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Interpreting the Bank Stress Tests

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We will hear on Thursday the results of the financial "stress tests" that the regulators have been running on the 19 largest banking groups in the U.S., those with assets of over $100 billion. We will directly learn which bank holding companies will be required to raise additional capital, or to convert one form of capital to another, and which are fine as is. The likely result is that a handful of the 19 banks will need to issue common or preferred stock totaling $100-200 billion in the aggregate, with some of that handled by converting preferred shares into common shares. Taxpayers would be on the hook as a "back stop" provider of capital if one or more of these firms cannot raise the capital privately or chooses not to.

Equally importantly, we may learn something about the government's views of the financial state, and prospects, of the 19 banks, and of the likely depth of the banking crisis. These firms dominate the U.S. banking system, holding over two-thirds of the system's assets among them. Good or bad news about them has profound implications for the overall economy, because the credit crunch created by the banking crisis is a major contributor to the severity and length of this recession. The "white paper" released by the Federal Reserve on April 24th makes clear that there is a great deal of regulatory judgment being applied in these tests, whether in judging loan quality or determining the capital requirements. Therefore, the results will give us a real sense of the thinking of the regulators about the financial state of the banks, based on a detailed, comprehensive analysis. Unfortunately, this view may be muddied a bit by political constraints.

The key figure to note is the size of the aggregate capital actions required for the 19 banks, measured as the amount of preferred stock converted to common stock plus the amount of incremental capital raised beyond the starting level. The range I expect, of $100-200 billion, would be broadly in line with consensus expectations for the depth of the recession and the resulting credit losses. A smaller requirement would likely indicate the regulators and the Administration are more optimistic about the banking crisis. The $100-200 billion range is feasible within political constraints and therefore would not be avoided solely for political reasons. On the other hand, a larger figure might indicate that things are worse than the consensus believes. Imposing a larger total capital requirement would hit significant political barriers, particularly since it would probably force an eventual return to an unwilling Congress for more money. Doing this despite those political constraints would seem to indicate serious concerns.

The trickiest situation to analyze would be if the aggregate figure is in the expected range. This could either mean that this is the level regulators genuinely see as the right additional buffer or could reflect the political reality that Congress would be extremely reluctant to authorize more funds and would almost certainly add strings that the Administration would find onerous. It could be more appealing to operate within the present authorization and wait to see if that proves to be enough.

This paper answers the following questions:

- How does the stress test work?
- How can we interpret the overall results?
- Can we tell in advance which banks will need the most funds?

How does the stress test work?

The Administration announced a plan in February to subject the largest banking groups in the country, those with assets of $100 billion or more, to a financial "stress test." For simplicity, I will refer to "banks," but the actual test analyzes the results for the entire group of companies controlled by a given bank holding company. Subsidiaries of these holding companies include securities dealers, some insurance companies, and other non-bank entities, as well as banks outside the U.S. Bank holding companies are required by law to be a "source of strength" for the banks they own, and there are also many business ties between the holding company, its banks, and its other affiliates. All of this makes it important to view a bank's health in the context of its entire group.

These 19 banks have spent the last couple of months analyzing what their profits and losses would be from now until the end of 2010 under two scenarios, an expected "baseline" case and a more pessimistic "stress" case. The high-level assumptions for each scenario were supplied by the regulators, coordinated by the Federal Reserve. Conceptually, the banks are filling in an immensely large spreadsheet to predict the profitability of their past investments and of new business over this time period.

Large banks run such analyses frequently, since it is critical for them to understand their likely levels of profit and loss as well as to run more pessimistic scenarios to assess their vulnerabilities. The difference with the current exam is that regulators are requiring a comprehensive test, under assumptions they have supplied, that is consistent across the 19 banks. Further, the White Paper makes clear that a great deal of regulatory judgment is being applied, with the regulators insisting on adjustments to estimates of loan losses, profitability of lines of business, etc., based on their views of how a bank would fare.

We know the values of a few key macroeconomic variables that are being used, such as economic growth over the period, unemployment rates, and house prices. The baseline scenario was intended to represent the consensus economic forecast at the time it was put together, but now appears somewhat optimistic. More importantly, there is a "stress" case intended to represent a more pessimistic economic scenario than anticipated. The White Paper on the stress tests indicated that the stress case was constructed so that there was believed to be only a 10-15% chance that a scenario as bad as the stress case would come to pass. Given the course of the economy since then, most commentators now view the odds as being considerably higher, although the stress case is still worse than the consensus forecast, taking all the assumptions together. Table 1 shows the key economic assumptions.

TABLE 1

Economic growth, unemployment, and house prices under the two scenarios

	Economic Growth		Unemployment		Decline in House Prices	
	2009	**2010**	**2009**	**2010**	**2009**	**2010**
Base Case	-2.1%	+2%	NA	8.9%	-14%	-4%
Stress Case	-3.3%	Flat	8.9%	10.3%	-22%	-7%

The key result of each bank's stress test is the level of capital remaining at the bank at the end of 2010 in the pessimistic scenario. The regulators will compare that level of capital to a standard which has not yet been revealed and which reportedly contains significant regulatory judgment, potentially varying by bank. If the level of Tier 1 capital or of common stock falls below the targets, then the bank will be given six months to raise additional capital.[1] The total capital requirement will be higher than regulators normally require, in order to provide a buffer that can be drawn down during this extraordinary financial crisis and still leave the bank appropriately capitalized at the end of 2010. In theory, capital rules will revert to their normal levels after the crisis, although separate regulatory reform legislation may increase the required capital levels.

One important aspect of the temporary capital requirements is that common stock must be the "dominant" form of capital to meet the minimum requirements. That is likely to mean that more than 50% of the required capital is in the form of tangible common equity. (Intangible assets have always been virtually fully excluded for regulatory capital purposes.) However, it is possible that an even higher proportion of common stock could be required.

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1. Please see "Bank Capital and the Stress Tests" for a longer explanation of the various categories of bank capital.

How can we interpret the overall results?

The 19 banks own over two-thirds of the assets in the U.S. banking system, which enables us to usefully compare the stress test results with the estimates of various experts about the losses likely to be endured by the system as a whole over the course of this crisis. We can make this comparison by backing out of the stress test results an estimate as to what credit losses are assumed through 2010 for the 19 banks and then grossing this up to account for the rest of the banks in the system.[2] The analysis is necessarily approximate, but it is likely to be clear whether the regulators have a view that is roughly in line with the consensus of analysts, somewhat more optimistic, or somewhat more pessimistic. It is virtually certain that the results will not be consistent with the views of much more pessimistic economists such as Nouriel Roubini. Thus, such a comparison will also provide a sense of how much more capital would be needed, beyond that implied by the stress tests, if the most pessimistic serious analysts are correct.

The first step in my analysis is to sum the key figures relating to asset size and capital position of a core group of banks included in the stress test.[3] These numbers are then grossed up to represent the figures for the full banking system. The analysis assumes that the core group of banks examined in this paper represents 60% of the total banking system[4] and that the capital position of the remaining banks is similar to the core group. In fact, the capital position of the smaller banks is likely to be stronger, but they are also likely to need more capital per dollar of assets. Smaller banks are usually judged to require more capital to cover the significantly greater risk created by their inherently less diversified business mix. (Most banking crises hit individual regions, causing less harm to truly national banks.)

Table 2 shows the asset levels and capital ratios for the banking system as a whole resulting from this analysis. These figures are broadly consistent with FDIC numbers for the banks as a whole, but differ in two significant ways. First, Table 2 includes other subsidiaries of bank holding companies, which the FDIC does not include. Second, the capital structures of bank holding companies generally

TABLE 2

Implied capital position of the U.S. banking groups, including non-bank subsidiaries

	System Total
Total assets	16,358
Total risk-weighted assets	10,502
Tier 1 capital	1,146
Common equity	1,064
Intangibles	443
Tangible common equity	621
Tier 1 capital as a % of risk-weighted assets	10.9%
Tier 1 leverage ratio (capital to total assets)	7.0%
Tangible common equity as a % of total assets	3.9%

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2. There is also a chance that the specific estimates for each bank will be released by the regulators, in which case we will not need to use estimates.
3. For simplicity, the nine banking groups in the stress test with less than $200 billion were excluded. Further, MetLife Bank, with $500 billion of assets, was excluded because the group's activities are dominated by life insurance and annuity activities, making it a very different animal than the others. The remaining nine banking groups own approximately 84% of the assets of the full group of 19, and hold a similar proportion of the capital.
4. Based on FDIC figures for the assets held by the banking system, plus my own rough estimate of the assets held by banking groups outside of their bank subsidiaries.

have more debt and less common stock than the banks themselves do. One reason for this is that bank holding companies often borrow money, or issue preferred stock, to fund injections of capital into their banking subsidiaries. Those injections are usually in the form of purchases of common stock of the bank.

Table 2 represents the starting position of the banking system. The financial position at the end of 2010, which drives capital needs under the stress test, would also be affected by credit losses, offset by net earnings exclusive of those credit provisions. For simplicity, the analysis assumes that the level of loans and other assets stays stable, except for the effect of gains or losses. In practice, some growth in lending is likely to be included in the business plans being analyzed, although this may be offset by an intention to shrink certain other assets to hold down the level of capital required.

Table 3 shows the net systemwide losses under three scenarios, chosen to represent the consensus economic viewpoint, a pessimistic view of the crisis, and an average of the first two scenarios. The first scenario attempts to apply the findings of the International Monetary Fund (IMF) given in their April 2009 Global Financial Stabilization Report (GFSR). That report starts with a very thorough analysis of likely losses on all forms of credit emanating from the United States. It further breaks down these losses into those that will remain with U.S. banks and those that fall on foreign or non-bank parties. Finally, the IMF estimates the likely benefit of bank earnings exclusive of credit losses, adjusting for taxes and dividend payments. The second scenario is based on the credit loss projections from February 2009 by Dr. Nouriel Roubini, of NYU's Stern School of Business. Dr. Roubini is a well-known pessimist on the current economic crisis who has done a thorough analysis of the likely credit losses for U.S. banks under his economic assumptions.

There have been a number of press reports providing guidance as to what assumptions were used in the stress test and what the results were. However, the reports, taken as a whole, seem inconsistent, which makes it difficult to be confident of their accuracy. For example, the Wall Street Journal has reported figures that purport to be the assumed loss rates on different major categories of loans for 2009-2010. These figures are generally higher than the IMF's assumed loss rates for the entirety of the crisis period, which started before 2009 and will likely produce losses into 2011 and beyond. The Journal has also reported likely minimum capital ratios that are significantly tougher than current rules. One would expect the combination to produce quite large capital requirements as a result of the stress tests. Yet reports also imply that the total requirements will be no worse than the $100-200 billion range I have estimated. As will be shown later in this paper, that range appears consistent with the IMF loss rates, not with rates substantially worse than those. It is possible that differences in other assumptions would explain the seeming inconsistency, but the gap appears too big to be explained in that manner.

These seeming inconsistencies and the general lack of detail in the press reports, which is consistent with the efforts of the regulators to keep a lid on the distribution of information prior to May 7th, make it difficult to base our expectations of the aggregate results on anything but the external loss analyses of the IMF, Roubini, and others, combined with the political constraints that exist.

An astute reader may wonder why there is no variable in these scenarios to deal with the important question of the valuation of the toxic assets at the banks. The scenarios deal with this indirectly by calculating the total credit losses, some of which will be expressed as declines in the value of toxic assets and some of which will show up in loans or other asset categories, and subtracting out the portion which has already been recognized as a loss. This approach works well as long as the banks hold onto their toxic assets or trade them with each other. Any gain or loss from selling toxic assets to non-bank parties at a price different from the assumed

TABLE 3

Net reduction in retained earnings under three economic scenarios, ($ in billions)

	IMF	Roubini	Average
Systemwide assets (from Table 2)	16,358	16,358	16,358
Portion of total assets exposed to credit losses[1]	70%	70%	70%
Total credit-exposed assets	11,451	11,451	11,451
Cumulative loss rate from 2007-2010[2]	10.2%	16.0%	13.1%
Implied cumulative losses for the system[3]	1,168	1,832	1,500
Bank writedowns through December 2008[4]	510	510	510
Q1/2009 writedowns, estimated[5]	40	40	40
Remaining writedowns through Q4/2010	618	1,282	950
Other retained earnings 2009 to 2010[6]	300	300	300
Net reduction in retained earnings	(318)	(982)	(650)

1. Approximate percentage of assets in the banking system that are loans and securities, according to the FDIC
2. For IMF: cumulative loss rate for all loans and securities from IMF GFSR. For Roubini: cumulative
   loss ratio chosen by the author to approximate Roubini's total projected losses
3. Figure for IMF column derived from their loss rate is about 10% higher than the number they indicate for total bank losses. This is presumably due to my inclusion of
   the effect of all non-bank subsidiaries.
4. From IMF April 2009 GFSR
5. Estimated by author
6. From IMF April 2009 GFSR

economic value would not show up here. In this regard, it is unclear what the effect of the incentives to be provided by the government for buyers of toxic assets would be. They will certainly raise the price above what investors would otherwise pay, but it is uncertain whether the price would be above or below the economic value assumed in the three scenarios.

These scenarios all show the likelihood that the additional credit losses taken in 2009 and 2010 will exceed the core earnings power of the banking system. It should be noted that many analysts expect a smaller gap, with core earnings of $100-200 billion more for the banks over the period. Whatever the size of the gap, it can be partially or fully covered

by existing capital in excess of the levels required by regulators under current rules. However, the regulators appear to be tightening these capital requirements temporarily in conjunction with the stress test results, likely resulting in substantial capital needs. Thus, the new capital requirements will be almost as important as the expected financial performance in explaining the capital needs resulting from the stress tests.

Current capital rules rely heavily on certain minimum capital ratios, although regulators are given flexibility to require still more capital if they feel it is necessary.[5] Bank holding companies, which are the entities undergoing the stress tests, are considered "well capitalized" if the figures for their consolidated groups exceed certain levels:

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5. Please see "Bank Capital and the Stress tests,", for a more comprehensive explanation.

- Tier 1 capital of at least 6% of risk-weighted assets;
- Tier 1 and Tier 2 capital of at least 10% of risk-weighted assets
- Tier 1 capital to total assets, without risk-weighting, ("leverage ratio") of at least 4%.

The ratio of Tier 1 capital to total assets can technically be as low as 3% for a well capitalized bank holding company, but only if the group is considered well-managed and the financial situation relatively benign. Under today's circumstances, this exception is unlikely to be applied. Banks themselves are judged on the same ratios as their parent holding companies, except that a 5% leverage ratio is required to be considered well capitalized. One technical point to note is that the remainder of this paper will ignore Tier 2 capital, as it is in relatively abundant supply in the banking system.

The regulators implied in the White Paper that they will not be applying a completely mechanistic set of ratios to determine the additional capital buffer required under the stress test. Apparently, they will take account of the individual risk profiles of the different banks and their affiliates. However, it should still be useful to make some estimates of capital needs based on simple ratios, as these figures should continue to carry great weight. The Federal Reserve has indicated further that the regulators are looking for the capital at the end of the stress test period to have common stock as the "dominant" component. Leaks have indicated that this would mean that more than half of the capital would need to be in that form. Since intangible assets are largely excluded from Tier 1 capital, this means that tangible common equity would need to supply half of the minimum required capital.

Table 4 shows the implied additional capital required under the three economic scenarios based

TABLE 4

Stress test capital requirements under current rules. All figures as of EOY 2010, ($ in billions)

	IMF	Roubini	Average
Total assets	16,040	15,376	15,708
Total risk-weighted assets	10,184	9,520	9,852
Tier 1 capital	828	164	496
Tangible common equity	303	(361)	(29)
Tier 1 qualifying preferred stock[1]	420	420	420
Other Tier 1 capital	105	105	105
Tier 1 capital required at 6% RWA ratio	611	571	591
Tier 1 capital required at 4% leverage ratio	642	615	628
Tangible common equity required as half of minimum Tier 1 capital	321	308	314
Additional common stock required	18	669	343
Amount available by converting preferred	18	420	343
New common to be issued	-	248	0
New Tier 1 preferred to be issued	-	202	132

1. Author's estimate that 80% of Tier 1 capital other than common consists of preferred stock

on the current criteria for a bank holding company to be considered well capitalized. The figures for capital and asset levels at the end of 2010 are derived by applying the results from Table 3 to the starting position of the banking system taken from Table 2. Note that the very different levels of common equity and Tier 1 capital across the three scenarios reflect the strongly differing expectations of credit losses.

It is certainly possible that the regulators will require higher capital levels than the ones currently needed for a bank holding company to be considered well capitalized. Table 5 shows the effect of one potential combination of ratios: an 8% ratio of

Tier 1 capital to risk-weighted assets; a 6% leverage ratio; and a requirement that half of the Tier 1 capital consists of tangible common equity. For comparison, the ratios for the banks analyzed here at the end of the first quarter of 2009 are: 11% Tier 1 to RWA, 7% leverage ratio, and 4% ratio of tangible common equity to total assets.

Thus, the rules analyzed in Table 5 would allow the banks to have less conservative ratios after the crisis has largely passed than they do now. This is not unreasonable, as the markets are clearly demanding extra capital because of the riskiness of the period ahead and concerns about the credibility of current accounting numbers. These issues should be less pressing by the end of 2010.

TABLE 5

Capital requirements at higher capital ratios, ($ in billions). All figures as of EOY 2010

	IMF	Roubini	Average
Total assets	16,040	15,376	15,708
Total risk-weighted assets	10,184	9,520	9,852
Tier 1 capital	828	164	496
Tangible common equity	303	(361)	(29)
Tier 1 qualifying preferred stock	420	420	420
Other Tier 1 capital	105	105	105
Tier 1 capital required at 8% RWA ratio	815	762	788
Tier 1 capital required at 6% leverage ratio	962	923	942
Tangible common equity required as half of minimum Tier 1 capital	481	461	471
Additional common stock required	178	822	500
Amount available by converting preferred	178	420	420
New common to be issued	0	402	80
New Tier 1 preferred to be issued	134	356	366

If these tougher temporary capital rules are applied, there would need to be significant new capital raised even under the IMF's credit loss and earnings assumptions, in addition to a significant conversion of existing preferred stock into common stock. Under Roubini's assumptions, these external capital issuances would be very large and would include a substantial issuance of new common stock.

Tables 4 and 5 make the major assumption that all of the banks in the system have similar capital levels, earnings capacity, and risks. This is clearly untrue, which means that the aggregate capital raising, and attendant government backstop commitment, could be significantly larger. The system as a whole could be basically fine, for example, but a few weak large banks could still need substantial capital support. The next section discusses why it is so hard to

make the estimates on a bank-by-bank basis.

A crude way of estimating the additional capital required in aggregate due to variations in bank strength is to assume that a quarter of the banks, weighted by size, are significantly worse than the average and a quarter better. The starting assumptions for Table 6 are the same as in the IMF column on Table 5. However, the top quartile of banks are assumed for this table to have assets equal to 102% of their expected one-quarter of the systemwide assets. Common equity and capital are higher by an equivalent absolute amount. The bottom quartile is worse off by the same adjustment of 2% of their proportional share of total assets.

This is for illustration only and not intended to be an exact estimate of the effect of heterogeneity among the banks in the system, which would

TABLE 6

Effects of variations in capital needs across banking system, $ billions

	Unadjusted Systemwide	Top quartile	Middle half	Bottom quartile	Total
Total assets	16,040	4,090	8,020	3,930	
Total risk-weighted assets	10,184	2,597	5,092	2,597	
Tier 1 capital	828	287	414	127	
Tangible common equity	303	156	152	(4)	
Tier 1 qualifying preferred stock	420	105	210	105	
Other Tier 1 capital	105	26	53	26	
Tier 1 capital required at 8% RWA ratio	815	204	407	204	
Tier 1 capital required at 6% leverage ratio	962	241	481	241	
Tangible common equity required as half of minimum Tier 1 capital	481	120	241	120	
Additional common stock required	178	-	89	125	214
Amount available by converting preferred	178	-	89	105	194
New common to be issued	-	-	-	20	20
New Tier 1 preferred to be issued	134	-	67	94	161

require much more detailed analysis.

Thus, in the example in Table 6, heterogeneity across the banks results in a capital need roughly a fifth higher than a uniform distribution would have exhibited, ($214 billion of additional common versus $178 billion.) On the other hand, using Roubini-like loss estimates for the same scenario creates no effect from heterogeneity, essentially because all quartiles of the banking system need to raise capital. There is literally no change in that example from adding the four quartiles versus simply assuming a uniform distribution. The additional capital need in the worst quartile due to its inferior performance is exactly offset by an equivalent reduction in the top quartile due to its better performance. That does not happen in the example shown in Table 6, because the top quartile cannot raise less than zero new capital.

Finally, it is worth a reminder that each of the scenarios shown in the preceding tables is for the system as a whole. The 19 banking groups in the test appear to have about 70% of the assets of the entire system and therefore any systemwide figures for capital needs must be scaled down by multiplying by roughly 70%. So, the $214 billion of new common stock required in the example shown in Table 6 for the system as a whole would translate to a bit over $140 billion for the banks in the stress test.

Can we tell in advance which banks will need the most funds?

Unfortunately, it is highly complex to analyze individual banks and much of the necessary information is not publicly available, which is one reason for the massive stress testing exercise. Two issues cut across all of the individual bank analyses: there are almost certainly significant differences in the degree of accounting conservatism across the banks and also in the quality of the loans on their books. It is possible to estimate these differences, but the conclusions based on publicly available information will be quite subjective and potentially error prone. However, the regulators have had access to much more detail and have devoted the resources to make significantly better judgments than we could. Those judgments will strongly affect the results for individual banks, but in ways that are difficult for us to guess now.

In addition, there are differences between three classes of banks. The largest banks, with their substantial investment banking and other activities, differ significantly from the regional banks like US Bancorp. In general, it appears that the regional banks have avoided many of the problems from toxic assets by focusing more on lending. This has worked in their favor. However, many categories of loans, such as commercial real estate, are just starting to experience heavy losses. The regional banks are likely to take bigger proportional hits from these areas through 2010. The balance between these factors is likely to work against the regional banks, but it is difficult to know for certain and to know how strongly they would be affected. Finally, two of the banks focus more on asset management and activities providing the plumbing for securities transactions, like clearing. This class of banks is generally perceived as being in relatively good shape.

Finally, two of the banks that have received the most focus as potentially needing to raise new capital have substantial benefits from government asset guarantees. Citigroup and Bank of America have purchased protection on hundreds of billions of dollars of their assets from the Federal Reserve. The guarantees kick in after the banks take substantial additional losses, but are still likely to be of major value in the stress scenario. The details are complex, and not fully explained, making it very hard to guess the level of benefit that flows through to the bottom line in the stress test.

Conclusions

There is a wide range of reasonable estimates for the capital needs that will arise from the stress tests, differing by hundreds of billions of dollars. The figure will depend particularly on judgment calls about likely credit losses from this recession and on the choice of capital ratios to be targeted. In addition, there are a host of technical assumptions that are difficult to estimate precisely with publicly available information and which will have considerable effect in the aggregate.

It seems likely that credit losses will be assumed that are broadly consistent with the assumptions of the IMF, with perhaps some modest additional losses. This does suggest that the "stress" test has turned out to be closer to consensus forecasts than to the original intent that it represent an unlikely, pessimistic scenario. For their part, required capital ratios for the end of 2010 are probably going to be noticeably tougher than the current standards for a bank holding company to be well capitalized, although it is difficult to predict what they will be exactly.

Political constraints layered on top of the above assumptions suggest that the tests will likely result in $100-200 billion of capital actions, defined as the amount of preferred stock converted to common stock, plus any incremental capital raised. A figure much above this level would almost certainly use up a significant amount of the remaining funds authorized by Congress, which is something the Administration and regulators would strongly prefer to avoid. A figure below this seems inconsistent with a true stress test and would not confer enough political benefits to be worth the hit to the credibility of the results that would come if the test seems too easy. Therefore, a figure significantly above or below the expected range would carry considerable information value, indicating greater optimism or pessimism from the regulators than the consensus forecast implies.

ABOUT THE AUTHOR

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