. *International Review of Financial Analysis* 18 (5), 285-293.

Albertazzi, U. and Gambacorta, L., (2010). Bank profitability and taxation. *Journal of Banking & Finance* 34 (11), 2801-2810.

Calomiris, C. and Nissim, D., (2007). Activity-Based Valuation of Bank Holding Companies. *National Bureau of Economic Research* Working Paper 12918.

Cole, R. and White, L., (2012). Déjà Vu All Over Again: The Causes of U.S. Commercial Bank Failures *This* Time Around. *Journal of Financial Services Research* 42 (1), 5-29.

Hughes, J., Mester, L. and Moon, C., (2001). Are scale economies in banking elusive or illusive? Evidence obtained by incorporating capital structure and risk-taking into models of bank production. *Journal of Banking and Finance* 25 (12), 2169-2208.

Hughes, J., Lang, W., Mester, L., Moon, C., and Pagano, M., (2003). Do Bankers Sacrifice Value to Build empires? Managerial Incentives, Industry Consolidation and Financial Performance. *Journal of Banking and Finance* 27 (3), 417-447.

Hughes, J. and Mester, L., (2010). Efficiency in Banking: Theory, Practice, and Evidence, in A. Berger, P. Molyneux and J. Wilson eds., *The Oxford Handbook of Banking.* Oxford University Press.

Jordan, D. J., Rice D., Sanchez, J., and Wort, D., (2011). Explaining bank market-to-book ratios: Evidence from 2006 to 2009. *Journal of Banking and Finance* 35 (8), 2047-2055.

Kupiac, P. and Lee, Y., (2012). What Factors Explain Differences in Return on Assets Among Community Banks? Retrieved from http://www.fdic.gov/regulations/resources/cbi/report/cbi-roa

Rasiah, D., (2010). Review of Literature and Theories on Determinants of Commercial Bank Profitability. *Journal of Performance Management* 23 (1), 23-50.

Saunders, A. and Schumacher, L., (2000). The determinants of bank interest rate margins: an international study. *Journal of International Money and Finance* 19 (4), 813-832.

Tregenna, F., (2009). The fat years: the structure and profitability of the US banking sector in the pre-crisis period. *Cambridge Journal of Economics* 33 (2), 609-632.