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Economic Letter

When Gauging Bank Capital Adequacy, Simplicity Beats Complexity

by Michael A. Seamans

It is unclear whether ratio complexity enhances the ability to identify failure and is better than a simpler ratio. But a simpler ratio offers the benefits of greater transparency and accountability.

The pace of bank failures during the recent financial crisis reached a level not seen in nearly 20 years, capturing the attention of regulators and policymakers—particularly those in search of the best gauge of institutional stress that might have reliably foretold of the difficulties.

The capital ratio, a measure of a bank's cushion against losses, is a key metric, and its adequacy is critical to bankers, regulators and, ultimately, taxpayers. Over time, regulatory capital ratios have evolved along with the shifting landscape of banking, becoming more complex in an effort to capture the risks of an increasingly complicated financial world. This reflects the idea that because a bank's risk profile helps determine the amount of capital it needs, more complex capital ratios should provide a better assessment of institutional capital adequacy.

Financial crisis experience suggests it is unclear whether ratio complexity enhances the ability to identify failure and is better than a simpler ratio.[1] But a simpler ratio offers the benefits of greater transparency and accountability. Conversely, the presence of more complicated ratios—whatever the measurement shortcomings—may influence the incentives for engaging in excessive risk taking.

Failed Bank Landscape

Banks are in the business of risk; failure will occur. An environment in which no banks ever fail is impractical and inefficient.[2] Generally, a bank fails when its capital is so depleted that it can't meet its obligations to depositors and other creditors.

A total of 400 commercial banks failed from Jan. 1, 2008, to Sept. 30, 2012; 10 more received government assistance and remained open (*Chart 1*).[3]
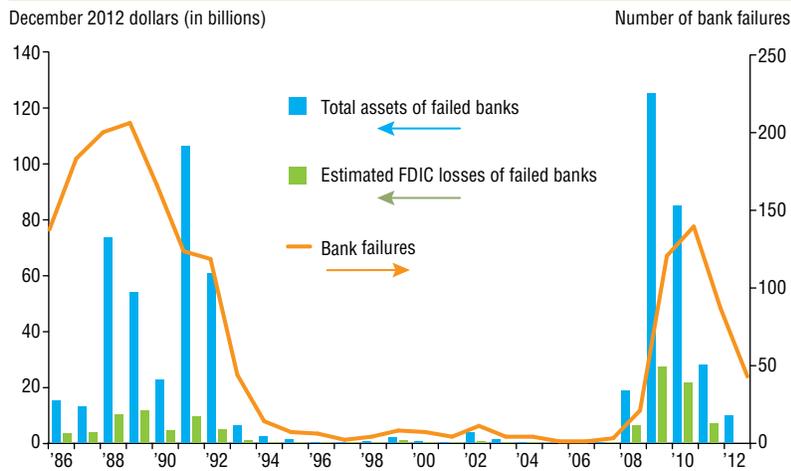
Relative tranquility preceded this turmoil—from 1994 to 2007, only 62 banks failed. Although more banks collapsed during the late 1980s and early 1990s than in the recent crisis, the sum of the estimated losses to the Federal Deposit Insurance Corp. (FDIC) insurance fund since 2008 exceeds the sum of losses from 1986 (when such data first became available) through 2007.

Beyond direct losses to the FDIC, failure-driven disruption of financial services inflicted additional costs—estimated at $10 trillion to $20 trillion for the 2008 crisis.[4]

Assessing Capital Ratios

To the extent that some believe more complex capital ratios better capture future risk, boosting their complexity theoretically should enhance identification of future financial difficulties.

Chart 1

Failures Highest Since Banking Crisis of 1980s, Early 1990s

December 2012 dollars (in billions)   Number of bank failures

- Total assets of failed banks
- Estimated FDIC losses of failed banks
- Bank failures

NOTE: Assistance transactions excluded. Comprehensive data for estimated FDIC losses are not available prior to 1986 and for 2012.

SOURCE: Federal Deposit Insurance Corp.

Many of the ratios use a basic measure of bank funding, tier 1 capital—in its simplest form, equity capital (common and preferred share equity along with retained earnings) plus minority interests in subsidiaries, less ineligible intangible assets (such as goodwill).[5]

To measure the value of complexity, we use two different, though similar, ratios. The relatively simpler tier 1 leverage ratio is tier 1 capital divided by bank assets. The more involved tier 1 risk-based capital (RBC) ratio is tier 1 capital divided by assets weighted by their riskiness. In either case, the larger the figure, the greater an institution's capacity to absorb future losses.

Chart 2 displays the median leverage and RBC ratios of failed banks as they approach failure, compared with historical medians and the historical fifth percentiles (representing the 5 percent of banks with the lowest capital ratios) and regulatory thresholds. Under regulatory requirements, banks with both leverage and RBC ratios of at least 4 percent are considered adequately capitalized.

The median failed-bank leverage ratio (black line) in the top panel begins near the historical median of all banks (blue line), suggesting little difference in capital levels between banks failing 12 quarters later and the median for all banks. By comparison, the median RBC ratio for failed banks (bottom panel, black line) is visibly lower than the historical median as far back as 12 quarters prior to failure. It's questionable, however, whether failed banks are distinguishable from nonfailed ones three years before failure because the presence of the median failed-bank RBC ratio above the bottom 5 percent of banks indicates that many banks have similar capital ratios. Additionally, the presumed effectiveness of forecasts so far in advance is very limited.

The median failed-bank leverage ratio falls into the bottom 5 percent of banks three quarters before failure.[6] The median RBC ratio of failed banks falls below the fifth percentile of all banks a quarter sooner, or a year before failure. (When a bank breaches a threshold between quarters, the occurrence is noted when the latter quarter's regulatory reports are filed.) Conversely, the median leverage ratio for failed banks falls below the well-capitalized threshold one quarter sooner than the RBC ratio does. This distinction earns the leverage ratio a slight advantage by its ability to identify troubled institutions a bit earlier using regulatory thresholds.

The median failed bank leverage ratio and RBC ratio both slip below the adequately capitalized threshold (green line) just one quarter prior to failure—neither providing much advance warning of gathering stress.[7]

Although the median failed banks' RBC ratio diverges from the median RBC ratio of all banks sooner than the less-complex leverage ratio, the RBC ratio doesn't clearly distinguish undercapitalized banks during the recent crisis any sooner than the leverage ratio.[8]

Adequate Capitalization

The likelihood of failure for banks not meeting "adequately capitalized" regulatory thresholds provides another comparative test. In Chart 3, three bars are shown for each quarter: the number of banks with leverage ratios below the existing 4 percent adequately capitalized threshold (left bar), the number with RBC ratios below 5.4 percent (center bar) and the number with RBC ratios less than the 4 percent adequacy measure (right bar). The 5.4 percent measure is the value at which an equal number of banks would fall below the RBC ratio threshold and the 4 percent leverage ratio threshold over the charted period.

At March 31, 2008, only five banks (less than 0.1 percent) had leverage ratios below 4 percent, while three institutions' RBC ratios fell below that same threshold. Of the 6,610 banks operating in June 2012, 99 banks' (1.5 percent) leverage ratios were below 4 percent; 46 banks' (0.7 percent) RBC ratios were less than 4 percent. The difference in the number of banks below regulatory thresholds for the two ratios signals the need for a more even comparison.

However, comparing the 4 percent leverage ratio on equal footing with the 5.4 percent RBC ratio doesn't yield a convincing winner over the four-and-a-half-year period—59 percent of banks below the leverage ratio regulatory threshold ultimately failed versus 61 percent of banks with RBC ratios below 5.4 percent.

Comparing Regulatory Thresholds

Another way to compare the ratios' ability to identify bank failures is to set thresholds for each so the same number of banks are flagged and then see which ratio predicts the greatest number of failures over the following year. In this case, the lowest 2.5 percent and 5 percent of each ratio as of June 30, 2009, were monitored over the four-quarter period between third quarter 2009 and second quarter 2010.[9]

Looking at the bottom 2.5 percent, the leverage ratio included 66 percent

of the banks that failed in the following four quarters and the RBC ratio captured 64 percent of the bank failures. In short, both identified about two-thirds of pending bank failures. Looking at the worst 5 percent, the leverage ratio captured 76 percent of failed banks, the RBC ratio 80 percent. Again, neither ratio stands out as a clear winner.
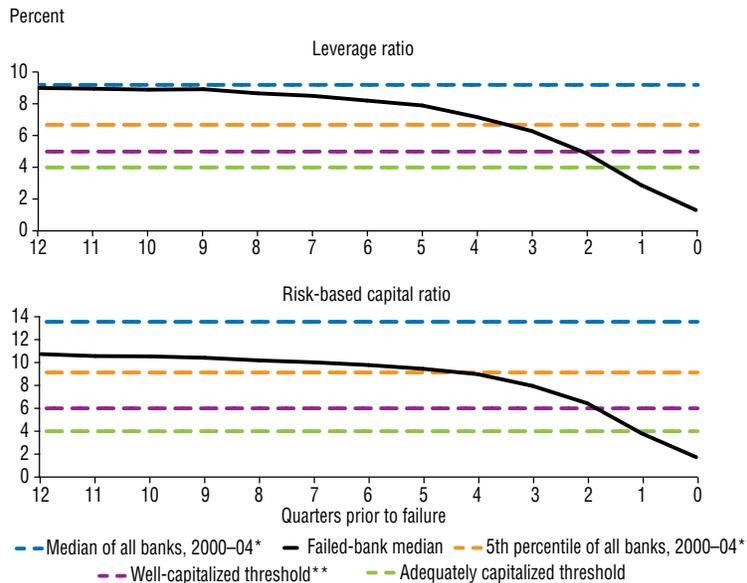
Predictive Power

The two ratios' accuracy is tested in Chart 4, identifying banks that failed or received assistance within four quarters (solid lines) or eight quarters (dashed lines) over a full range of hypothetical thresholds.[10] The vertical axis measures the percentage of missed alarms (failed banks identified as nonfailed)—in statistical terms, the type I error rate. The horizontal axis measures the percentage of false alarms (nonfailed banks identified as failed), the statistical type II error rate.

The performance of the two capital ratios when the percentage of false alarms/type II errors is low is of particular interest because a tradeoff in efficiency arises when a reduction of missed alarms comes at the expense of misclassifying more surviving banks. Focusing on a low type II error rate enables comparison of the number of failures missed (type I error rate) for a given sample number of banks that each ratio misclassified as failures.

Both ratios are quite successful at detecting bank failures four quarters in the future (solid lines). At the 5 percent false alarm/type II error rate, the leverage ratio correctly classifies 77 percent of failures (misclassifies 23 percent) and the RBC ratio correctly classifies 79 percent of failures (misclassifies 21 percent).

As one might expect, the ability to identify failed banks decreases with an increase in the forecast horizon. For example, at the eight-quarter horizon (dashed lines) and 5 percent false alarm/type II error rate, the RBC ratio correctly classifies 57 percent (misclassifies 43 percent) of failures, whereas the leverage ratio correctly identifies 51 percent (misclassifies 49 percent). While the difference in predictive power increases at a 10 percent false alarm/type II error rate over eight quarters, the leverage ratio is 7.5 percent and the RBC ratio is 9.75 percent at this error rate—both outside existing regulatory thresholds.

Chart 2 Changes in Leverage, Risk-Based Capital Ratios Precede Failures

Percent

Leverage ratio

Risk-based capital ratio

Quarters prior to failure

– – Median of all banks, 2000–04*   — Failed-bank median   – – 5th percentile of all banks, 2000–04*
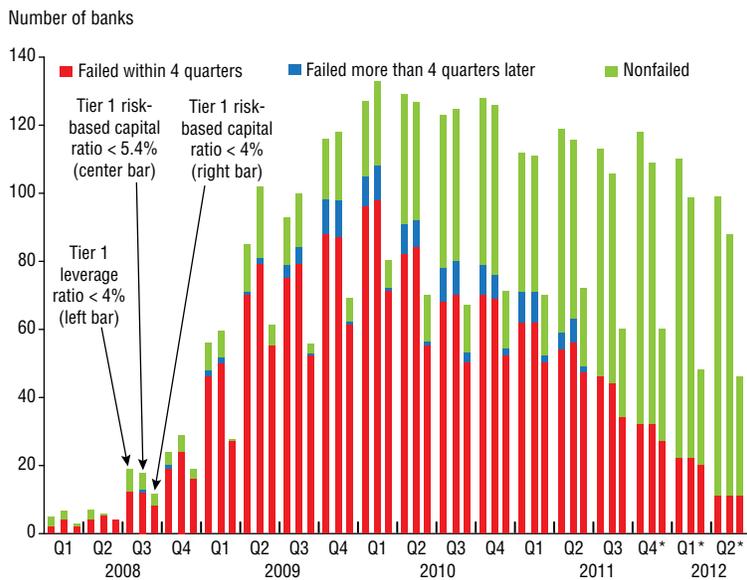– – Well-capitalized threshold**   – – Adequately capitalized threshold

* The median and fifth percentile values are constants calculated using the five-year period preceding the analysis window and include all commercial banks from first quarter 2000 through fourth quarter 2004. Failed-bank medians include banks that failed between first quarter 2008 and third quarter 2012.

**To be considered well capitalized, banks must have a tier 1 leverage ratio of 5 percent or more, a tier 1 risk-based capital ratio of 6 percent or more and a total risk-based capital ratio of 10 percent or more.
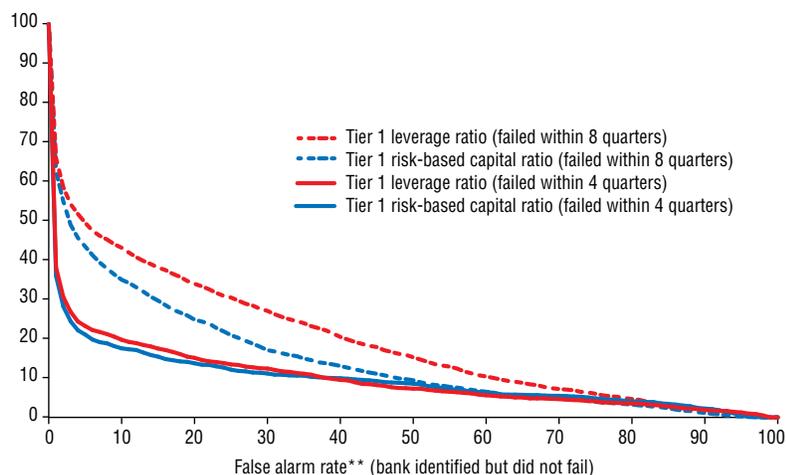
SOURCES: Federal Deposit Insurance Corp.; Reports of Condition and Income, Federal Financial Institutions Examination Council; author's calculations.

Chart 3 Both Ratios Identify a Similar Number of Failed Banks When Placed on Even Footing

Number of banks

■ Failed within 4 quarters   ■ Failed more than 4 quarters later   ■ Nonfailed

Tier 1 risk-based capital ratio < 5.4% (center bar)

Tier 1 risk-based capital ratio < 4% (right bar)

Tier 1 leverage ratio < 4% (left bar)

* The most recent three quarters do not include a full four quarters of failures.

SOURCES: Federal Deposit Insurance Corp.; Reports of Condition and Income, Federal Financial Institutions Examination Council; author's calculations.

The portion of the chart corresponding to current regulatory minimums is where the false alarm/type II error rate is very low and both ratios have a similarly high missed alarm/type I error rate. If the false alarm/type II error rate at the eight-quarter

Chart 4 — Both Capital Ratios Exhibit Similar Success in Predicting Bank Failures with Respect to Regulatory Minimums*

Missed alarm rate** (bank failed but not identified)

Legend:
- Tier 1 leverage ratio (failed within 8 quarters)
- Tier 1 risk-based capital ratio (failed within 8 quarters)
- Tier 1 leverage ratio (failed within 4 quarters)
- Tier 1 risk-based capital ratio (failed within 4 quarters)

False alarm rate** (bank identified but did not fail)

* Successful predictions for a given quarter are defined as banks that failed or received assistance in the following four or eight quarters. Analysis includes banks that failed between Jan. 1, 2008, and Sept. 30, 2012.

**Missed alarm rate refers to the type I error rate. False alarm rate refers to the type II error rate.

SOURCES: Federal Deposit Insurance Corp.; Reports of Condition and Income, Federal Financial Institutions Examination Council; author's calculations.

horizon is set at a level that includes banks with leverage ratios below 4 percent, the type II error rate is 0.17 percent and the corresponding type I error rate is 79 percent. For the RBC ratio, the type II error rate is 0.06 percent and the type I error rate is 86 percent. The extremely low type II error rates indicate that there is little difference in the performance of the two ratios with respect to the regulatory minimums.

While both the tier 1 risk-based capital ratio and tier 1 leverage ratio help predict future bank failures, the more complex tier 1 RBC ratio does not markedly outperform the simpler tier 1 leverage ratio and, at times, underperforms it. In essence, greater capital ratio complexity doesn't make the task of identifying future bank failures any easier.

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Notes

[1] For more information on the topic, see "The Dog and the Frisbee," by Andrew G. Haldane and Vasileios Madouros, Bank of England, paper presented at "The Changing Policy Landscape" symposium sponsored by the Federal Reserve Bank of Kansas City, Jackson Hole, Wyo., Aug. 30–Sept. 1, 2012; and "Capital Ratios as Predictors of Bank Failures," by Arturo Estrella, Sangkyun Park and Stavros Peristiani, Federal Reserve Bank of New York *Economic Policy Review*, July 2000.