

Douglas J. Elliott, The Brookings Institution
March 3, 2009

Bank Capital and the Stress Tests

The government has embarked on “stress tests” of the financial health of the 19 largest banks to determine whether they have adequate capital to withstand an even worse recession than is expected. The testing, along with recent events at Citigroup, has spurred an extended discussion of what “capital” is and how much banks need to have.

In this key component of the Financial Stability Plan, the Administration is right on virtually all counts. It is right to insist on comprehensive, uniform stress tests to measure the effect on banks of a considerably more severe recession than expected. It would not be helpful, as some have suggested, to move to a test of still more extreme conditions. That kind of test would create unreasonable pressure to take actions, such as sweeping nationalizations, that are quite unlikely to be necessary.

It is right to insist that the banks temporarily carry additional capital sufficient to handle this stress case, since a large audience needs reassurance that the banking system can handle the worst. It is right to focus primarily on raising this cushion through additional Tier 1 capital, which includes a fairly wide range of capital instruments. The government should focus on protecting depositors, customers, and trading counterparties of the banks, all of whom would benefit fully from the protection of Tier 1 capital.

At the same time, as is rumored to be part of the plan, it would also be right to insist that enough of this capital be in the form of common stock, the purest form of capital, in order to reassure the stock market. This crisis has demonstrated how a sharp fall in a bank’s stock price can spook many constituencies of the bank, creating wider problems. However, that should not mean requiring an excessively high proportion of common stock in the capital structure. Beyond a certain point, federal purchases of common stock reduce the value for existing stockholders while simultaneously transferring too much risk to taxpayers.

Lest this litany of approval sound like a partisan position, the author would note again his serious concerns about another aspect of the overall plan, the “public/private partnership.” Please see his other papers at <http://www.brookings.edu/experts/elliotttd.aspx>.

This paper explains the following topics:

- What is “capital” at a bank?
- Why are there different definitions? When is each appropriate?
- How has the government injected capital into banks?
- Why don’t banks hold more capital?
- How much capital do banks need?
- How will the stress tests work?
- What capital will need to be raised as a result of the stress tests?

What is “capital” at a bank?

In simplest form, capital represents the portion of the bank’s assets which does not have to be repaid and therefore is available as a buffer in case the value of the bank is lower than the accountants thought or becomes lower over time. If bank balance sheets were always accurate and banks always made profits, there would be no need for capital. Unfortunately, we do not live in that fantasy world, so a cushion of capital is clearly necessary. Banks attempt to hold the minimum level of capital that supplies adequate protection, since capital is expensive, but all parties recognize the need for such protection, even if they may debate the right level or form.

Capital comes in many variations. The ideal form of capital has the following characteristics. Weaker forms of capital have most of these characteristics or have all of them but in a weaker form.

- **It does not have to be repaid.** Some instruments are still considered capital because repayment is far in the future.
- **There is no requirement for periodic dividend or interest payments.** Weaker forms of capital have an expectation of periodic payments, but not an absolute requirement.
- **Low bankruptcy priority.** In bankruptcy proceedings, claimants are paid out in a priority order depending on the nature of their claim. Capital provides the most protection to other parties if it ranks last. Some forms of capital are not at the lowest priority, but still rank below the great bulk of claimants.

There are different financial instruments that can represent capital. The purest form is “common stock”. Shares of common stock represent direct ownership of a company; if one owns 1 share out of 100 in existence, then one owns 1% of the company and is entitled to 1% of any profits that are distributed over time. Common stock is the purest form of capital because there is no requirement to ever pay it back, nor is there a legal requirement to pay dividends. Common stock also has the lowest payment priority in bankruptcy, with the legal right only to receive any residual value after all other claimants are paid. It would be impossible to design a purer form of capital, as it fully meets the three tests listed above.

Preferred stock can also be considered capital. A preferred share is similar to a loan or a bond, in that there is a fixed claim on the assets of the company (a “redemption value”) and an agreed dividend rate that will be paid periodically. However, it is considered “stock” (and capital) because, unlike a loan, preferred shareholders have no right to force the company into bankruptcy if the preferred dividend is not paid. The penalty for skipping a preferred dividend is that no dividends can be paid to common stockholders unless the preferred shareholders receive a full dividend. In terms of bankruptcy priority, preferred shares rank behind all other claimants, except for common stockholders.

There are many variations of preferred stock, spanning the range from instruments that look more like common stock to ones that look more like debt. For example, there are participating preferred shares whose dividend rises if the dividend rate on common shares goes up. There are also perpetual preferred shares which never need to be repaid. Towards the other end of the spectrum, there are cumulative preferred shares which have the right to eventually receive any skipped dividends payments; no common dividends can be paid until the cumulative preferred dividends are paid.

Generally, preferred shares are considered stronger forms of capital if they: are perpetual or have maturities many years in the future; do not have the right to catch-up payments on any missed dividends; and are lower in bankruptcy priority than anything except common stock. (There can be senior preferred issues which have priority above more junior preferred shares and are therefore weaker forms of capital.)

From certain vantage points, some kinds of debt are similar enough to preferred stock to count as capital, in a weak sense. Such debt is perpetual or has a maturity far in the future and is explicitly “subordinated” to other debt, meaning that it has a lower claim in bankruptcy. This is the weakest form of capital, since it must be repaid and has the right to receive regular interest payments, enforced by the ability to put the company into bankruptcy. However, it does provide a cushion for depositors and other debtors, since, in bankruptcy, subordinated debt would be paid off only to the extent there were assets available after these other classes were paid.

At the other extreme, there is an even more conservative definition of capital than common equity. This is “tangible common equity,” which is common equity minus the value of “intangible assets.” Common equity is the total accounting (“book”) value of assets minus the value of liabilities (everything that the company owes) minus the value of any form of equity other than common stock, usually consisting only of preferred stock. That is, it represents the value of the assets minus everything that someone else has a claim on. However, this assumes that all of the assets should count at their book value. This includes intangible assets; ones that have value, but which are not physical in nature, such as copyrights, or brand names, or goodwill.

Most intangibles at banks derive from the difference between the amount the bank paid in the past for another bank and the book value of the acquired bank’s assets at the time of the purchase. The presumption is that the sales price represents the fair value of the bank, since it was arrived at in an arms-length negotiation, so intangible assets must exist that were worth the difference between the price and the book value. If these assets can be clearly identified, such as a copyright, then they are shown as a separate category of intangible assets. However, usually the great bulk of the value for a bank falls into the catch-all of “goodwill.” The largest banks have grown through many acquisitions, so goodwill can represent a large figure for them. Goodwill and other intangible assets are written off over time, as their value is assumed to diminish with the passing years, but the amortization periods are long enough that the major banks still have large quantities of intangibles on their books.

Intangible assets can represent true value, but investors recognize that they are particularly difficult to turn into cash in a crisis and that they can lose value if a bank's overall franchise deteriorates. For this reason, many investors prefer to treat them as worthless when evaluating capital adequacy. Such investors focus on tangible common equity.

Why are there different definitions of capital? When is each appropriate?

A key point about capital is that the relevant amount depends on where you are in the priority of repayment in the event of insolvency. **One only directly benefits from capital which is repaid AFTER you are or which is repaid as you are, thus sharing your loss.** Any part of the capital structure which has higher priority than you do has no direct value for you. Those other forms of capital may provide indirect value, by helping avoid insolvency in the first place by meeting regulatory requirements or reassuring customers. However, if a bank does go off the rails, these indirect values count for very little.

This is why the government has focused on Tier 1 capital, which includes a fairly wide range of securities. The government's principal concern is to reassure depositors, customers, and trading counterparties, who all have higher bankruptcy priority than the providers of Tier 1 capital. Common stock investors, who have the lowest repayment priority, have focused intensely recently on the most conservative measure, tangible common equity. However, no party can afford to ignore those capital measures that matter to other key parties. Regulators have to watch tangible common equity, because they do not want shareholders to grow too concerned about any of the banks, and stock investors have to pay attention to Tier 1 capital, since this is the regulators' main focus.

There is one other benefit of common stock, and to a considerable extent, preferred stock – the ability to forego dividend payments. Skipping dividend payments allows the bank to build its capital base through retained earnings. This ability is strongest for common stock, because it is always understood that dividends are optional. Investors view preferred stock somewhat more like debt, so there is more of a stigma in skipping a dividend payment, even though it is legal to do so. Of course, when it is already apparent that a bank is in crisis, this stigma counts for little and preferred dividends tend to be skipped.

How has the government injected capital into banks?

Treasury's Capital Protection Program (CPP) resulted in the purchase of large volumes of preferred stock from banks. The preferred shares carry a dividend rate of 5% for the first five years, at which time the rate increases to 9%. The dividend is cumulative, meaning that any skipped dividends must be made up eventually before common dividends can be resumed. Banks may redeem the preferred after three years, or anytime earlier if at least 25% of the amount is replaced by equity raised from the private markets.

Certain key characteristics of the CPP preferred would normally have prevented it from being considered Tier 1 capital, so legislation mandated that regulators give it Tier 1 treatment. Tier 1 preferred may not normally be paid back so soon, nor have such a big jump in dividend rate, (partly because it is considered to be a backdoor way of forcing a redemption,) nor may the dividends be

cumulative. The existence of these characteristics is one reason why the government's capital injections have provided somewhat less comfort than originally hoped.

Why don't banks hold more capital?

The problem with capital is that it is expensive. If capital were cheap, banks would be extremely safe because they would hold high levels of capital, providing full protection against even extreme events. Unfortunately, the suppliers of capital ask for high returns because their role, by definition, is to bear the bulk of the risk from a bank's loan book, investments, and operations.

If a bank were to hold 50% more capital than it really needed, it would have to charge more for its loans and other services in order to earn more for its capital providers. Of course, the reduction in risk should make capital providers willing to accept somewhat lower returns, but the net effect, in practice, would still be an increase in the total cost of capital and therefore the returns demanded from customers. In the real world, there are a number of factors that keep the required returns on capital from dropping as much as one might expect from an increase in capital levels. For one thing, the government's implicit and explicit guarantees make additional capital less valuable. To some extent, adding capital shifts risk from the taxpayers to the providers of capital, as losses that would have been paid for by a deposit insurance fund or a government rescue can instead be funded out of investors' capital.

Table 1 shows a very simplified example of the effect of capital requirements on the return on common equity of a bank. It assumes that the loan book represents all of the bank's \$100 of assets. The bank earns 6% on loans after subtracting expenses and credit losses from the interest rate charged. All capital is in the form of common stock, which is required to be either 8% or 12% of the assets. The rest of the bank's assets are funded by deposits which cost 5%, counting the bank's expenses of generating the deposits.

Table 1: Returns on common stock at different capital requirements

		12% capital	
	8% capital	Same loan rate	Higher loan rate
Balance sheet items			
Loan assets	\$100.00	\$100.00	\$100.00
Deposits	\$92.00	\$88.00	\$88.00
Common stock	\$8.00	\$12.00	\$12.00
Income statement items			
Interest rate	6.00%	6.00%	6.25%
Loan income (loan assets * interest rate)	\$6.00	\$6.00	\$6.25
Deposit costs (deposits * 5.5%)	\$(5.06)	\$(4.84)	\$(4.84)
Net income	\$0.94	\$1.16	\$1.41
ROE (net income/common stock)	11.75%	9.67%	11.75%

Thus, increasing the required capital by half would reduce the return on equity (ROE) by a bit over 2 points. The original ROE could be restored by raising the interest rate on loans from 6.00% to 6.25%, assuming competitive conditions allowed this. In practice, the new balance would probably come from a combination of (1) higher interest rates on loans, as the entire banking system strove to restore returns, (2) reduced ROE requirements from stock investors as they recognized that the riskiness of the stock had declined, and (3) a fall in the share price, assuming the fall in the ROE is greater than the decline in return expectations. This assumes that competition from other sources of loan funding would substantially limit the ability to raise interest rates. It also assumes, as mentioned above, that the perceived riskiness of the stock investment would not fall in proportion to the reduced ROE.

Capital requirements are always a compromise between capital efficiency and bank safety. Policymakers and regulators do not wish to add a friction cost to lending transactions by requiring excess capital and the banks and their shareholders have no interest in earning lower ROE's.

How much capital do banks need?

The level of capital "needed" by a bank depends on the risk-aversion of the party calculating the need. In practice, the most conservative key constituency, usually the regulators, determines the level of capital a bank will hold. (Please note that "regulators" is intended to include the policymakers who set the high-level framework for them.) Common shareholders want their bank to be safe, but are willing to accept a higher risk of insolvency than other parties, because shareholders benefit substantially from employing less capital under normal conditions.

Regulators, on the other hand, are generally the most conservative of the banks' constituents, since it is their job to minimize the probability that a bank fails. Regulators receive much less upside than shareholders do from allowing a bank to employ less capital and therefore earn higher returns on that capital. It is true that a more profitable banking sector brings indirect benefit to regulators, but the penalties for them of a bank failure are much larger than those benefits. As a result, regulatory capital requirements are generally higher than a bank would choose looking purely at the interests of its shareholders, as can be seen from the internal capital models at banks, which usually call for less capital in total than the regulatory requirements.

Credit rating agencies also play a role in determining the capital levels carried by banks, since ratings are a major determinant of the cost of funds for banks as well as their ability to do business with certain counterparties who are concerned about credit risk. The general analytical approach of the rating agencies overlaps considerably with regulatory capital calculations, in part because the agencies factor into their analyses the likely actions of regulators. The two sets of approaches are sufficiently similar that this paper will focus almost exclusively on regulatory capital.

Regulators around the world defined two tiers of capital in the 1988 Basel Accord. "Tier 1," the strongest, consists of common stock and those forms of preferred stock that are most like common. "Tier 2" adds in many types of preferred stock that are less like common stock and more like debt, as well as certain subordinated debt securities. In addition, it includes some accounting reserves that are

not tied to specific claims and therefore provide a protective function somewhat like other forms of capital. The two tiers are intended to ensure that there is enough total capital available to handle even extreme occurrences and that the bulk of this capital is the stronger “Tier 1” variety. Generally, banks have plenty of Tier 2 capital, so the focus has been on ensuring there is enough of the stronger form of capital, Tier 1.

Regulators in the U.S. measure capital adequacy in part by looking at the ratio of Tier 1 capital to “risk-weighted assets,” (RWA.) RWA is the risk-weighted total amount of assets held by the bank. That is, the total value of each asset is multiplied by a percentage reflecting its risk level and this adjusted amount is added across all assets to produce a total risk-weighted asset figure. The percentage weighting for each category ranges from 0%, for extremely safe investments such as cash and US government securities, to 100% for the riskiest classes of assets.

The ratio of Tier 1 capital to RWA is required to be an absolute minimum of 4% and must be at least 6% for a bank to be considered “well-capitalized.” Banks that are not well-capitalized have a number of regulatory restrictions which create strong incentives for a bank to remain “well-capitalized.” Generally, banks aim to have a ratio of at least 8% of Tier 1 capital to risk-weighted assets.

It is important to note that these capital tests are balance sheet tests, based on the level of assets, liabilities, and capital in existence at the time of the test. This has two key implications. First, the accounting figures determine the test results. Thus, the aggregate value chosen for “toxic assets,” which is a point estimate of a value that could arguably lie within a wide range, currently has a major impact on the reported capital levels. Regulators can push for more conservative estimations, but their ability to force this matter is somewhat limited, given that the accounting rules do allow considerable leeway.

Second, the standard tests are not forward-looking. Regulators may ask for scenario analyses looking at how the economic situation might unfold, but it can be difficult under normal circumstances for them to push the banks too hard to add capital based on those hypothetical cases.

Given the current extraordinary circumstances and the likelihood of further severe effects from the recession, the Administration concluded that there needs to be a forward-looking component of capital requirements. Therefore, the Administration, in concert with the Fed and other regulators, recently announced the intention to create an additional, temporary, layer of capital requirements, based on a “stress test.” The test is intended to ensure that banks have sufficient capital if the economy were to deteriorate substantially more sharply than the consensus of forecasters already anticipates.

How will the stress test work?

Regulators are requiring the 19 bank holding companies that have total assets of more than \$100 billion to run a stress test and to raise additional capital if the tests show the need. These tests are being run now and the results will be available by April.

The stress test is intended to determine what would happen to bank capital levels if the economy shrank substantially more than is already anticipated, while house prices fell further. The fundamental idea is to ensure that the banking behemoths that dominate the system will have more than sufficient capital to withstand even a very bad economic environment. Such an environment would exacerbate the losses on the toxic assets that created the initial problems for financial institutions. (Toxic assets generally consist of securities whose returns are tied in complex ways to the results of an underlying pool of mortgages.) In addition, the severity of this recession is already producing substantial losses on loans in categories that have not been viewed with the same concern as the toxic assets have, such as business loans. The stress test is intended to capture all sources of credit and investment losses that would be affected by a more severe economic downturn.

The hope is that by applying a rigorous, uniform test, and infusing whatever additional capital is shown to be necessary, confidence in the banking system will return. A return of confidence to the banks' depositors and creditors, and to the banks themselves, would facilitate the renewal of normal operations, including an increase in new lending activity.

Alongside the stress test, a base case will be run that roughly represents the consensus forecast of private economists. Table 2 shows the key variables under each case. For comparison, economic growth in the fourth quarter of last year was approximately -1.5% (annualized to -6.2%); unemployment was 7.6% in January; and house prices have fallen approximately 25% from their peak already, according to the Case Schiller index.

Table 2: Economic growth 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 19 largest banks are highly complex entities and it will be necessary for the regulators to rely to a considerable extent on the internal models at each bank in order to determine the likely effects of these scenarios. However, the regulators intend to closely supervise the modeling process and to impose what uniformity and rigor they can. Doubtless they will also use a number of consultants to review the process and results. All in all, it appears unlikely that gamesmanship or fraud will significantly affect the outcome of the analyses. That does not, however, preclude considerable negotiation about how to value the toxic assets.

In addition to these 19 banks, other banks may request to participate in the process, although it seems unlikely that many will, since the major benefit is access to additional government capital, as explained next. Since this capital will be available to a substantial extent even without running the tests, there does not appear to be any great advantage to volunteering for the process.

What capital will need to be raised as a result of the stress test?

The stress tests will be used to impose additional, temporary, capital requirements. It appears that the regulators will require that banks raise sufficient capital in advance to maintain their Tier 1 capital ratio at 6%, (the level to be considered “well-capitalized”), for the entirety of the period covered by the stress test. There are indications that half of this 6% minimum will be required to be in the form of common stock, although it is not clear that this will be a hard and fast rule or that the 3% level represents a firm decision yet.

Banks will have six months from the conclusion of the test to raise these funds. If they are unable, or unwilling, to raise the funds from investors, Treasury will buy new preferred securities sufficient to reach the required levels. These shares will be mandatorily convertible, meaning that they will automatically be converted into common stock in seven years if not paid down first. Prior to that time, the bank can cause a conversion of all or part of the preferred into common. Any conversion will take place at a conversion ratio set at a 10% discount to the average price of the bank’s stock on the 20 trading days prior to February 10, the date of the announcement of the government’s Financial Stability Plan.

The preferred has been carefully designed to make clear that federal money would be automatically available to supply common equity, if needed. At the same time, banks are to be given every reasonable possibility to avoid accepting federal ownership if management views the terms as unattractive to shareholders. The banks will have six months to try to raise other funds and seven years to find a way to pay off the preferred, if they would rather it did not convert to common. This balance seems a wise one. The world needs to know that the government will provide the highest quality capital, if needed. At the same time, it is critical not to spook existing shareholders into selling their shares based on a fear of future dilution of their ownership, since plunging stock prices can spread fear to other parties who are more critical to the banks and the government.

The preferred shares will pay the government a 9% rate from the beginning, rather than starting at 5% for the first five years, as the CPP preferred did. This rate is almost certainly lower than other market participants would charge, especially given the ability of the banks to force conversion at a fixed price. This does not mean the government will necessarily lose money, but it means that it could theoretically have earned more for taking a similar risk and thus incurs an opportunity cost. The opportunity cost may be exacerbated by offering the same basic terms to all 19 banks, since any bank that could acquire the funds more cheaply in the private market would likely do so, leaving the government providing funds to those who would be charged the most by the markets.

The opportunity cost would be registered in the budget as a subsidy expense at the point when the preferred is purchased by the government. This helps explain why the Administration has set up a contingency reserve of \$250 billion in its budget proposals for the potential cost of future financial support for the banks. Not all of this will necessarily be needed for the capital requirements produced by the stress test, but a large chunk of it likely will be allocated for this purpose. (Please see the author’s paper, [“Measuring the Cost of the TARP,”](#) for additional details on the budget implications.)

The temporary capital requirements are intended to deal with the extreme level of uncertainty created by the current economic crisis, including the high level of uncertainty about the value of the toxic assets on the books of the banks. Presumably, these requirements will be phased out as the crisis abates and the extra cushion is no longer deemed necessary to reassure all concerned about the banks' solvency.

The temporary nature of the additional capital requirement is crucial to helping banks recapitalize over time by accessing the stock market. The more capital a bank has to hold for a given level of business, the lower the returns are on each unit of capital, as described above. Thus, a share of common stock in a bank would generally be worth more at lower capital levels than at higher levels, as long as the level is perceived as a safe one. Excessive conservatism would doom shareholders to low returns, making it difficult to raise new common stock at a reasonable price. A couple of years of higher capital requirements should not markedly affect that pricing, but a permanent change would have a major effect.

Banks smaller than the initial 19 may apply for a similar government investment of between 1% and 2% of their risk-weighted assets. If they need more capital than this, they can apply for "extraordinary" aid, which will presumably come with greater oversight and other conditions. It does not appear that smaller banks will have to run the stress test in order to qualify for the government investment.