
Stress testing convergence

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Abstract 2015 marked the six-year anniversary of US regulatory stress testing. In this paper the authors observe three key trends: (1) Increasingly aggressive capital management: banks initially responded to CCAR by maintaining wide capital cushions versus regulatory minimums. As CCAR processes stabilise and capital minimums increase, however, some institutions appear to be managing capital more and more tightly, especially investment banks, universals and custodians. (2) Drivers of enhanced financial resource management: what allows institutions to manage capital more closely? First, stress test results are beginning to stabilise and, in some cases, converge. Secondly, although we have just a handful of examples, the market seems to reward aggressive capital requests, even if they are, at first, rejected by the Fed. (3) Unintended consequences: as stress test results converge and institutions begin to manage capital to *Fed-projected* results, the Fed's stress-testing models become an increasingly important driver of the fate of the financial system.

Keywords: *capital requirements, CCAR, systemic risk, bank performance*

INTRODUCTION

This year, 2015, marks the six-year anniversary of US regulatory stress testing. Since its inception as a one-time response to the financial crisis through

SCAP in 2009, US regulatory stress testing has evolved into an ongoing — and extremely critical — supervisory and risk management tool. Indeed, macro-scenario style stress testing is probably the

most significant change arising from the financial crisis in how regulators (and banks) look at risk management capabilities and capital adequacy.

Results for the 2015 CCAR exercise were released in March. The Federal Reserve ('Fed') did not issue any objections due to capital deficiencies, although two capital plans received objections for qualitative reasons such as deficiencies in risk identification, risk measurement and risk management capabilities. In addition, Bank of America was required to resubmit in the Autumn of 2015 due to qualitative deficiencies, and three Bank Holding Companies (BHC) with large investment banking operations (Goldman Sachs, Morgan Stanley and JP Morgan) had to 'take a Mulligan' and quickly resubmit their plans with reduced capital actions to remain above post-stress capital requirements. These results, and a wide range of analyst reports and bank disclosures, indicate that CCAR is an often binding constraint for the industry (see, for example, 'Tougher US stress test challenge looms for lenders in round two',¹ 'Wells Fargo Corporate Treasury Investor Day presentation, May 2014'²).

With six years of system-wide stress testing behind us, what trends are we observing? This paper looks at the evolution of US regulatory stress tests, from the 2009 SCAP to the 2015 CCAR, and we see three key trends emerging:

- *Increasingly aggressive capital management.* Banks initially responded to CCAR by maintaining wide capital cushions versus regulatory minimums. As CCAR processes stabilise and capital minimums increase, however, some institutions appear to be managing capital more and more tightly. In particular, investment banks, universals and custodians appear to be optimising against their relevant binding constraints. By contrast, regionals and card companies are still managing capital conservatively — and hence have room to enhance financial performance (if desired and aligned with their business model).
- *Drivers of enhanced financial resource management.* What allows institutions to manage capital more closely? First, stress test results are beginning to stabilise and, in some cases, converge. Such stability in results (despite variations in scenarios, models, capital distributions, etc) allows institutions to

better estimate *Fed-projected* results — which, after all, are the binding quantitative constraint for CCAR — and calibrate their capital actions accordingly (at least compared to the early years of the stress test). Secondly, although we have just a handful of examples, the market seems to reward aggressive capital requests, even if they are, at first, rejected by the Fed.

- *Unintended consequences.* As stress test results converge and institutions begin to manage capital to *Fed-projected* results, the Fed's stress-testing models become an increasingly important driver of the fate of the financial system: if these models prove to be vulnerable to a specific source of risk, the entire US financial system may find itself heavily undercapitalised at a time of stress. Similarly, if these models prove to be overly conservative, the efficiency of the financial system would be reduced.

The rest of the paper discusses these observations in detail for the 18 original CCAR banks, to enable comparisons over time. Results for the remaining banks subject to the CCAR programme are not included, as at most two years of results are available, although to date they exhibit behaviour very similar to the 18 original CCAR banks. Throughout this paper we categorise the 18 original CCAR banks into five groups: universals (Bank of America, Citibank, JPMorgan and Wells Fargo), investment banks (Goldman Sachs and Morgan Stanley), regionals (Ally, BB&T, Fifth Third, Key Bank, PNC, Regions, Suntrust and US Bank), card monolines (American Express and Capital One) and custodians (State Street and BNY Mellon). The 19th SCAP institution, MetLife, de-banked in 2013 and is thus excluded from our analysis.

It is worth noting that, by comparing results across CCAR exercises, we effectively assume that all annual exercises are comparable. While it is true that some results are impacted by changes to the CCAR framework since its introduction (eg changes in the macro-economic environment and associated scenarios; introduction of new requirements such as the Counterparty Default Shock; evolution of data, portfolios and models), we still believe there is value in understanding how results have evolved. Indeed, we believe that valuable insights can be gained from these comparisons. Please note that these results

(and those discussed in the rest of this paper) should be interpreted with caution. Although they appear relatively stable over time and by type of institution, they are based on a limited sample of institutions over a relatively short time period. Differences may not be statistically significant.

BANKS ARE MANAGING CAPITAL MORE CLOSELY

Banks need to meet a variety of capital metrics including a leverage ratio and several risk-based capital ratios. They can respond to these constraints *conservatively*, by raising capital to maintain healthy capital buffers across all measures; they can respond *marginally*, by optimising against a particular constraint that is binding at a given point in time; or they can respond *holistically*, optimising against all constraints simultaneously. Moreover, they can maintain a healthy buffer against their binding constraint or manage it tightly to regulatory minimums. Maintaining healthy buffers or managing capital *conservatively* or *marginally* comes at the expense of efficient use of some financial resources, decreasing economic performance. Managing capital tightly and *holistically* improves financial performance, but requires specific business models coupled with careful, strategic management of group-wide capital resources. In particular, universals and investment banks typically run up against both risk-weighted assets and leverage constraints, while some regionals and custodians tend to have more lopsided capital uses.

This section aims to tease out, from the published CCAR results, which of the capital management approaches is used by different types of institutions, and what this implies for the industry.

Capital management at institutions

Figure 1 shows the average pre- and post-stress tier 1 common ratio across all CCAR institutions from 2012 to 2015. Across all years, institutions started with an average ratio of ~11 per cent and reached a projected post-stress minimum average ratio of ~7 per cent. The average tier 1 common capital consumption was 3.8 per cent in 2012, 4.3 per cent in 2013, 4.0 per cent in 2014 and 4.4 per cent in

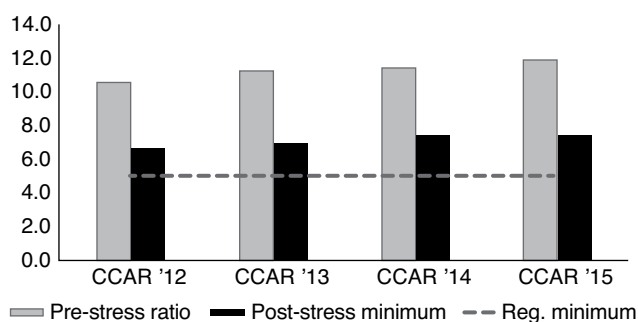


Figure 1: Average Fed-projected pre- and post-stress (minimum) tier 1 common capital ratio by stress test exercise

2015; meanwhile, the average post-stress buffer (the difference between the post-stress ratio and the 5 per cent regulatory minimum) increased from 1.7 per cent in 2012 to 2.5 per cent in 2014 and 2015.

Figure 2 displays, in one chart, how close banks were to each of the four capital metrics over the course of the last four CCARs. In addition to showing the results for all 18 BHCs that have participated in all CCARs to date, we also consider major business model segments. The closer the thick line (solid or dashed) for a given ratio, say tier 1 common, is to the light black contours, the closer the post-stress capital ratio was to the regulatory minimum (5 per cent for tier 1 common). A graph line at zero implies that the corresponding ratio was equal to the corresponding regulatory minimum, leaving no buffer. Take custodians and leverage ratio, for example: in CCAR 2012 they exhibit an average buffer of about 2.5 per cent relative to the corresponding regulatory minimum. By CCAR 2015, their average buffer was at close to 0 per cent.

As seen from these charts, banks initially responded to the CCAR requirements *conservatively*, maintaining relatively wide capital cushions. As regulatory capital and leverage ratio minimums increase, however, the stress-testing infrastructure matures and stress-testing results begin to stabilise (particularly in the last years), institutions are exhibiting capital ratios closer and closer to regulatory minimums. In other words, the lines in the charts are getting progressively closer to the origin from early to recent CCARs.

Virtually all types of institutions are more capital constrained under the CCAR 2014 and

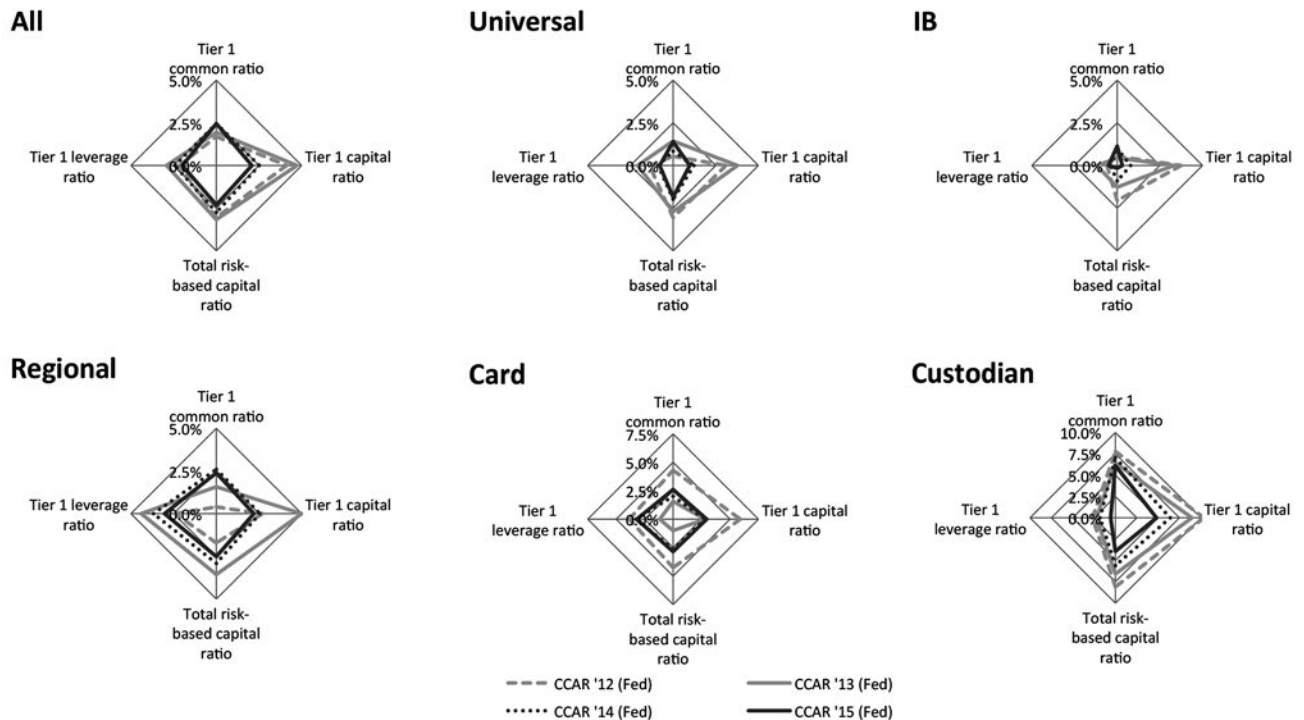


Figure 2: Average Fed-projected minimum stressed capital buffer relative to required regulatory minimum by type of institution: CCAR 2012, 2013, 2014, 2015

2015 exercises than under the 2012 and 2013 exercises. As noted above, some of the decreases in capital buffers are driven by increases in regulatory capital and leverage ratio minimums introduced from 2012 to 2015 as part of the phasing in of Basel 3 (particularly between CCAR 2013 and CCAR 2014 when the largest increases were introduced). Yet those changes explain only some of the evolution of capital buffers across institutions. Different institutions seem to have reacted differently to the changes, suggesting different approaches to capital management: buffers on capital and leverage ratios at investment banks and universals decreased along with the increase in regulatory minimums and then continued to decrease even as regulatory minimums over the forecast horizon have been largely stable. Similarly, custodians have continued to decrease their capital buffers so as to barely exceed the leverage ratio minimum in 2015 — their main constraint given their business model. By contrast, regional banks and card monolines responded to the increases in regulatory minimums by adjusting their starting

capital ratios to maintain healthy (and relatively stable) capital buffers. Thus:

- Investment banks appear to be managing capital *tightly* and *holistically* since 2014: they have limited capital flexibility across all major capital constraints. This year, the total risk-based capital ratio was their primary constraint, at only 0.2 per cent capital above the minimum requirement; last year it was the leverage ratio at 0.4 per cent.
- Universals also appear to be managing capital *holistically* since 2014, albeit with slightly larger buffers: the leverage ratio requirement has been binding for them for the last two years with buffers below 1 per cent, while the remaining ratios are also low with buffers of 1–2 per cent. Some differences are observed across institutions — for example, JPMorgan exhibits buffers below 1 per cent across all ratios while Bank of America has buffers above 1 per cent for all ratios.
- Card monolines exhibit convergence as Capital One increased its buffers in 2015. Capital One showed relatively limited capital flexibility in 2014

(minimum buffer of 0.6 per cent), but increased its capital buffers in 2015 (minimum buffer of 2 per cent) to roughly align with its peer, American Express (which exhibits buffers between 2.9 per cent and 3.6 per cent in 2015).

- Custodians are mainly constrained by the leverage ratio, driven by their business model and in recognition of significant challenges under the switch to Basel 3. They are managing this ratio closely — with an even smaller buffer in 2015 than 2014 (0.6 per cent and 1.8 per cent, respectively) — while keeping larger buffers on other dimensions.
- Finally, although buffers for regionals decreased from 2014 to 2015, they still appear to be managing capital *conservatively* all around. Their average minimum (maximum) buffer is 2.2 per cent (3.0 per cent) for tier 1 capital (leverage ratio).

Why are some institutions willing to fly closer to the sun than others? We consider a few factors:

- The institution's flexibility with respect to capital, particularly in terms of managing down the amount of capital required — the easier it is to manage capital down, the closer institutions would be willing to fly;
- The institution's risk appetite (ie willingness to take on more risk);
- The institution's constraints around non-stress capital.

Universals and investment banks can typically be more aggressive, given their business models: they have more flexibility around capital actions and their business models imply that all constraints can become binding. Still, some institutions (eg Goldman Sachs) are more aggressive than others (eg Bank of America). Regionals are typically more constrained by capital ratios, given their loan-heavy businesses, yet they exhibit similar (and healthy) buffers across all ratios. This may be driven by fears that managing to lower capital ratios would cause negative rating changes or analyst reactions, a reflection of a firm's risk appetite. Lastly, custodians are typically constrained by the leverage ratio, given their low-risk balance sheets; they exhibited relatively healthy buffers in 2014 (1.8 per cent) but moved to much thinner buffers in 2015 (0.6 per cent). Obviously this implies that regionals and custodians are well positioned for

leverage/capital consumptive businesses, respectively, from a capital perspective, although less so from a business model perspective. Put differently, these institutions typically do not have existing businesses that disproportionately consume either risk-based (for custodians) or leverage (for regionals) capital which they can quickly ramp up to take advantage of these buffers. This is a key strategic question driven by capital requirements, but we leave it for a separate discussion.

Nonetheless, institutions that exhibit healthy buffers, or are managing capital *marginally* or *conservatively*, may have room for enhanced financial resource management to maximise financial performance in today's resource-constrained environment.

THE DRIVERS OF ENHANCED FINANCIAL RESOURCE MANAGEMENT

What is allowing institutions to manage capital more closely? Two main factors appear to explain this behaviour:

- (1) *Market rewards for capital distribution.* Despite limited observations, the market appears to reward institutions that use the 'Mulligan', as it implies a more aggressive response to shareholders' (and analysts') desire for capital returns.
- (2) *Stability of CCAR results.* Fed CCAR projections — from granular projections to stressed capital consumption — appear to be stabilising for most institutions (see also a recent report from the Office of Financial Research³).

Market rewards

Failing CCAR has very real consequences: in March 2014, Citi had the most dramatic share price impact, with the market reacting swiftly and harshly to the news of capital plan rejection. Citi's stock price dropped 6.1 per cent in the three days following the announcement (measured as trading days since the last close before release of results), compared to a 1.4 per cent drop on average for all CCAR-2014 banks and a 0.4 per cent drop in the S&P 500. The 4.7 per cent difference translated to a market cap erosion of US\$7.1bn. A similar pattern repeated

itself when Santander Consumer Holdings USA's stock price remained largely flat in the three days after the release of CCAR-2015 results while average CCAR banks' stock price increased by 2.5 per cent. (Note that Santander Consumer Holdings USA represents only a portion of Santander's US business. It is used as reference as it includes the US traded portion of the BHC.)

Such high costs of failure could encourage institutions to remain conservative relative to regulatory minimums, but this is not what we observe. As discussed above, institutions appear to be managing capital ever more tightly to regulatory minimums, and the market appears to be rewarding the most aggressive institutions. Figure 3 shows the average percentage change in stock prices for the three days after the release of CCAR 2013, 2014 and 2015 results, separating institutions that passed with a Mulligan, institutions that passed without a Mulligan and institutions that failed. As shown, Mulligan users exhibit average stock performance around 50bps better than straight passes after three days.

How can we explain this discrepancy? The bulk of failures since the SCAP, including the Citi and Santander USA examples, were not due to capital inadequacy but for qualitative reasons. Conservative capital management will not solve this problem. Indeed, the ability to pass on qualitative grounds gives banks the ability to more aggressively manage capital and take advantage of the Mulligan rule, and the market rewards this ability, as shown dramatically in Figure 3.

While these results (and those discussed in the rest of this paper) appear relatively stable over time, they should be interpreted with caution; they are based on a limited sample of institutions over a relatively short time period.

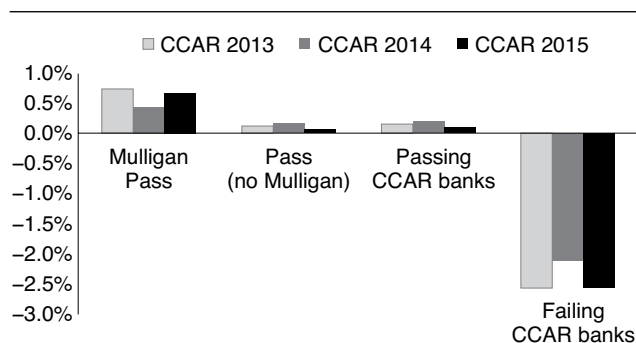


Figure 3: Average 3-day % change in stock price since last close before release of CCAR results; relative to benchmark defined as the average of all CCAR banks

Stability of CCAR results

Beyond market rewards, stress test results are beginning to stabilise and, in some cases, converge. This is observed at a granular level, including loss, PPNR, balance sheet and RWA projections; and at an aggregate level considering projections of stressed capital consumption. Such stability of results despite variations in scenarios, models, capital distributions, etc, allows institutions to better estimate *Fed-projected* minimums and calibrate their capital actions accordingly (at least compared to the experience in the early years of CCAR).

Stability of Fed-projected stressed capital consumption

Fed projections of capital consumption appear to be stabilising — especially for universals, regionals and card monolines. Figure 4 shows the Fed-projected capital and leverage ratio consumption for the 18 original CCAR banks, by type of institution over the CCAR 2012, 2013, 2014 and 2015 exercises.

As shown in the first chart, the average capital consumption remained roughly stable from 2012 to 2015 across all institutions (ie there is fairly little change in the thick (solid or dashed) lines across charts — especially at the aggregate level). This masks differences across institutions, however. From 2012 to 2013, average *risk-based capital* ratio consumption decreased for regionals, remained roughly stable for universals and increased significantly for card, custodians and investment banks; over the same period, *leverage* ratio consumption increased significantly for card monolines, decreased significantly for regionals and remained roughly stable for the rest. From 2013 to 2014, risk-based capital ratio consumption remained roughly stable across all institutions, while leverage ratio consumption decreased for card monolines and custodians and increased for regional banks. From 2014 to 2015, we observe slight increases in risk-based capital and leverage ratio consumption for regionals and universals, yet significant increases for investment banks and custodians. These increases likely explain why both investment banks used a Mulligan to remain above minimum risk-based capital and leverage ratios and why custodians exhibit a much lower leverage ratio 'buffer' relative to the CCAR 2014.

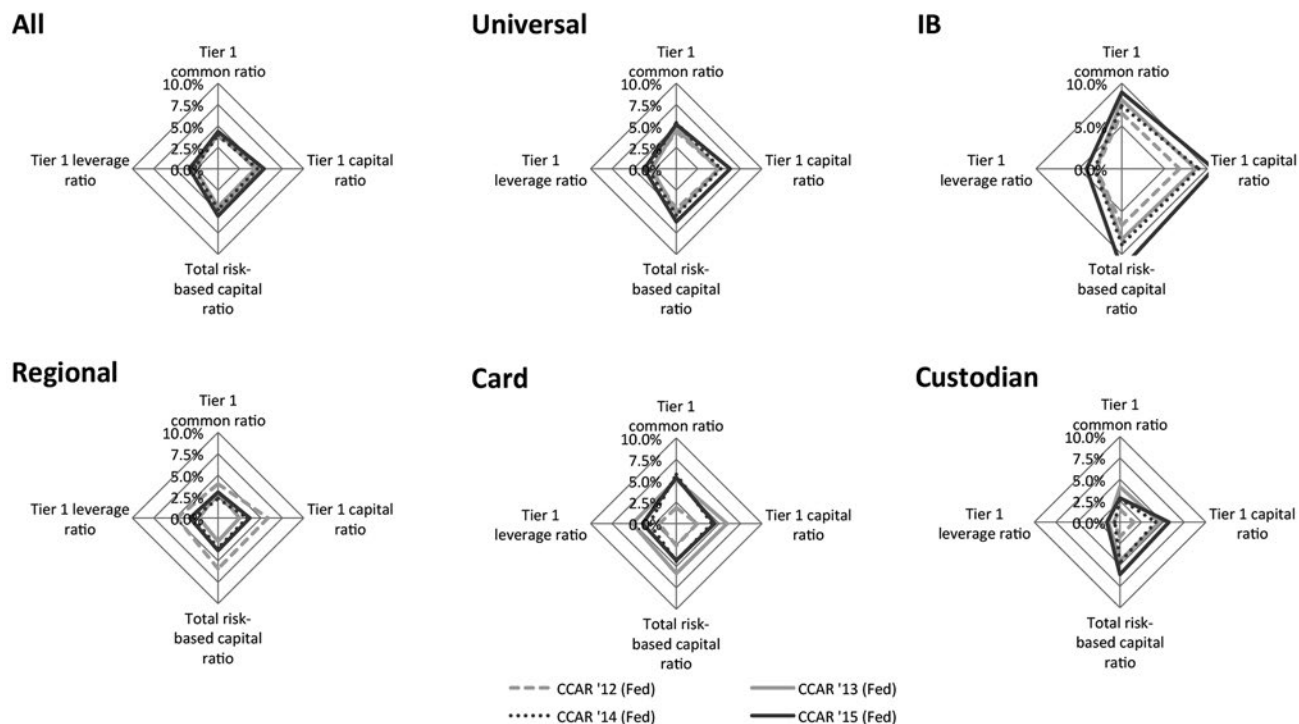


Figure 4: Average Fed-projected capital consumption (starting to minimum) by type of institution: CCAR 2012, 2013, 2014, 2015

Stability of differences between Fed and BHC capital consumption projections

Typically, Fed projections of capital erosion due to stress are greater than bank projections. But there are differences across types of institution, and custodians present the interesting exception to this pattern (see Figure 5).

Using DFAST results (instead of CCAR results as DFAST harmonises capital actions across all banks, allowing like-for-like comparison) we see that, overall, Fed projections remain slightly more conservative than BHC projections with an average 0.9 per cent

additional capital consumption (across all ratios and institutions). Fed projections are fairly conservative compared to the corresponding universal, investment bank and card monoline projections, which have remained relatively stable or have decreased since 2013. In fact, average *Fed-projected* capital consumption across all investment banks and capital ratios was 3 per cent higher than the corresponding BHC projections; 1.3 per cent higher than the corresponding universal BHC projections; and 1.1 per cent higher than the corresponding card projections.

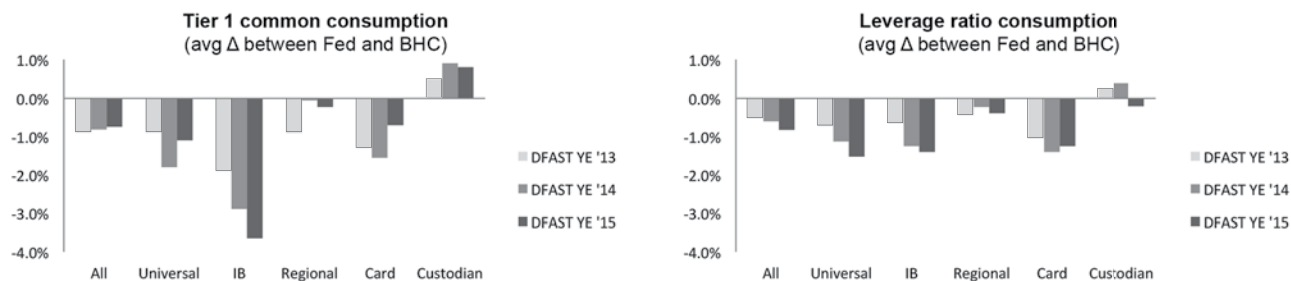


Figure 5: Average difference between BHC and Fed projections of capital ratio and leverage ratio consumption (starting to minimum): DFAST 2013–2014; by type of institution

By contrast, Fed and regional bank projections have largely converged, driven by a significant decrease in Fed-projected capital consumption from 2012 to 2013 and a similar increase in BHC-projected capital consumption from 2013 to 2014. In the 2015 DFAST exercise, Fed-projected capital consumption was only slightly higher than regional bank projections, on average. Custodians had historically projected higher capital ratio consumption than the Fed. Given the significant increase in leverage ratio consumption projected by the Fed from 2014 to 2015 for custodians, however, the BHC's projection was 0.2 per cent lower than the Fed's in 2015.

The relative conservatism of Fed projections for investment banks, universals and card monolines has multiple drivers:

- Fed balance sheet forecasts are significantly more conservative across all institutions, leading to ~1 per cent lower capital ratios even after accounting for higher PPNR forecasts. (Note that the Fed started generating its own RWA forecasts with CCAR-2014. Before that, the Fed took the banks' projections as given.)
- Fed credit loss forecasts are typically more conservative than the associated universal, card and investment bank forecasts, yet roughly in line with regional forecasts.
- Fed PPNR projections are significantly more conservative than the associated investment banks' projections, in-line with universal projections and more generous for regional and card projections.

The aggregate-level differences can be interpreted in one of two ways: the Fed may be exerting downward pressure on the stressed capital ratios of the largest institutions as a matter of policy; or BHC models may be overly aggressive. The former is supported by the increasingly conservative Fed projections for investment banks, universals and card companies (since 2012) as well as the relatively conservative balance sheet projections introduced in 2014. The latter, however, is supported by the increased convergence or conservatism of regional bank and custodian projections relative to the corresponding Fed forecasts.

Regardless of the explanation, the differences between Fed and BHC projections appear to be decreasing and stabilising; significant variations are likely explained by Fed model changes which in some cases were disclosed in advance

of CCAR submissions. Again, this evolution enables institutions to better estimate *Fed-projected* minimums and manage capital accordingly.

Stability of granular projections

At a more granular level, Fed and BHC forecasts of losses, PPNR, balance sheets and RWAs also appear to be stabilising. Appendix A provides a detailed analysis of loss, PPNR, balance sheet and RWA projections. Some discrepancies remain — and institutions and regulators will continue to introduce variability to CCAR results through model enhancements — but projections are starting to exhibit consistent trends that generally align with intuition. Unexpected movements often appear to be explained by model changes. Again, the increased stability of results suggests that the stress-testing infrastructure is beginning to mature, allowing institutions to manage capital more and more tightly to *Fed-projected* minimums.

For instance, Fed and BHC loss projections exhibit convergence. Projections have decreased since the initial SCAP exercise in 2009, driven by improvements in the macro-economic environment as well as improved asset quality from several years of more rigorous underwriting (offset, in some cases, by model adjustments leading to more conservative estimates). The cumulative nine-quarter loss rate projected by the Fed for all loans decreased from 11.6 per cent in 2009 to 6.0 per cent in 2015, while the total loss rate projected by BHCs decreased slightly from 5.3 per cent to 4.6 per cent between 2013 and 2015 (based on three year-end DFAST projections available). Note that 2009 projections are estimated by scaling the eight-quarter 2009 projections by 9/8 to mirror the nine-quarter tests in 2012 onwards. Fed loss projections have decreased for virtually all asset classes. The decrease is pronounced for mortgages and credit card loans, asset classes that experienced high actual losses in the crisis, and far smaller for commercial loans where realised losses did not spike. Similarly, BHC loss projections for mortgages decreased from 2013 to 2015, while projections for commercial and industrial (C&I), CRE and credit cards joined the decreasing trend in 2015. The decrease in BHC projections is far smaller than in Fed projections, leading to increased convergence in results: the weighted average difference between Fed and BHC loss forecasts decreased from

2.2 per cent to 1.4 per cent from 2013 to 2015. See Appendix A for additional discussion.

IMPLICATIONS FOR THE INDUSTRY

While convergence in results and more efficient financial resource management is expected as the stress-testing infrastructure matures, the trends we discussed above highlight a potential increase in systemic risk. As the largest US institutions begin to manage capital around *Fed-projected minimums*, the Fed's models become increasingly important in guiding bank behaviour. If all parties rely on projections from a single set of models (the Fed's) under the same scenario (specified by the Fed), then the entire industry relies on the same risk infrastructure — and inherits the same weaknesses and vulnerabilities. Some variability is introduced by BHC-specific stress tests and modelling approaches. But that may not be enough if Fed projections remain the binding constraint for the largest institutions. Were the Fed's risk infrastructure to prove vulnerable to a specific source of risk, the entire US financial system may find itself heavily undercapitalised (see, for instance, the *WSJ* editorial⁴). Similarly, if the Fed's risk infrastructure is overly conservative, it risks reducing the efficiency of the financial system.

Thus, institutions (and their regulators) should not — and cannot — become complacent. Now, more than ever, the industry must consider a broad set of capital management processes. Efficient and more aggressive capital management is only possible in the brave new world of CCAR if the qualitative aspects of risk and capital management are fully buttoned up. To be sure, risk and capital management capabilities at the CCAR banks have improved markedly since the beginning of the CCAR programme, but this improvement has been accompanied by, and is in part due to, a veritable explosion of models. From a quantitative perspective, thoughtful, creative and independent model development that relies on alternate forecasting approaches is fundamental to challenging both internal and Fed forecasts. And as reliance on models increases, model risk management becomes ever more critical. From a qualitative perspective, robust capital policies, risk appetite statements and risk limit frameworks, supported by capital management tools such as traditional stress

testing, reverse stress testing and economic capital will be critical to complement regulatory stress testing.

Regulatory stress testing should not be mistaken for a panacea of capital management. It is only one weapon in the capital manager's armoury that complements other existing — and new — capital management tools.

Acknowledgments

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APPENDIX: LOSS PROJECTIONS

Credit loss forecasts

As shown in Table A1, the cumulative nine-quarter loss rate projected by the Fed for all loans decreased from 11.6 per cent in 2009 to 6.0 per cent in 2015, while the total loss rate projected by BHCs decreased from 5.3 per cent to 4.6 per cent between 2013 and 2015 (based on three year-end DFAST projections available). Note that all 2009 results quoted in this section are estimated by scaling the eight-quarter 2009 projections by 9/8 to mirror the nine-quarter tests in 2011 onwards. Fed loss projections have decreased for virtually all asset classes. The decrease is very pronounced for mortgages and credit card loans, asset classes that experienced high actual losses in the crisis, and far smaller for commercial loans

where realised losses did not spike. Similarly, BHC loss projections for mortgages decreased from 2013 to 2015, while projections for C&I, CRE and credit cards joined the decreasing trend in 2015. The decrease in BHC projections is far smaller than in Fed projections, leading to increased convergence in results: the weighted average difference between Fed and BHC loss forecasts decreased from 2.2 per cent to 1.4 per cent from 2013 to 2015.

This convergence is skewed across asset types and institutions, however. Loss forecasts for regional banks had largely converged with the corresponding Fed forecasts by 2014 — and exhibit a similar difference in 2015. Loss forecasts for universals and monolines remained aggressive relative to Fed forecasts in 2015, although the difference decreased from 2014.

Table A1: Loss rates by type of institution

	Fed projections					BHC projections			Difference (Fed minus BHC)		
	2009	2012	2013	2014	2015	2013	2014	2015	2013	2014	2015
<i>All banks</i>											
Loan losses	11.6%	8.3%	7.5%	6.8%	6.0%	5.3%	4.8%	4.6%	2.2%	2.0%	1.4%
First-lien mortgages	9.9%	7.2%	6.6%	5.5%	3.3%	3.3%	2.5%	2.4%	3.3%	3.0%	0.9%
Junior liens mortgages	15.4%	13.1%	9.6%	9.8%	8.1%	8.6%	6.3%	7.1%	1.0%	3.4%	1.0%
Commercial and industrial	7.0%	8.2%	6.9%	5.6%	5.7%	3.9%	3.9%	3.6%	2.9%	1.6%	2.1%
Commercial real estate	10.0%	5.5%	8.0%	8.3%	8.5%	4.4%	4.4%	4.0%	3.6%	3.8%	4.6%
Credit cards	25.2%	17.2%	16.7%	15.0%	13.2%	15.3%	14.5%	13.7%	1.4%	0.5%	-0.6%
<i>Universal banks</i>											
Loan losses	11.7%	8.9%	7.6%	7.0%	6.0%	5.2%	4.6%	4.4%	2.4%	2.4%	1.6%
First-lien mortgages	10.2%	7.8%	7.3%	6.1%	3.4%	3.2%	2.5%	2.5%	4.0%	3.6%	0.9%
Junior liens mortgages	16.1%	13.8%	9.9%	10.9%	9.2%	9.0%	6.6%	8.1%	0.9%	4.3%	1.1%
Commercial and industrial	6.9%	8.8%	6.5%	5.2%	5.5%	3.7%	3.3%	2.8%	2.8%	1.9%	2.7%
Commercial real estate	7.8%	5.1%	8.3%	7.9%	7.9%	3.4%	3.2%	2.9%	4.9%	4.7%	4.9%
Credit cards	26.1%	17.8%	16.4%	14.8%	12.8%	15.4%	14.7%	13.3%	1.0%	0.0%	-0.5%
<i>Regional banks</i>											
Loan losses	10.4%	6.7%	6.4%	5.6%	5.4%	4.9%	4.7%	4.4%	1.4%	0.9%	1.0%
First-lien mortgages	7.3%	6.5%	4.8%	3.5%	3.1%	3.8%	2.8%	2.2%	1.0%	0.7%	0.9%
Junior liens mortgages	12.3%	11.2%	8.4%	6.3%	5.0%	7.5%	5.7%	4.5%	0.9%	0.7%	0.5%
Commercial and industrial	7.4%	7.0%	6.8%	5.5%	5.5%	4.0%	4.5%	4.1%	2.9%	1.0%	1.3%
Commercial real estate	13.5%	6.4%	7.9%	9.1%	9.6%	6.3%	6.8%	5.9%	1.6%	2.3%	3.7%
Credit cards	23.0%	17.1%	17.3%	16.1%	14.1%	17.4%	15.8%	18.6%	-0.1%	0.2%	-4.4%
<i>Card banks</i>											
Loan losses	16.7%	10.7%	12.5%	11.4%	10.2%	9.6%	8.9%	9.0%	2.9%	2.5%	1.2%
Credit cards	22.0%	15.4%	17.4%	15.6%	13.8%	14.5%	13.6%	13.8%	2.8%	2.0%	0.0%

Year over year declines in the projected loss rates could be due to three reasons (and combinations thereof): the scenario is getting less severe; the portfolios are improving; or the models are changing. The stress scenario severity has remained relatively constant over time. Indeed, the Fed calibrates its severely adverse scenario around the unemployment rate which needs to increase at least 400 bps and reach at least 10 per cent. There have been changes in the Fed's models: they reported significant model changes for CRE and credit cards in 2013, which impacted loss forecasts for ~22 per cent of balances and ~40 per cent of losses. Changes to home equity were reported in 2014, accounting for ~8 per cent of balances and ~12 per cent of losses, while no changes to the loss forecasting modelling suite were reported in 2015. The convergence of bank to Fed results suggests that at least the bank models are adapting to the Fed's. But the most likely reason for declining loss rates is simply an improvement of credit quality of the assets being stressed. That is especially the case for mortgages which were so hard hit in the crisis, and where underwriting standards have changed drastically since then.

Looking at projections for individual major asset class and type of institution, we find some key trends.

- *First lien mortgages.* The decrease in both Fed- and BHC-projected loss rates for first lien residential mortgages is driven by an improved macro-economic environment as well as strengthened underwriting standards following the crisis. Although the 2014 severely adverse scenario included roughly similar to or more severe increases in unemployment and house price drops than the 2013 and 2012 scenarios, the starting point has improved significantly. Coupled with stronger underwriting standards post-crisis, this leads to lower stressed likelihood of default and loss-given default projections today than immediately following the crisis.

Loss forecasts for universal bank mortgages (both first and second lien) were nearly 4 per cent lower than the corresponding Fed forecasts in 2014. In 2015, however, Fed loss forecasts were substantially lower, while BHCs increased their junior lien mortgage loss forecasts. This reduced the differences across all mortgages to only around 1 per cent.

- *Junior lien mortgages.* Despite improved macro-economic conditions and decreasing BHC-projected loss rates for junior lien mortgages, the Fed-projected loss rate remained largely stable from 2013 to 2014 (from 9.6 per cent to 9.8 per cent), although lower than the 2009 and 2012 level of >13 per cent. In 2015, the average Fed loss forecast fell further to 8.1 per cent. The relatively stable Fed forecasts from 2013 to 2014 despite a substantial drop in BHC projections are likely driven by a 'substantial change or newly implemented' Fed model in 2014. In particular, in the DFAST 2014 disclosure, the Fed for the first time disclosed the treatment of HELOCs reaching their end-of-draw period: 'HELOCs that reach the end-of-draw period are assumed to ... default at a higher rate just after end-of-draw than HELOCs that are still in their draw period.' Given this change, we expect loss rates for junior liens to remain somewhat elevated as 10-year HELOCs originated pre-crisis approach the end of their draw periods. Fed forecasts decreased from 2014 to 2015, moving closer to BHC projections. See above for discussion of the discrepancies between Fed and universal bank forecasts.
- *Commercial and industrial.* Fed-projected C&I loss rates increased from 2009 to 2012 but declined thereafter, roughly in line with loss rates projected by universals. C&I loss rates projected by regionals increased from 2013 to 2014, before decreasing back to 2013 levels in 2015. The recent decrease in loss projections is likely due to improvements in market indicators (eg GDP, BBB spreads), offset by potentially riskier underwriting given increased competition over the past few years.

Although the decrease in Fed projections versus relatively flat aggregate BHC projections reduced the difference between Fed and BHC forecasts, universals and regionals projected loss rates 2.7 per cent and 1.3 per cent lower than the Fed in 2015, respectively. These differences are sizable given the significance of this asset class, and may attract continued regulatory scrutiny.
- *Commercial real estate.* Despite continued recovery in asset prices, transactions and capital availability, as well as strengthened CRE

fundamentals since the economic downturn, Fed CRE loss forecasts have remained largely stable from 2009 to 2015. They decreased from 10 per cent in 2009 to 5.5 per cent in 2012, yet stabilised around ~8.5 per cent by 2015. BHC loss forecasts remained stable between 2013 and 2015.

The relative stability from 2013 to 2015, despite improving conditions, can be explained by a far more severe peak to trough drop in CRPI (Commercial Real Estate price index; for details on Fed scenarios and their variables, please see the DFAST stress-testing rule⁵) in the 2014 than the 2013 severely adverse scenario (35 per cent versus 21 per cent, respectively). The increase from 2012 to 2013, however, is harder to explain. As the corresponding scenarios were largely similar, we believe this is driven by a 'substantial change or newly implemented' Fed model as reported in the DFAST 2013 disclosure. Irrespective of the driver of changes, Fed CRE loss forecasts for universals (regionals) were 4.9 per cent (3.7 per cent) higher than BHC forecasts in 2015; this will likely be an area of continued regulatory pressure.

- *Credit cards.* Similarly to the lower projected residential mortgage loss rates, lower credit card loss projections are likely driven by the improved macro-economic environment (particularly as measured by the unemployment rate) and strengthened underwriting standards. Here the BHCs on average forecasted larger losses than the Fed by 0.6 per cent.

Trading and counterparty loss forecasts

The six largest BHCs are also required to stress their trading operations. Fed trading and counterparty loss projections at the six largest BHCs increased by 17 per cent from 2009 to 2012 (10 per cent excluding Wells Fargo for which no trading and counterparty losses were reported in 2009) but decreased thereafter by an equivalent 17 per cent to 2013. The decline is likely driven by a shift in business models from more speculative to more flow-based revenue, in light of Dodd-Frank. The year 2014 saw the addition of the counterparty default shock for the same six banks plus the two largest custodians

(which together form the eight US GSIFIs), which led to a US\$1.1bn larger impact versus 2013 — a relatively small amount given the exclusion of G-7 sovereigns and designated clearing firms which cover an increasingly larger volume of higher risk trades (although admittedly offset by likely lower risk sensitivity of trading portfolios due to Dodd-Frank). In 2015, trading and counterparty loss projections at universals and investment banks increased slightly, by US\$4.7bn. At custodians, the inclusion of a counterparty default shock led to an increase of ~US\$3bn in trading and counterparty losses in 2014 and 2015. Note that the two custodian banks are not subject to the trading shock, only the counterparty default.

Although some discrepancies persist — particularly for Goldman Sachs and Bank of America — Fed and BHC projections of trading and counterparty losses are also converging. Discrepancies are relatively small compared to total capital resources, which supports relatively granular capital management decisions (see Figure A1).

PPNR forecasts

Although relatively stable at the aggregate level, PPNR projections have been quite volatile at the institution level since 2012, the first time they were disclosed (see Table A2). Fed forecasts decreased significantly for universals and investment banks since 2012, yet increased significantly for regionals, card monolines and custodians — in part driven by a reported enhancement to the Fed's PPNR modelling suite in 2015. BHC projections decreased significantly from 2013 to 2014, yet remained stable from 2014 to 2015. At a more granular level, universals and investment banks projected significantly higher PPNR than the Fed in 2015 (16 per cent and 62 per cent, respectively), while regionals, card monolines and custodians project significantly lower PPNR (39 per cent, 20 per cent and 70 per cent, respectively).

Such erratic behaviour across institutions and between the Fed and BHCs materially impacts estimates of capital consumption. Still, forecasts are beginning to stabilise for most institutions, allowing them to manage capital against regulatory minimums more tightly.

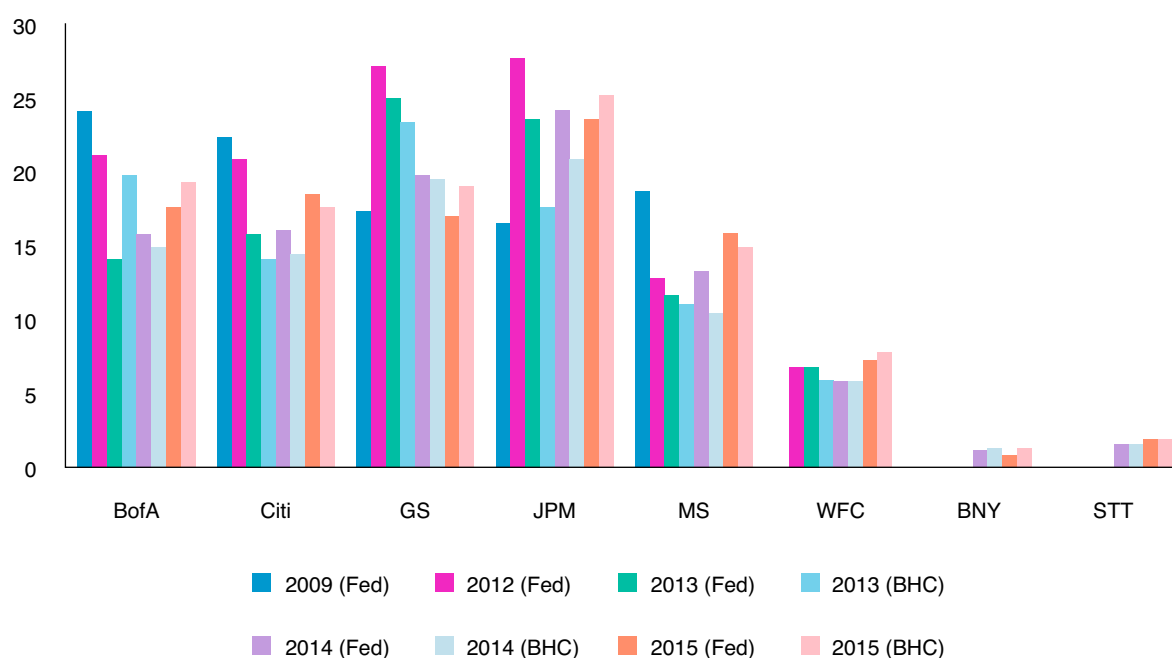


Figure A1: Comparison of Fed and BHC trading and counterparty loss projections, by exercise and institution (US\$bn)

Table A2: Comparison of Fed and BHC PPNR projections, by type of institutions and exercise

US\$bn	Fed				BHC			Difference (FED – BHC)		
	2012	2013	2014	2015	2013	2014	2015	2013	2014	2015
Total	284	268	283	271	311	257	251	-43	26	21
Universal	194	159	163	137	198	157	159	-4	3	4
Regional	31	50	59	64	44	42	39	-13	8	20
IB	15	16	5	7	27	18	11	-12	-2	-5
Card	35	34	42	45	37	34	37	-2	0	6
Custodian	9	10	13	19	5	7	6	4	3	7

Balance sheet and RWA forecasts

Up to and including CCAR 2013, the Fed had relied on BHC balance sheet and therefore RWA projections. In December 2013, however, the Fed announced that it would ‘independently project balances and use these projections to produce its projections of pre-provision net revenue, loan losses, risk-weighted assets and other relevant items’.¹ In contrast to the typical BHC projections of slightly shrinking balances under stress, Fed projections assume balance growth in line with the historical asset growth at the largest BHCs during previous recessions (although there is considerable controversy

around this ‘historical’ observation). For instance, Fed-projected average loan balances were roughly equal to BHC-projected balances in DFAST-2013, yet around 8 per cent higher in DFAST-2015. As assets are the basis for RWA estimates, Fed DFAST-2015 RWA projections were also significantly higher than BHC projections. Ultimately, the adjusted Fed balance sheet projections decrease capital ratios by ~1 per cent compared to BHC projections (accounting for higher PPNR forecasts) — a significant impact that explains a sizable portion of the discrepancy between Fed and BHC predicted capital ratio declines.

This ‘last-minute’ adjustment applied to Fed projections in 2014 serves as an example of two broad lessons for BHCs: first, institutions must be ready to quickly fine-tune capital distributions to account for any last-minute information or model adjustments (either from the Fed, or the institutions themselves); and secondly, the Mulligan option provides some protection for overly aggressive capital plans and unexpected model changes. The three most aggressive institutions in 2015 — GS, MS and JPM — relied on the Mulligan to fine-tune their capital decisions in light of the Fed adjustment.

Overall, discrepancies between Fed and BHC forecasts may persist, and last-minute changes

to the Fed’s models may yet be implemented. Nonetheless, recent disclosure patterns enable institutions to roughly accurately estimate *Fed-projected* minimums and manage capital accordingly.

Reference

- 1 Board of Governors of the Federal Reserve System, Federal Reserve Independent Balance Sheet and RWA Projections, available at: <http://www.federalreserve.gov/bankinfo/reg/independent-projections-letter-20131216.pdf> (accessed 5th January, 2016).