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The Adoption of Stress Testing: Why the Basel Capital Measures Were Not Enough

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Abstract: The Basel capital adequacy ratios lost credibility with financial markets during the crisis. This paper argues that failure was the result of the reliance of the Basel standards on overstated asset values in reported equity capital. The United States' stress tests were able to assist in restoring credibility, in part because they could capture deterioration in asset values. However, whether stress tests will prove equally valuable in the next crisis is not clear. Some of the weaknesses in the Basel ratios are being addressed. Moreover, the U.S. tests' success was the result of a combination of circumstances that may not exist next time.

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Key words: Basel capital ratios, stress test, financial crisis

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1. Introduction

Prior to the financial crisis that started in 2007, bank supervisors in the developed world had invested enormous resources in developing and implementing the capital adequacy requirements as one of their primary prudential regulatory tool. These efforts have been most evident internationally in the capital adequacy accords of the Basel Committee on Banking Supervision (BCBS). The first of these accords, widely known as Basel I, was released in July 1988 with the expectation that it would be fully implemented no later than the end of 1992 for internationally active banks (BCBS).[1] A more sophisticated system of measuring capital adequacy, called Basel II, was issued in June 2004.[2]

Yet when tested by the financial crisis that started in 2007, the Basel approaches (I and II) to capital adequacy were not enough to sustain depositor and investor confidence in many large banking organizations. To be sure, the problem was not that investors lost confidence in banks because the they were reporting low Basel capital ratios. Furlong[3] shows that large U.S. bank holding companies (BHCs) consistently reported tier one capital ratios above 8 percent on average throughout 2007 and 2008 (versus Basel tier one requirements of four percent). Haldane[4] finds similar results for a sample of large, internationally important financial firms in the U.S. and Europe.[5] Nevertheless, many globally important financial firms failed or required extraordinary assistance from their respective governments during the crisis including Bear Stearns, Lehman Brothers, American International Group (AIG), Royal Bank of Scotland, Dexia, Lloyds and Fortis.[6]

After the widespread runs that followed the failure of Lehman Brothers, the U.S. authorities turned to stress tests as a way of addressing market concerns about capital adequacy.

The U.S. Supervisory Capital Assessment Program (SCAP) subjected the country's 19 largest BHCs to a stress test. BHCs under SCAP were required to evaluate the adequacy of their capital against a "severely adverse" scenario and they were expected to retain sufficiently high capital ratios throughout the scenario to be able to continue lending to creditworthy customers. BHCs that did not pass the test were required to either issue additional capital to investors or accept a capital injection from the federal government that came with various restrictive requirements.[7] SCAP appears to have been a success as market concerns about BHC's financial conditions were reduced and BHCs increased their capital ratios.[8,9]

The purpose of this paper is to evaluate what the stress tests did that the Basel ratios did not do, and to examine whether stress tests are likely to serve a similar purpose in the future. The next subsection begins this analysis by providing a brief historical summary of capital regulation to set the stage. The third section explains why the Basel ratios were not enough and how stress tests addressed Basel's inadequacy. The fourth section examines the likelihood that stress tests will be called upon to perform a similar role in the future. The last section provides some concluding remarks.

2. A brief history of capital regulation

Bank supervisors have long use ratios to evaluate the capital adequacy of their banks.[10] In the United States after World War II, the federal bank regulatory agencies did not issue regulations setting minimum capital requirements but rather used a variety of ratios as a part of the supervisory process. However, Marcus[11] argues that absent minimum regulatory requirements the supervisors used these ratios to judge banking organizations against their peers. As a consequence, although U.S. supervision generally succeeded in keeping individual banking organizations from reducing their capital ratios below their peers, it was ineffective in preventing

widespread declines in capital ratios. In response to these declines, the U.S. entered the modern era of capital regulation by adopting numeric requirements based on a simple leverage ratio in 1981.[12] However, the U.S. measure which equally weighted assets was, in the words of Kapstein,[13] "hopelessly simplistic" relative to several other G-10 countries including Belgium, France and Germany.

This section provides a brief summary of the procedures followed to measure capital adequacy in the Basel ratios and stress tests.

2.1. Basel Capital Accords

The first step towards Basel I standards came as U.S. supervisors noted the weaknesses in the leverage ratio and started looking at the more risk sensitive measures used in several G-10 countries. The U.S. then worked on its own and in coordination with increasing numbers of supervisors in other developed countries to reach agreement on a common capital standard.[14] International agreement was reached by the BCBS[15] on July 15, 1988. The 1988 agreement, now commonly referred to as Basel I, set requirements for the ratios of tier one capital to risk weighted assets (RWA) and of total (Tier 1 plus Tier 2) capital to RWA. Tier one capital consists primarily of common and perpetual preferred equity whereas tier 2 included items such as general loan-loss allowances, hybrid capital instruments and subordinated debt. RWA was calculated by classifying assets into one of five categories based on their relative credit risk, assigning each category a risk weighting that ranged from zero percent to one hundred percent, multiplying the assets by their risk weights and then summing the weighted assets.

Basel I's crude measurement of credit risk in the banking book discouraged the accumulation of low risk loans to the private sector while encouraging banks to take risks that were underweighted by the standards. Concerns about these distortions led to the issuance of the

BCBS[16] publication of "International Convergence of Capital Measurement and Capital Standards: A Revised Framework," more commonly known as Basel II.

Basel II contains three parts or "pillars." Pillar 1 provides the methodologies for calculating risk-based capital ratios. Pillar 2 deals with additional discretionary supervisory tools to address risks and other concerns not covered in Pillar 1. Pillar 3 is intended to enhance market discipline by requiring increased risk disclosure.

Pillar 1 provides banks with three different ways to risk weight their assets: standardized, foundation internal ratings based approach (foundation IRB) and the advanced IRB. The standardized approach is like Basel I in that it assigns assets to different buckets and then assigns a fixed weight to each of the buckets. The foundation IRB requires banks to provide their own estimates of the probability of default (PD) for each asset class and enter this into supervisory formulas to obtain the risk weight. The advanced IRB expands the set of parameters estimated by the bank to include not only probability of default, but also exposure at default (EAD), loss given default (LGD) and effective maturity (M). The supervisors would then supply a formula including an assumed loss correlation to risk weight each exposure. Banks that wanted to use either of the IRB approaches were required to obtain prior supervisory approval of their models for estimating the parameters.

In light of the problems revealed by the global financial crisis that started in 2007, the BCBS reviewed the Basel II standards looking at areas where the standards may have underweighted risk. This review led to a comprehensive revision called Basel III being issued by the BCBS[17] in December 2010. Basel III introduced several changes, including new limitations on the instruments that qualify as capital, enhanced risk coverage, the adoption of a new leverage requirement, countercyclical capital buffers, and new minimum liquidity standards. Given the

magnitude and variety of the changes, the various new requirements are being phased in over several years.

2.2. Brief history of Stress testing

Committee on the Global Financial System (CGFS)[18] describes stress testing as "generic term describing various techniques used by financial firms to gauge their potential vulnerability to exceptional but plausible events." Stress testing was incorporated into the market risk amendment to Basel I with the BCBS[19] requirement that firms using internal models must have a "rigorous and comprehensive stress testing program" for the risks in their trading books. CGFS followed this up with two subsequent surveys CFGS .[20,21] These surveys by CFGS found that large banks were conducting their own stress tests but that these tests were largely limited to the banks' trading books.

2.2.1. Supervisory stress tests in the United States

The role of stress tests as measures of individual bank's capital adequacy took a dramatic change with the February 10, 2009 with the announcement by U.S. Treasury Secretary Geithner[22] that the largest U.S. BHCs would be required to undergo a supervisory stress test. This stress test came to be known as the Supervisory Capital Assessment Program (SCAP) and was applied to the 19 largest U.S. owned bank holding companies (BHCs).[23] The Board of Governors of the Federal Reserve System (BOGFRS)[24] describes the tests as "a forward looking exercise designed to estimate losses, revenues, and reserve needs for BHCs in 2009 and 2010 under two macroeconomic scenarios, including one that is more adverse than expected." The Federal Reserve provided baseline and more adverse scenarios for unemployment, GDP growth and national home price changes. BHCs took the details of their portfolios and their own stress test models to estimate for each scenario the following: (a) pre-provision net revenue, (b)

expected losses in 12 loan categories, (c) expected losses in their available for sale (AFS) and held to maturity (HTM) securities portfolios and (d) in some cases the losses in their trading portfolios. These estimates were then subject to review and revision by the supervisors using newly developed supervisory models.

The BHCs subject to SCAP were expected to maintain capital levels in excess of regulatory requirements at the end of the eight quarter horizon. Those BHCs that fell short of this standard were required to issue new capital; they could not meet the standards by shrinking their portfolios. The result of the exercise was that 10 of the 19 BHCs needed to raise an aggregate of $185 billion in Tier 1 common capital.[25] These 10 BHCs were given an opportunity to do so in private markets, but those that did not raise the funds privately were required to accept a capital injection by the U.S. government through the Capital Purchase Program of the Troubled Asset Relief Program (TARP). Only one of these banks, GMAC, was unable to raise additional capital or improve the quality of their existing capital without government assistance.[26]

The Federal Reserve and other U.S. bank supervisors have also run stress tests as a part of the Comprehensive Capital Analysis and Review (CCAR) in 2011,[27] 2012,[28] and 2013.[29] CCAR includes stress tests using supervisory supplied scenarios; stress tests using BHC supplied scenarios, and an analysis of the adequacy of each BHC's capital planning process. As a part of the CCAR, the covered institutions each submitted their capital distribution plans (dividend payments and stock repurchases) for Federal Reserve approval. BHCs whose initial plans were rejected by the Federal Reserve in 2011 and 2012 were not allowed to increase their capital distributions. In order to pass the stress test, each BHC had to maintain capital above the existing minimum regulatory minimums and a tier 1 common ratio of 5 percent on a pro forma

basis throughout the planning horizon. Additionally, the CCAR exercises require BHCs to report their ability to meet the Basel III capital requirements. For the 2012 exercise the BOGFRS[30] states that they BHCs were required to show they could "achieve readily and without difficulty" the ratios required by Basel III.

Although banks were not required to issue new capital as a result of the CCAR exercises, the Federal Reserve "objected to" (effectively blocked) some BHCs plans for increased capital distributions in the 2011, 2012 and 2013 exercises. The Federal Reserve did not provide BHC specific disclosures in the 2011 CCAR results but Bank of America Corporation publicly disclosed that the Federal Reserve had objected to its plans.[31] The Federal Reserve did provide more information about 2012 and 2013 CCAR results. The Federal Reserve reported that it objected to the capital distribution plans of four BHCs in 2012[32] and two BHCs in 2013.[33]

The set of BHCs subject to mandatory stress testing and capital planning was expanded in 2012 to include all domestically owned BHCs with assets greater than $50 billion. However, these additional nine BHCs were analyzed under a less rigorous Capital Plan Review or CapPR because these BHCs were smaller and lacked the stress testing experience of the larger CCAR BHCs.[34] Also, in 2012 the Federal Reserve formalized its guidance in the form of revisions to Regulation YY.[35]

Finally, the Dodd-Frank Act has made stress testing a permanent part of the supervisory evaluation of large bank's capital adequacy. Section 165 of the Dodd-Frank requires the Board of Governors to conduct annual stress tests with three sets of scenarios (baseline, adverse and severely adverse). Additionally large BHCs are required to conduct their own semiannual stress tests.

2.2.2. European Union Experience

Many European countries also ran a stress test in 2009 using a common scenario and guidelines developed by the Committee of European Banking Supervisors (CEBS). However, the CEBS[36] announcement of the test explicitly stated that the evaluation of banks' capital adequacy remained the province of national supervisors and this test was only intended to assess the resilience of the European financial system. The subsequent announcement of the results by CEBS[37] only provided overall results for the sample of 22 major banking but it also stated that no bank would see its Tier 1 ratio fall under 6% under the adverse scenario.

The following year, CEBS conducted another EU wide stress test where individual bank results were released. The 2010 stress test was expanded to 91 European banks with only seven of these banks failing to pass the test and these seven banks were expected to raise only €3.5 billion.[38] However, one of the key stresses facing European banks in 2010, the threat of a sovereign default, was deliberately understated by the structure of the tests which required banks to recognize potential losses on bonds in their trading books but not in their banking book.[39] Four months after the announcement of the results of the 2010 CEBS stress test, Allied Irish Banks and Bank of Ireland failed even though both had passed the stress test.[40] Their failure also raised doubts as to whether the stress scenarios were sufficiently stressful.

The 2011 European stress tests were conducted by CEBS successor, the European Banking Authority (EBA).[41] The EBA stress tests were similarly limited in their treatment of sovereign debt, suffered from other problems[42,43] and again found relatively few banks (8) needing to raise a relatively small amount of capital (€3.5 billion). However, the EBA enhanced transparency by providing information on exposures by asset class and geography in the form of a spreadsheet. Thus, analysts could and many did, conduct their own version of the stress tests

using their preferred loss assumptions. The credibility of the official 2011 EBA results were undercut by reports that a bank which had passed the test, Dexia, required Belgian and French support in early October 2011.[44]

3. Why Basel was not enough and how that lead to adoption of stress tests

Basel II in particular is supposed to provide a 99.9% level of confidence at an annual level, that is that a bank will suffer losses in excess of its tier 1 and tier 2 capital only once in a thousand years. Such a 1000 year period would seem to capture even the "severely adverse" scenario used in the U.S. SCAP. Yet, the U.S. supervisors turned to SCAP rather than rely on Basel I or force its large commercial banks to immediately adopt Basel II. In order to understand why Basel was not enough and why stress tests were needed, one has to look at the construction of the two measures. The next two subsection examine each of the two measures in greater detail. The third section uses these details to explain what the stress tests did that the Basel ratios could not do.

3.1. Basel ratios

Despite their may differences, all versions of the Basel Capital ratios can be described as being unconditional static measures of capital adequacy with the risk adjustment occurring in the denominator (risk-weighted assets). The Basel ratios are static, unconditional measures in that they measure capital adequacy at a single point in time using a process to calculate the ratios that does not depend upon the expected future state of the economy. The Basel ratios use historical data to estimate the bank specific distribution of losses associated with various asset categories. These distributions are then used to estimate expected losses in the lower tail of the distribution.[45] The current portfolio positions are then summed using weights derived from the expected losses to calculate the denominator of the Basel ratios.

The Basel ratios rely on the denominator for risk adjustment with the calculation of the measure of capital (the numerator) being relatively mechanical. The Basel capital accords provide definitions of the items to include in tier 1 capital (such as common equity and retained earnings) and to include in tier 2 capital (such as subordinated debt). The accords also provide for certain deductions from tier 1 capital (such as for certain intangible assets) and tier 2 capital (such as deductions to subordinated debt as it approaches maturity). However, the values of each of the items included in capital are taken directly from each bank's financial statements and hence are measured in a process that is independent of the process for calculating the Basel capital ratios.

3.2. Stress tests

In contrast, the stress tests are conditional dynamic measures with the risk adjustment occurring in the numerator (capital). A bank's stress tests begin with whatever ratio(s) are being used by its supervisor, which is to say that all of the EU and U.S. supervisory stress tests have begun with one or more of the Basel ratios. The stress test then becomes dynamic in that it measures the capital ratios at various points in time throughout the scenario. It is conditional in that the result of each stress test is conditional on an economic scenario specified prior to the start of the stress test.

The primary goal of a stress test is to project the capital ratios at the end of one or more periods. The EU and U.S. stress tests to date have focused on regulatory measures of capital which implicitly requires estimates of changes in the financial accounting value of capital given a specific scenario. In order to do so, scenario dependent estimates are needed of the financial accounting (or book) value of each bank's pre-provision net revenue (PPNR), its losses during the scenario, and planned capital distributions. The first step is to develop an economic scenario

containing the paths of key economic variables over the stress test horizon. Examples of such variables include unemployment, GDP growth rate and housing prices. Next, historic data are used to estimate models of the sensitivity of PPNR and of the losses in various parts of the portfolio to the economic variables in the scenario. Finally, the stress scenario and characteristics of the bank's portfolio are fed into the estimated models to project PPNR and losses. The projected losses and projected capital distribution are subtracted from PPNR to estimate each period's change in capital.[46] The capital at the end of each period is then its value at the start of the next period.

3.3. Comparison of measures

The stress tests start with one or more of the Basel ratios, thus if Basel was not enough, the benefit of stress tests must lie in something stress tests do that the Basel ratios do not. The above discussion suggests two not mutually exclusive candidates for this something: (a) Basel relies on historic risk distributions whereas the stress tests use forward looking scenarios, and (b) Basel accepts accounting measures of capital whereas the stress tests allow capital to move up or down in response to the stress scenario.

Although the Basel' measures seek to provide enough capital to cover all but a one in a thousand year scenario, it relies on a combination of statistics and relatively recent history to determine how big the losses could be over the next one thousand years. If economic conditions have been relatively benign, as happened in the "Great Moderation," statistical measures estimated from these data will predict that the one in a thousand year estimated losses are not going to be very large.

Supervisory stress tests, however, allow the supervisors to specify the conditions against which the banks' capital positions will be tested. This allows the supervisors to construct stress

scenarios that are not in the recent data and may not have been observed for decades such as a prolonged nationwide decrease in housing prices. Thus, it is plausible that the reason the Basel ratios were not enough is that despite its seemingly extremely high standards, that in practice it underestimated banks' risk exposure and, hence, their capital needs.

While underestimation of risk exposure may have been a contributory factor, it is not obvious that the severely adverse scenario in SCAP was as adverse as the scenarios that concerned investors. Indeed, Berner, Graseck and Tirupattur[47] state that "The SCAP economic assumptions are realistic, but not especially adverse, in our view."

The other possibility is that the Basel ratios problem was their reliance on accounting measures of capital which might embed unrecognized losses in asset values. Although the stress tests as currently implemented also rely on accounting measures of capital, the longer time horizon of the stress tests can force a bank to eventually recognize its losses.

Bank asset values around the time of the stress tests were criticized as not fully reflecting losses in security valuations (such as not marking to market holdings in subprime mortgage backed securities and in collateralized debt obligations) or in their loan portfolios. The accounting standards at the time permitted banks to combine their own models with market inputs to estimate the price of an illiquid security (level 2) or even combine their models with at least some inputs reflecting management judgment (level 3). Some investors criticized level 3 valuations as not being "mark to market" but rather as being "mark to myth." Additionally, accounting standards required that a loss be "probable" based on events that have occurred up to the date of the statements before a lender could recognize a loan loss. The term "probable" is not well defined in the accounting standards, but Traub[48] says that in practice "probable" was taken to mean an approximately 75 to 80 percent probability of loss.

Stress tests that are sufficiently long and stressful can "smoke out" losses that banks would not (and in the case of loan losses often could not) recognize in their current financial statements. As a result, stress tests could give investors a clearer picture of a bank's current condition and give supervisors a better idea how much more capital a bank needed to replace its recent losses.

The extent to which investors discounted banks' reported equity values may be seen by comparing the bank's capital ratios using book values with those calculated using market values of equity. Furlong[49] and Haldane[50] compared these two ratios and both found that capital ratios were generally far lower when measured with market values of equity.

Thus, theory provides two reasons why Basel was not enough. Evidence from that period provides strong support for the hypothesis that the Basel ratios relied on inflated estimates of capital. In contrast, the evidence suggests that even the severely adverse stress scenario tested by the U.S. was not at the low end of investors' expectations for the economy and, hence, that stress tests relative advantage in measuring risk was at most a secondary factor in their success.

4. Will the Basel ratios remain inadequate and stress tests an appropriate fix?

Stress tests proved valuable in resolving the last crisis in the U.S., but will they prove equally valuable in the next crisis? While the definitive answer will have to wait until the next crisis, there are a couple of reasons to think that the stress tests will not be as valuable. One reason is that the Basel ratios are likely to better measure capital in the next crisis. The prudential supervisors quickly identified and sought to repair a number of flaws in both the measures of risk and capital of Basel II. Moreover, the one flaw not addressed in the Basel Capital Accord process was the measures' reliance on accounting measures of capital. Fixing this problem was left to the accounting standard setting bodies, the Financial Accounting

Standards Board (FASB) in the U.S. and the International Accounting Standards Board (IASB) for the rest of the developed countries. Although the approaches taken by FASB and IASB are somewhat different, at least FASB's proposal would require far earlier recognition of credit losses than is the case under the current "probable" standard.[51,52] To be sure, neither FASB's nor IASB's proposed changes would necessarily force banks to always make timely provision for deterioration in the value of their assets. Financial statements remain management's representation of the issuer's financial condition, with the result that the estimates of loan losses will continue to be based on management's judgments. Moreover, these changes relate exclusively to credit losses and will not address potential losses due to interest rate changes in the value of the loan portfolio. Nevertheless, the combination of changes in the calculation of the Basel ratios and the measurement of equity for financial accounting will likely reduce the value added of conducting stress tests in the next crisis.

Moreover, the effectiveness of stress tests is conditional upon the use of discretion by the supervisors in selecting the stress scenario. While stress tests can be designed to force recognition of economic losses, the EU experience show that stress tests can also be designed to avoid recognizing such losses. Thus, in order to evaluate the likely value added of stress tests in a future crisis, one needs to understand supervisory incentives when selecting the stress scenario. A comparison of the U.S. SCAP and CEBS 2011 stress tests highlights some of the more important supervisory incentives.

In formulating its stress scenario, the U.S. was in an almost ideal circumstance for effective use of a stress test to strengthen its financial system. The ability of the stress test to undermine confidence in U.S. banks was limited given that the runs after Lehman's failure in late 2008 had demonstrated that market participants lacked confidence in reported capital ratios.

Moreover, the U.S. supervisors had an acceptable plan for dealing with any revealed shortages with the passage of the Troubled Asset Relief Program (TARP) in 2008 and the allocation of part of the TARP funds to recapitalize banks.

In contrast, when the CEBS 2010 program took place the EU Member States had neither allocated funds to fill any revealed capital shortfalls nor made provisions to resolve systemically important banks that failed the test. The CEBS scenario also took place at a time when EU policymakers were unwilling to contemplate a scenario where the holders of the Member State's sovereign debt might suffer credit losses. Accordingly, the CEBS scenario allowed for "liquidity losses" in banks' holdings of sovereign debt in their trading books but not the larger potential credit losses in the sovereign debt held in the rest of their portfolios. Additionally, the EU wide scenario had to be translated into country specific scenarios that allowed supervisors design scenarios under which their banks would not need government support to cover revealed weaknesses.

Thus, the EU experience demonstrates that supervisors may not be willing to impose test scenarios that would raise concerns about their banks, especially, if supervisors do not have confidence in their ability to address revealed weaknesses. However, even if the mechanisms exist it is still possible that supervisors may be reluctant in some circumstances to impose scenarios that reveal problems. For example, suppose that the U.S. had been scheduled to hold stress test shortly before the collapse of Bear Stearns in March 2008. At that point, the absence of runs on large U.S. financial groups allowed supervisors to believe the U.S. might get through this period of financial difficulty if the weakened financial firms were given time to rebuild their capital on their own. However, if the supervisors had made banks apply a truly stressful scenario to their portfolios the results might have forced supervisors to take prompt action on

revealed weaknesses or deal with runs on some large banks. Would supervisors have been willing to risk the possibility of undermining market confidence in some large banks on the basis of a stress scenario that might not happen? Of course, we will never know the answer to this counterfactual. However, one can say that it would take a brave supervisor to run such a risk, even if the supervisor had access to funds for a public recapitalization of undercapitalized banks or a credible resolution mechanism for banks that were run (neither of which existed in March 2008).

6. Conclusion

The Basel ratios failed to maintain investor confidence during the recent financial crisis. Although Basel II underestimated some risks, the bigger problem with the Basel II appears to have been largely lack of market confidence in asset valuations. Largely in response to this lack of confidence, the U.S. and the EU implemented stress tests. The U.S. supervisors had almost ideal incentives to run effective stress tests and the U.S. stress tests did help in restoring confidence. Many EU supervisors had strong incentives to avoid fully recognizing losses and as a result some large EU banks failed within months of having successfully passed their stress tests.

In response to the crisis, both bank supervisors and accounting standards setters have sought to address some of the flaws in Basel II. While these efforts are unlikely to completely solve the problems, they are likely to result in the supervisory capital ratios that more accurately reflect the true economic condition of the banks. Moreover, the conditions that contributed to the success of the U.S. stress tests may not be repeated in the next crisis, and anyway few would care to repeat the conditions leading up to the U.S. stress test. This suggests that if the stress tests are to justify the amount of resources currently required, at least in the amount of resources

invested by the U.S., that these tests must also serve some other functions. A companion piece discusses some of these functions.[53]

[1] Basel Committee on Banking Supervision (2009). History of the Basel Committee and its Membership, August, http://www.bis.org/bcbs/history.pdf, accessed 16 May 2013.
[2] Although the United States (U.S.) commercial bank supervisors were still using Basel I in 2007, the other major supervisors including those supervising investment banks in the U.S. and banks of all types in the European Union (EU) had switched to Basel II.
[3] Furlong, F. (2011) Stress Testing and Bank Capital Supervision, FRBSF Economic Letter 2011-20, 27 June, http://www.frbsf.org/publications/economics/letter/2011/el2011-20.html, accessed 16 May 2013.
[4] Haldane, .G. (2011). Capital Discipline, Speech given at the American Economic Association, Denver, 9 January, http://www.bankofengland.co.uk/publications/Pages/speeches/2011/484.aspx, accessed 16 May 2013.
[5] Probably the biggest holdout to adopting Basel II was the United States (U.S.) which did not apply Basel II to its commercial banking organizations, but did to its investment banks.
[6] A possible explanation for the failures despite overall high capital ratios is that the losses in the failed banks were being masked by high overall capital ratios averaged across banks? Haldane[4] (2011) also considers this possibility using an 8 percent cutoff for distress to give the Tier 1 ratio a chance. What he finds for his sample of globally important is that this cutoff produces Type 1 errors (false positive) of 50 percent and Type 2 errors (missed crisis) of 43 percent. A concrete example of a firm failing with high Basel ratios is Lehman with a tier 1 capital ratio of 11.6 percent is provided by Johnson, S. and Kwak, J. (2010) Capital Requirements Are Not Enough. Economix, New York Times, 1 April, http://economix.blogs.nytimes.com/2010/04/01/capital-requirements-are-not-enough/, accessed 16 May 2013.
[7] United States Treasury (2008) Treasury Announces TARP Capital Purchase Program Description, (October 14), http://www.treasury.gov/press-center/press-releases/Pages/hp1207.aspx, accessed 30 June, 2013 summarizes a variety of conditions including: (a) the capital injections took the form of senior preferred stock that paid cumulative dividends at a rate of 5 percent per year. (b) The senior preferred stock could not be redeemed within the first three years unless the banking organization made a qualified equity offering of a least 25 percent of the issue price of the senior preferred. (c) Senior executive officers were subject to limits on their compensation. (d) The banking organization was also required to issue warrants on its common stock to the U.S. Treasury.
[8] Bernanke, B.S. (2013). Stress Testing Banks: What Have We Learned? Speech given the Federal Reserve Bank of Atlanta's Financial Markets Conference, 8 April, http://www.federalreserve.gov/newsevents/speech/bernanke20130408a.htm, accessed 16 May 2013.
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[10] In the early 1900s that several U.S. state banking supervisors adopted a requirement that the capital-to-total-deposits ratio must be no less than 10 percent. This use of this ratio lapsed during World War II. After the war, U.S. federal supervisors adopted various measures as guidelines for evaluating bank capital . The Swiss Banking Law of May 1972 set a minimum capital-deposit ratio. See Orgler, Y.E. and Wolkowitz, B. (1976) Bank Capital. New York: Van Nostrand Reinhold Company.
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[14] See Kapstein in reference 13.
[15] Basel Committee on Banking Supervision (1988) International Convergence of Capital Measurement and Capital Standards, July, http://www.bis.org/publ/bcbs04a.pdf, accessed 28 August 2013.
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