American SECURITIZATION FORUM

April 29, 2012

SUBMITTED VIA E-MAIL

Board of Governors of the Federal Reserve System
20th Street and Constitution Avenue, N.W.
Washington, DC 20551
Email: regs.comments@federalreserve.gov

Re: Enhanced Prudential Standards and Early Remediation Requirements for Covered Companies (Regulation YY; Docket No. 1438; RIN 7100-AD-86)

Ladies and Gentlemen:

The American Securitization Forum ("ASF")[1] appreciates the opportunity to comment on the Board's proposed Regulation YY (Enhanced Prudential Standards and Early Remediation Requirements for Covered Companies).

ASF shares the Board's goal to meaningfully reduce the probability that a systemically important company would fail and to minimize the damage that the financial system and the broader economy would suffer if such a failure were to occur.

We also support the Board's multi-stage process for implementing the enhanced risk-based capital, leverage, and liquidity standards required by Section 165 of the Dodd-Frank Wall Street Reform and Consumer Protection Act, especially to ensure that Regulation YY does not in any way front-run a more thorough and holistic assessment of how best to adopt the Basel III capital and liquidity frameworks in the United States.

Our comments, which are therefore targeted pending the release of proposals on Basel III, focus on three elements of proposed Regulation YY: (i) stress testing and specific limits on cash outflows, (ii) eligibility criteria for the liquidity buffer, and (iii) approaches to collateral and unused credit lines in the single-counterparty exposure limits.

Response to Questions 13 and 17: Data Analyses Demonstrate More Limited Cash Outflows in Committed Credit and Liquidity Facilities for Qualifying Bank Customer Securitizations

[1] The American Securitization Forum is a broad-based professional forum through which participants in the U.S. securitization market advocate their common interests on important legal, regulatory, and market-practice issues. ASF members include over 330 firms, including issuers, investors, servicers, financial intermediaries, rating agencies, financial guarantors, legal and accounting firms, and other professional organizations involved in securitization transactions. ASF also provides information, education, and training on a range of securitization market issues and topics through industry conferences, seminars, and similar initiatives. For more information about ASF, its members, and activities, please go to www.americansecuritization.com.

The Board's proposal requires each covered company to develop a robust methodology for projecting cash flows on assets, liabilities, and off-balance-sheet exposures. The commentary explicitly notes that "stress testing should address potential liquidity issues arising from the covered company's use of sponsored vehicles that issue debt instruments periodically to the markets, such as asset-backed commercial paper and similar conduits."[2] In conducting stress tests, however, the covered company must assume that "only highly liquid assets that are unencumbered may be used as cash flow sources to meet projected funding needs" during the first 30 days of a stress scenario.[3] In addition, the covered company must establish limits on off-balance-sheet exposures such as "unfunded loan commitments, lines of credit supporting asset sales or securitizations, . . . and a letter of credit supporting a variable demand note."[4]

While none of these requirements are objectionable in and of themselves, ASF is concerned about perceptions that the Board may have singled out asset-backed commercial-paper ("ABCP") conduits and securitization transactions because of a belief that they collectively present heightened liquidity risks for covered companies.

As a result, we want to stress a fundamental point: Within the $3.3 trillion U.S. private (non-agency) securitization market, a wealth of diversity exists among issuers and servicers and among asset classes and structures. The senior tranche of credit-card or auto-loan asset-backed securities is altogether different than the mezzanine tranche of commercial mortgage-backed securities, and a collateralized-loan warehouse facility is not comparable to a trade-receivables term facility. These variables, in addition to others, have a significant effect on the credit and liquidity risks posed by any particular special-purpose vehicle or any particular securitization exposure. Not all securitization transactions, therefore, can be painted with the same brush either in the market or for regulatory purposes.

During the Basel III observation period, we have devoted considerable energy to examining the behavior of committed credit and liquidity facilities for qualifying bank customer securitizations. A conservatively tailored definition of these securitizations was developed for purposes of our analyses,[5] but in short, each involves a traditional securitization that (i) is sponsored by a financial or non-financial customer of a bank, (ii) is used by the customer to securitize and finance the credit that they extend to their own clients (*e.g.*, consumers with auto loans or credit cards and corporations with trade credit or working capital lines), (iii) is transacted directly between the bank or its agent and the customer or its special-purpose vehicle, and (iv) is not subject to market-value triggers requiring securitized assets to be sold. The committed credit or liquidity facilities for these securitizations are supplied sometimes by a bank directly and other times by an ABCP conduit sponsored by a bank.

---

[2] 77 Fed. Reg. 594, 607 (Jan. 5, 2012).

[3] *Id.* at 608.

[4] *Id.* at 611.

[5] For our detailed definition, *see* Appendix B at 13-14.

Even during periods of liquidity stress or economic shock, draws by customers under committed credit and liquidity facilities in qualifying bank customer securitizations are limited –

- by the pool of eligible (performing and otherwise unencumbered) receivables and other assets owned by the customer's special-purpose vehicle, which establishes a ceiling (borrowing base) on draws,

- by the performance of the receivables and other assets and the material first-loss exposure retained by the customer, which constrain the advance rate and the customer's risk appetite, and

- by the working capital and other financing needs of the customer.

In our experience, because of these guardrails, the risk of a surge in draws is more limited in qualifying bank customer securitizations than in general credit and liquidity facilities.

To test this experience more quantitatively, we analyzed data on customer draws from the ABCP conduits of 12 North American and European banks before the recent financial crises, during the economic and market shocks, and through the periods of recovery. For both financial and non-financial customers, the data validated our experience and supported an assumed 15% draw-down of the currently undrawn portion of credit and liquidity facilities for qualifying bank customer securitizations – which is substantially less than the pre-observation-period assumption of 100% in the Basel III liquidity standard.

We have separately presented our findings to staff for the Board, other U.S. regulatory authorities, and European counterparts and have included with this letter the detailed written materials as *Appendix A* and *Appendix B*.

For these reasons, we respectfully ask that the Board (i) clarify in commentary to Regulation YY that no presumption is made about the liquidity risks presented by any particular asset, liability, or off-balance-sheet exposure or the use of any particular special-purpose vehicle and (ii) give our findings due weight in developing proposals on the Basel III capital and liquidity frameworks.

Response to Questions 14 and 15: Preliminary Evidence and an Ongoing Study Demonstrate the Benefits of Diverse Diversification in the Liquidity Buffer

The Board's proposal directs each covered company to maintain a liquidity buffer of unencumbered, highly liquid assets that would be sufficient to meet projected net cash outflows and the projected loss or impairment of funding sources for 30 days. "Highly liquid assets" are identified as (1) cash, (2) securities issued or guaranteed by the U.S. government, a U.S. government agency, or a U.S. government-sponsored enterprise, and (3) other assets demonstrated by the covered company to the satisfaction of the Federal Reserve as (i) having low credit and market risk, (ii) being traded in an active secondary market with observable

market prices, committed market makers, a large number of market participants, and a high trading volume, and (iii) being a type that investors historically have purchased in periods of financial-market distress when market liquidity is impaired.[6] To the extent that a covered company holds assets described in clause (3), they "should be diversified by collateral, counterparty, or borrowing capacity, and other liquidity risk identifiers."[7]

ASF is troubled that this approach does not assign sufficient import to diversification within the liquidity buffer of each covered company and to diverse diversification across the liquidity buffers of all covered companies.

Evidence suggests that herding investments for liquidity into a narrow band of asset classes – even if perceived as optimal for an individual institution (a premise which itself is questionable) – increases the probability of multiple failures and associated systemic and societal costs.[8] For example, if the Board's proposal had been in force during the summer of 2008, its admonition to justify and diversify only assets described in clause (3) coupled with market pressure to invest for additional yield could have incentivized covered companies to maintain a liquidity buffer comprised largely of securities issued or guaranteed by Fannie Mae, Freddie Mac, and the Federal Home Loan Banks. Such a public policy, of course, would have made the autumn of 2008 even more disastrous for individual institutions and the financial system as a whole.

Working with Martin Nowak and David Rand at Harvard University, we have commenced a study (i) to gauge the systemic and institutional risks arising from the composition of high-quality liquid assets proposed in the Basel III liquidity framework and (ii) to analyze whether these risks can be reduced by altering that composition. Our work is ongoing, but preliminarily, the evidence in support of diversifying away from sovereign debt (including U.S. Treasuries) and including more municipal obligations and even senior credit-card and auto-loan asset-backed securities is compelling at both an institutional and a systemic level. In addition, through the use of varying haircuts, we have been able to dispense with the artificially binary "liquid or not liquid" designation, introduce a much wider range of eligible assets, and because of diversification enhance the strength of the liquidity buffer even more. We expect to conclude the first phase of our study in the coming weeks and to share our results with regulatory authorities at that time.

Diverse diversification, in our view, solves other difficulties as well. For example, compelling covered companies to build liquidity buffers using only a narrow band of asset classes ends up defeating the Board's public-policy purpose because, as those assets are stockpiled by covered companies and not traded, the secondary market for them becomes more and more illiquid. Similarly, while sovereign-debt issuance has reached historically high levels,

---

[6] *Id.* at 609.

[7] *Id.* at 608.

[8] *See, e.g.*, Beale et al., *Individual Versus Systemic Risk and the Regulator's Dilemma* (August 2, 2011), which is attached as *Appendix C*.

it is still not clear whether a sufficient inventory of assets in clause (2) exists to enable covered companies to meet the proposal's minimum standard.

Finally, on a more technical note, we recommend that liabilities owed to a covered company be fully recognized for cash-inflow purposes to the extent that the liabilities are collateralized by highly liquid assets, can be satisfied only with cash or other highly liquid assets, and come due or can be called during the 30-day period. This would avoid any anomalies or opportunities for arbitrage that may arise from covered companies being assured of having cash and other highly liquid assets made available during the stress scenario but being prevented from recognizing them in full (subject only to any discount required under § 252.56(b)(4)(iii)).

For these reasons, we respectfully request that the Board (i) clarify in commentary to Regulation YY that prudent liquidity-risk management is served by diverse diversification, (ii) also clarify in commentary that the assets described in clause (3) of the definition of highly liquid assets are crucial to a prudently diversified liquidity buffer, and (iii) treat as an unlimited cash inflow (subject only to any discount required under § 252.56(b)(4)(iii)) any liability owed to the covered company to the extent that the liability is collateralized by highly liquid assets, can be satisfied only with cash or other highly liquid assets, and comes due or can be called within the required time period.

Response to Questions 27, 41, and 47: Single-Counterparty Exposure Limits Should Not Disregard Securitization

The Board's proposal prohibits covered companies from being exposed to the credit of other counterparties beyond specified thresholds. Special-purpose vehicles consolidated by a counterparty for financial reporting purposes are treated under the proposal as subsidiaries of the counterparty, and the right to look through unconsolidated special-purpose vehicles "either to the issuer of the underlying assets in the vehicle or to the sponsor" or, if unidentified concentration tests are failed, "to the underlying assets" is expressly reserved.[9] For purposes of calculating a covered company's net credit exposure to a counterparty, "eligible collateral" includes debt securities but specifically excludes all "mortgage- or asset-backed securities."[10]

The punitive treatment handed out to securitization in the definition of eligible collateral is extraordinary. No precedent for such an approach exists, and no explanation is supplied in the proposal's commentary. Excluding from eligible collateral every single mortgage-backed security and asset-backed security – no matter how creditworthy and no matter how liquid – while including every single publicly traded equity security or convertible bond and every single bank-eligible debt security does not appear to further any purpose behind netting credit exposures or limiting single-counterparty exposures more broadly. The only conceivable rationale would be a judgment that no mortgage-backed security or asset-backed security is

[9] 77 Fed. Reg. at 615.

[10] *Id.* at 619.

creditworthy or liquid at all, which runs counter not only to market experience but even to the Board's own risk-based capital and liquidity standards. A defense of securitization generally, we expect, is beyond the scope of comments sought on this proposal, although we would be pleased to supply such a document and associated data if that could prove helpful in developing the final rule. Suffice it to say for now that the proportion of creditworthy and liquid securities in the $3.3 trillion U.S. private (non-agency) securitization market is not unlike that found in other debt or equity markets, and as a result, mortgage- and asset-backed securities that are bank-eligible investments should be included as eligible collateral to the same degree.

In a related vein, we note that a covered company is only permitted to net its gross exposure under the unused portion of a credit line or revolving credit facility if no advance is required until the counterparty supplies "qualifying collateral equal to or greater than the entire used portion of the facility."[11] Qualifying collateral in this case is limited to (i) cash, (ii) obligations of the United States or its agencies, (iii) obligations fully guaranteed by Fannie Mae or Freddie Mac while operating under conservatorship or receivership, and (iv) other obligations issued by a U.S. government-sponsored entity as determined by the Board. No explanation is provided in the commentary, however, for allowing less than the full range of eligible collateral as adjusted for market value. It appears incongruous – and, worse, an incentive to engage in regulatory arbitrage – for a funded exposure to be reduced by the market value of eligible collateral but for unfunded commitments to be denied an identical credit. On the same grounds, we have difficulty understanding why the proposal incorporates an all-or-nothing approach here and refuses a proportionate credit to partially secured facilities.

As for the reservation of authority to look through special-purpose vehicles, we welcome the opportunity to collaborate with the Board on principles that would justify such an action. The separateness of these vehicles – especially for financial risk-management purposes – forms the very core of securitization, other bankruptcy-remote financing structures, and many joint ventures. As a consequence, the burden of proof for looking through the vehicles must be extraordinarily high. The principles for doing so also need to be articulated with precision and care to ensure that arbitrage and other destabilizing activities do not result. Equally important is making certain that the principles are workable in practice – for example, we are not even confident that the treatment of consolidated vehicles is feasible because covered companies often do not know whether a counterparty has consolidated particular vehicles for financial reporting purposes. We look forward, therefore, to learning more about the Board's views on this matter and to providing legal and market insights that can facilitate the Board's deliberations.

For these reasons, we respectfully ask that the Board (i) include mortgage- and asset-backed securities in the definition of eligible collateral for single-counterparty exposure limits, (ii) allow all eligible collateral to offset gross exposures under unused credit lines and revolving credit facilities, (iii) permit a covered company to proportionately reduce its gross exposure under unused credit lines and revolving credit facilities to the extent of the adjusted market value of eligible collateral that the counterparty must provide in order to obtain an advance of

[11] *Id.*

additional funds, and (iv) exclude "special purpose entity" from the definition of subsidiary and clarify in the commentary to Regulation YY that the Board will propose a separate rule addressing the treatment of consolidated and unconsolidated special-purpose vehicles.

* * *

ASF appreciates your consideration of our comments on proposed Regulation YY. If you have any questions, please do not hesitate to contact me at tdeutsch@americansecuritization.com or 212.412.7107 or our outside counsel on this matter, Scott Stengel of King & Spalding LLP, at sstengel@kslaw.com or 202.626.2936.

Sincerely,

Tom Deutsch

Tom Deutsch
Executive Director
American Securitization Forum

Appendix A

American SECURITIZATION FORUM

OPTIMIZING THE LIQUIDITY COVERAGE RATIO

WITH A FOCUS ON SECURITIZATION

FEBRUARY 2012

American SECURITIZATION FORUM

Targeted adjustments to Basel III, which enhance rather than diminish the framework, would prevent the LCR from unnecessarily harming bank customers that rely on securitization.

Basel III	Findings from ASF Analyses (with a Focus on the Period between 2005 and 2010)	Targeted Adjustment to Basel III
Paragraph 97 of the Liquidity Standard: in the LCR, 100% draw-downs on the undrawn portions of committed credit and liquidity facilities to any special purpose vehicle (irrespective of its sponsor)	Aggregate monthly change in customer usage, as a percentage of total commitments, never exceeded 3.84%. Aggregate monthly change in cash outflows from banks sponsoring ABCP conduits, as a percentage of total commitments, never exceeded 3.44%. Dividing these by the average unused percentage of total commitments in the data set (31.32%) yields draw-downs of 12.26% and 10.98% respectively at the worst of the crises.	In the LCR, 15% draw-downs on the undrawn portions of the borrowing bases in committed credit and liquidity facilities for customer-sponsored securitization transactions lacking market-value triggers
Paragraph 162 of the Capital Standard: in the leverage ratio, inclusion of commitments (including liquidity facilities)	Duplicative capital results from the interaction of the leverage ratio and the LCR. Each US$1 commitment requires (1) capital under the leverage ratio on the US$1 commitment, (2) ≥100% of the US$1 commitment in unencumbered Level 1 or Level 2 assets, and (3) capital under the leverage ratio on the ≥US$1 of Level 1 or Level 2 assets.	In the leverage ratio, exclude commitments (including liquidity facilities)
Others: (1) composition of Level 1 and Level 2 assets in the LCR and (2) nth-order effects of the Net Stable Funding Ratio	ASF has commenced a study (1) to gauge the systemic and institutional risks arising from the existing composition of Level 1 and Level 2 assets and (2) to determine whether these risks can be reduced by altering that composition. ASF also has begun to assess potentially adverse nth-order effects of the NSFR's interaction with the LCR.	Proposals to come in the near term

American SECURITIZATION FORUM

Targeted Adjustments to the Basel III Framework

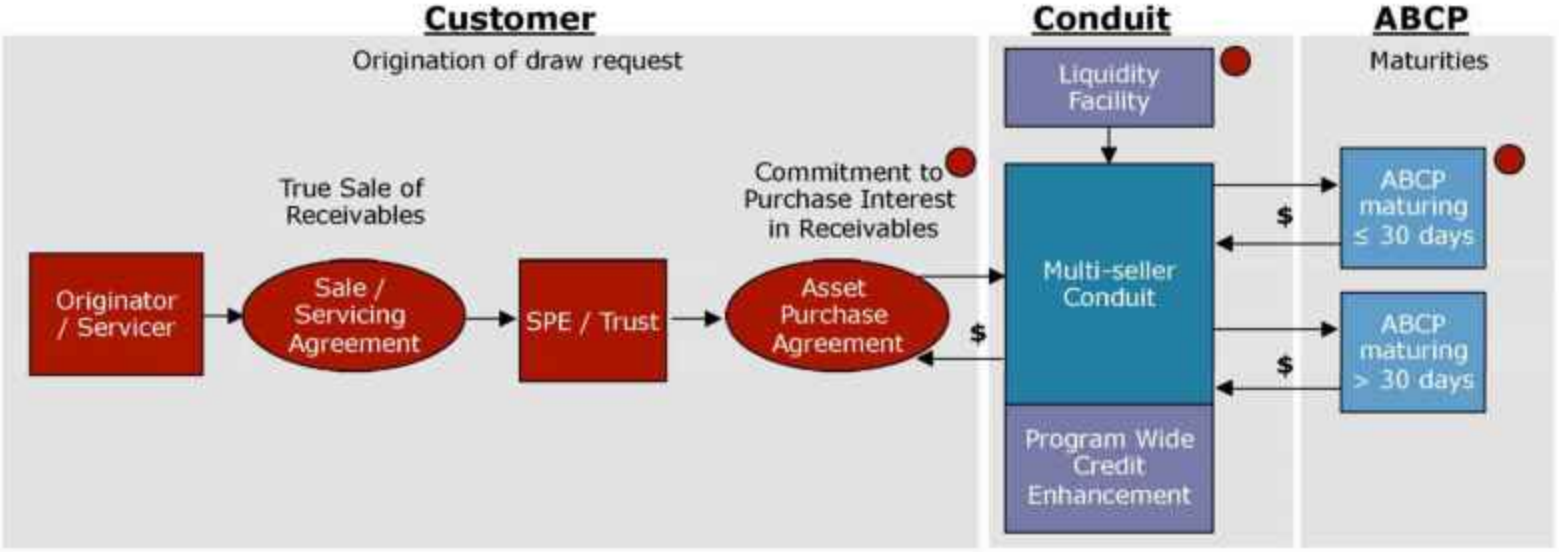
1. **In the LCR, 15% draw-downs on the undrawn portions of the borrowing bases in committed credit and liquidity facilities for customer-sponsored securitization transactions lacking market-value triggers**

2. In the leverage ratio, exclude commitments (including liquidity facilities)

3. Proposals to come in the near term on (a) enhancing the composition of Level 1 and Level 2 assets in the LCR and (b) mitigating potentially adverse nth-order effects of the NSFR

The LCR is expected to adversely affect the pricing and availability of credit for customers that procure working capital through securitization transactions with a dependence on bank commitments.

The ABCP market continues to supply material funding to, as well as material commitments to fund, businesses and governments around the world – on a scale of many hundreds of billions of dollars and euros.



$$\frac{\text{Stock of Unencumbered, High-Quality Liquid Assets}}{\text{Total Net Cash Outflows During the Next 30 Calendar Days}} \geq 100\%$$

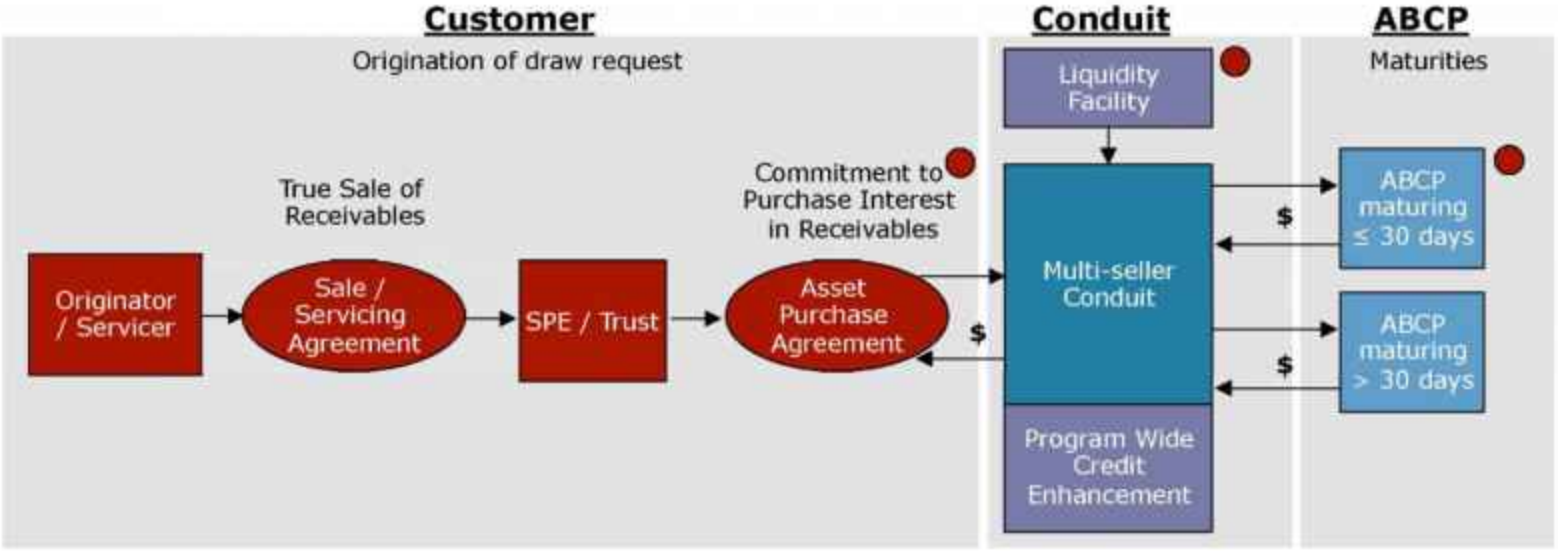
- The LCR's capital charge for potential cash outflows – which implicates (1) the ABCP conduit's commitments to customers, (2) the bank's liquidity facility for the ABCP conduit, and (3) the ABCP maturing within 30 days – ***incents banks to scale back and increase the cost to customers for all unfunded commitments***.

The risk of a surge in draws by customers under committed facilities in securitization transactions is more limited than the risk associated with general credit and liquidity facilities.

Even during periods of significant liquidity stress or economic shock, draws by customers under committed credit and liquidity facilities in securitization transactions are limited –

- by the pool of eligible (performing and otherwise unencumbered) receivables and other assets owned by the customer's special purpose vehicle, and
- by the working capital needs of the customer that is sponsoring the special purpose vehicle.

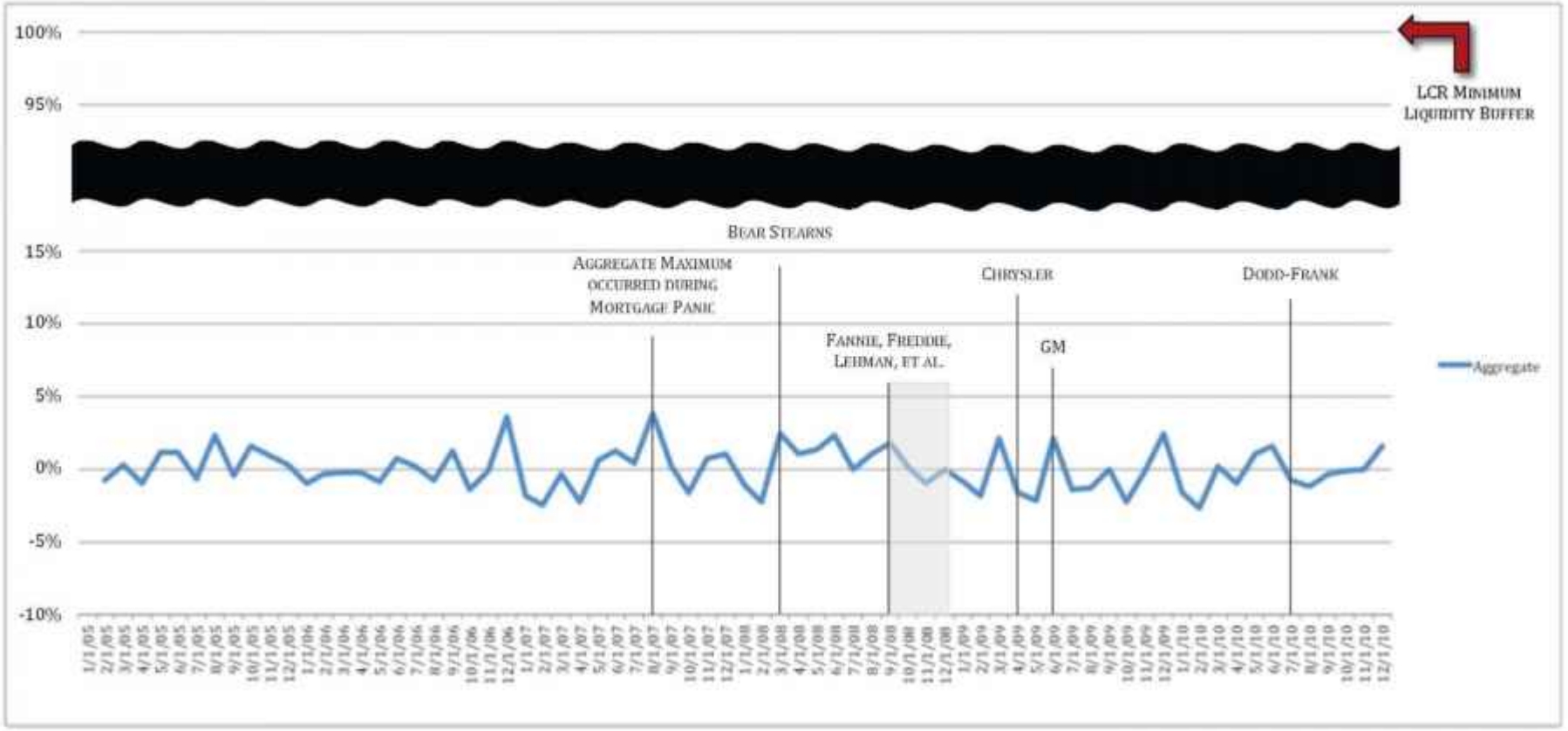
Put another way, only customers that are successfully generating loans and other receivables during the stress scenario would qualify to draw on committed facilities in securitization transactions.



American SECURITIZATION FORUM

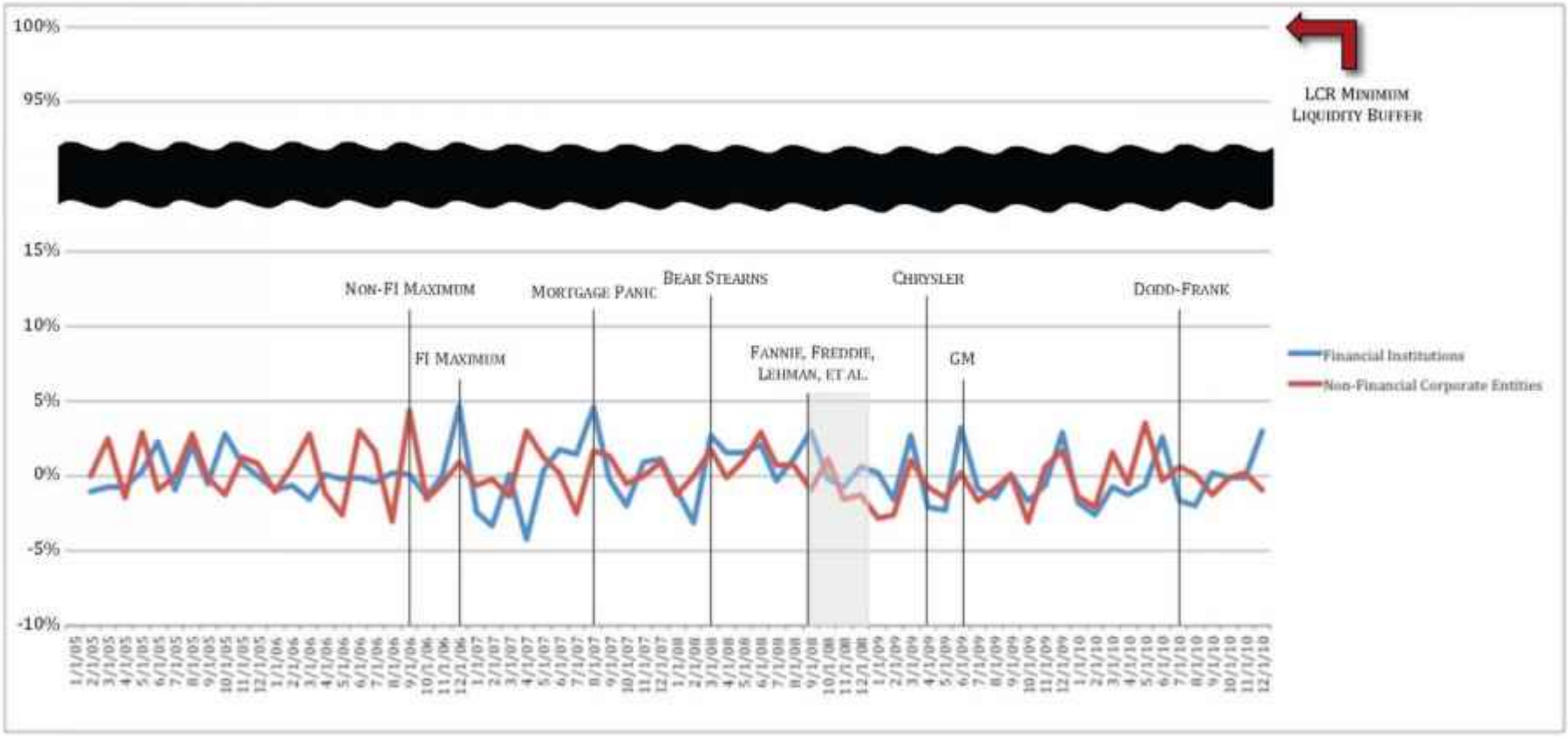
This limited risk of a surge in draws is borne out by our analysis of the aggregate change in customer usage of committed ABCP facilities.

Based on data supplied by 12 North American and European banks that sponsored ABCP conduits between January 2005 and December 2010, we found that the aggregate change in customer usage as a percentage of total commitments – even during periods of significant liquidity stress – ***never exceeded 3.84% (August 2007)***.



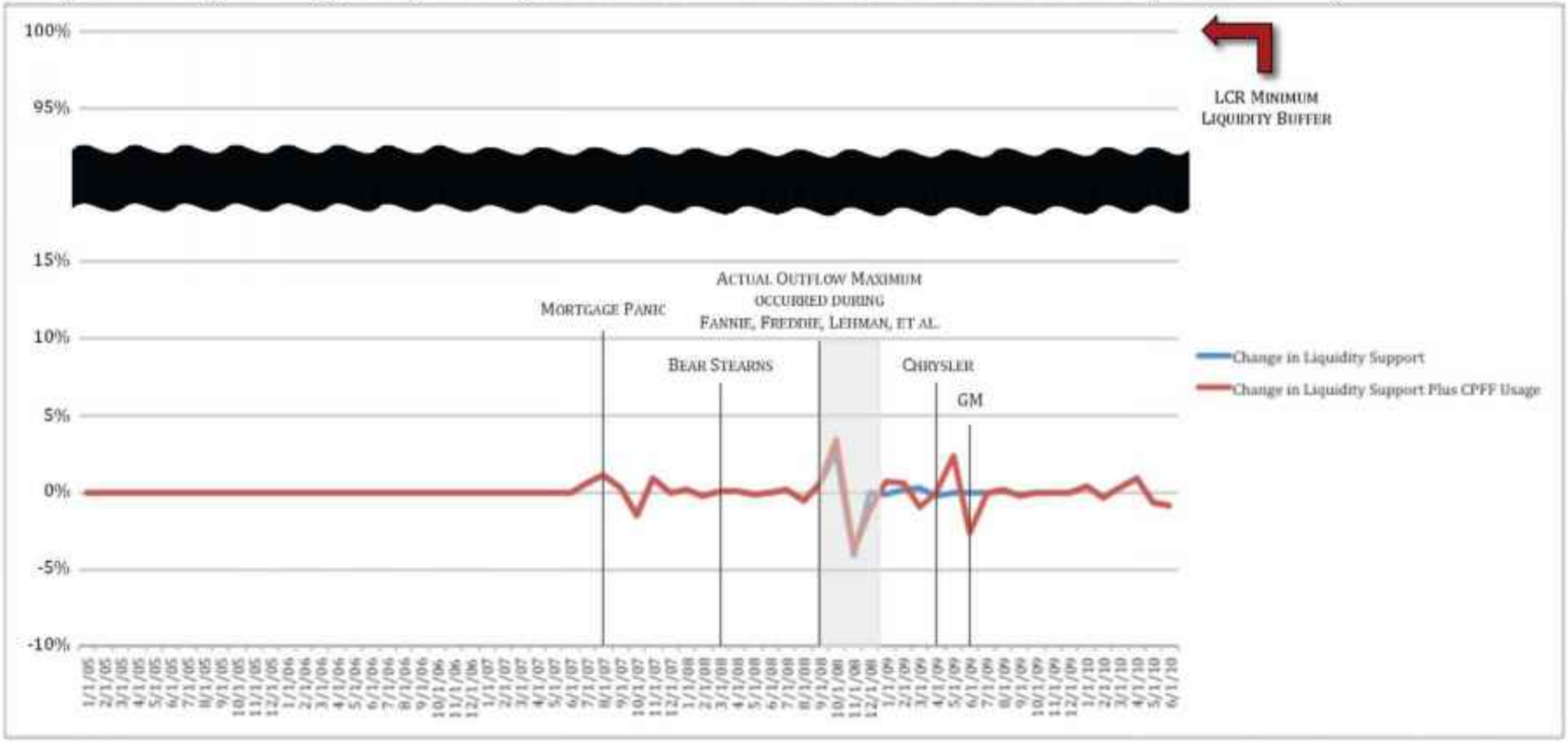
We also found no meaningful variance in the risk of a surge in draws when separating out customer-sponsor types.

Based on this same data, we found that the change in usage was not volatile and did not meaningfully vary by the type of customer-sponsor. The change in usage as a percentage of total commitments ***never exceeded 4.63% for financial institutions (December 2006) and 4.39% for non-financial corporate entities (September 2006)***.



Testing actual outflows from the banks themselves, in contrast to their ABCP conduits, demonstrated an even lower risk to the liquidity buffer.

We found, based on a separate set of data supplied by 12 North American and European banks that sponsored ABCP conduits between January 2005 and June 2010, that the aggregate change in actual outflows from banks (the sum of conduit liquidity draws, bank purchases of ABCP in the open market, and usage of the FRB's Commercial Paper Funding Facility) as a percentage of total commitments ***never exceeded 3.44% (October 2008)***.



American SECURITIZATION FORUM

We endorse a conservative LCR but believe that a proper calibration is crucial to avoid unintended consequences and to mitigate harm to customers that rely on securitization.

We endorse a conservative LCR as a mechanism for fireproofing banks against a severe liquidity crisis.

A ***proper calibration of the LCR is crucial***, however, to avoid unintended consequences and, equally important, to mitigate adverse effects on the pricing and availability of credit for businesses, governments, and other customers that rely on securitization.

- *The LCR is premised on a stress scenario that is unprecedented even in the recent crises and that would immediately prompt both political and central-bank intervention.* Under this scenario, all banks are fully drawn on most unfunded commitments, all market participants are hoarding cash, and all interbank and wholesale funding markets are closed for 30 consecutive days.
- *The LCR is a minimum standard.* Prudent capital management will compel banks to maintain a liquidity buffer that is hundreds of basis points higher than the hard 100% floor.
- *The inability to encumber Level 1 and Level 2 assets will exact a material cost.* Issuers of Level 1 and Level 2 assets (including sovereigns) will receive less favorable pricing as banks comprise an ever larger percentage of the buy-side but are prevented from financing their purchases. This dynamic also is likely to contract the repo and other markets that regulatory authorities expect will be available to convert liquid assets to cash during a crisis.
- *Redundant capital will result from the LCR's interaction with the Net Stable Funding Ratio.* Banks sponsoring securitization facilities in order to finance their customers will need to raise long-term funding under the NSFR for the commitments (5% RSF factor) and the acquired customer receivables (100% RSF factor for most) as well as liquid assets under the LCR (5% to 100% RSF factor for most).

We conclude, from both quantitative and qualitative analyses, that a targeted adjustment is warranted in connection with the draw-downs for customer-sponsored securitization transactions.

Under Paragraph 97(d) of the Basel III Liquidity Standard, draw-downs on the undrawn portions of committed credit and liquidity facilities to any special purpose vehicle (irrespective of its sponsor) is 100%.

Our analyses highlight the idiosyncratic (non-systemic) nature of utilization in the context of customer-sponsored securitization transactions. They also suggest that, while financial and non-financial customer-sponsors should continue to be treated identically, a targeted adjustment to the draw-down is warranted.

- The aggregate monthly change in customer usage, as a percentage of total commitments, never exceeded 3.84%
- The aggregate monthly change in cash outflows from banks sponsoring ABCP conduits, as a percentage of total commitments, never exceeded 3.44%.
- Dividing these by the average unused percentage of total commitments in the data set (31.32%) yields draw-downs of 12.26% and 10.98% respectively at the worst of the crises.

Imposing, for customer-sponsored securitization transactions lacking market-value triggers, a draw-down of 15% in Paragraph 97 of the Basel III Liquidity Standard would add to the worst experience of the recent crises a further cushion of 22% to 37%.

We also believe that the Basel III Liquidity Standard should make clear that the "undrawn portion" referenced in the LCR is the "undrawn portion of the borrowing base." As previously noted, the pool of eligible receivables and other assets owned by the customer's special purpose vehicle (the borrowing base) sets an upper bound on the maximum amount that remains undrawn.

The banks that submitted data on customer usage recently authorized individual-institution analyses on an anonymous basis, which have the potential to supply additional insights of value.

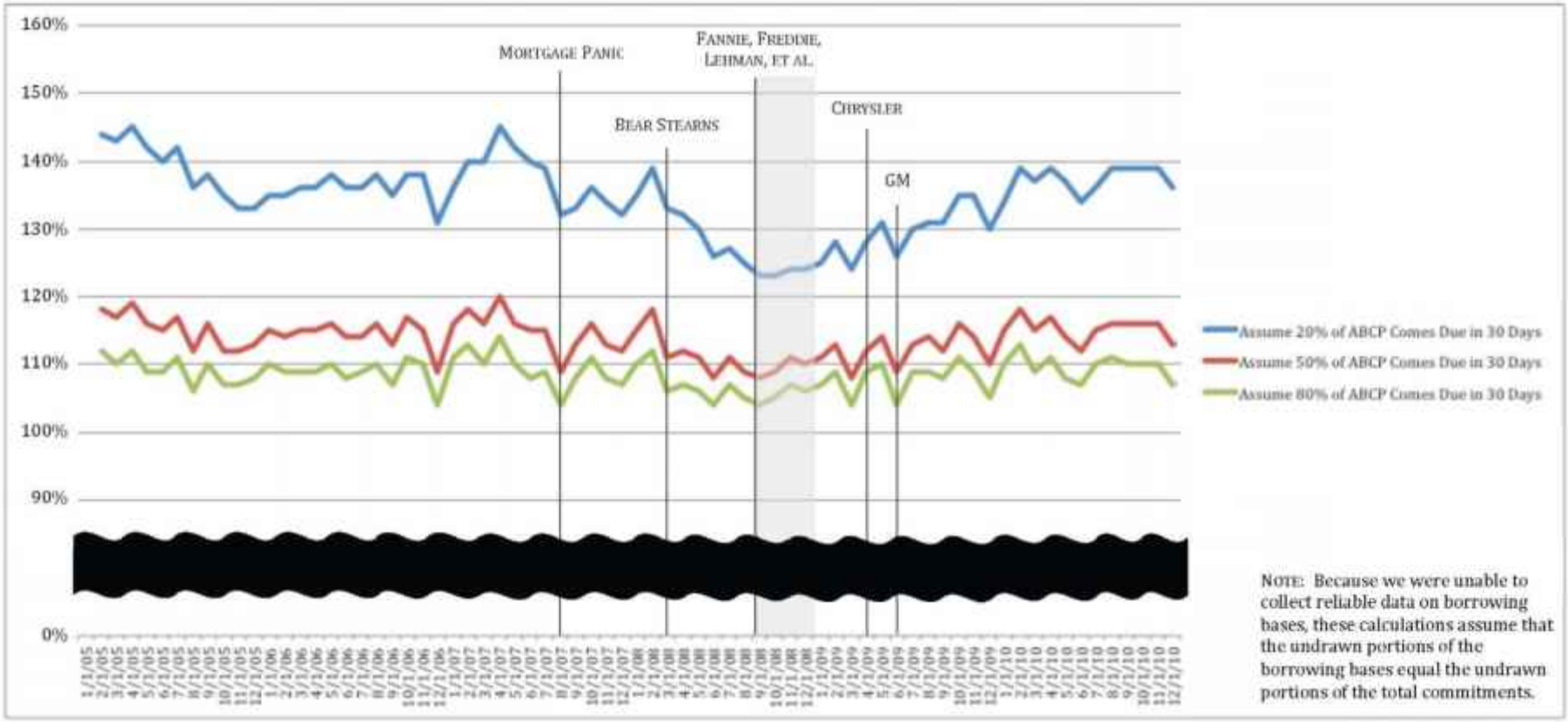
We recently obtained permission from the 12 North American and European banks that submitted data on customer usage to conduct individual-institution analyses on an anonymous basis.

While we cannot predict the results or prejudge their value, these analyses could tease out even more the idiosyncratic nature of utilization by customer-sponsors and could suggest a need for more tailored draw-downs.

- The maximum monthly change in usage will continue to be limited by (1) the pool of eligible assets owned by the customer's special purpose vehicle and (2) the working capital needs of the customer.
- In any particular month, some ABCP facilities will have experienced increases in usage and others decreases. Aggregate data both among and within institutions, therefore, likely will be found to have smoothed out some degree of volatility.
- ABCP facilities with lower commitments or higher utilization will have exhibited, on a percentage basis, more volatility from the same absolute amount of draws. For example, a US$1 draw on a US$1 commitment or unused amount will be reflected in these analyses as more volatile than a US$1 draw on a US$5 commitment or unused amount. Aggregate data, therefore, may end up being more reliable.
- Instances of stress for different kinds of customers are unlikely to have been correlated, either among themselves or with instances of stress for banks. As a result, (1) ABCP facilities with more diverse customers/exposures and less concentration risk likely experienced less volatility and (2) maximum monthly changes in customer usage for individual institutions likely did not occur simultaneously and, therefore, likely were not part of a systemic liquidity drain.

In the meantime, testing our current proposal against the recent crises demonstrates a liquidity buffer that would have remained, at all times, comfortably higher than 100% of the ABCP coming due in 30 days.

Pending individual-institution analyses, we tested our proposal against the aggregate data to ascertain how robust a liquidity buffer would have existed under an adjusted LCR, still assuming that no ABCP could be issued for 30 days but lowering the draw-down for customer-sponsored securitization transactions to 15% of the undrawn portion. ***As a percentage of ABCP coming due in 30 days, the buffer would have remained well above 100%.***



American SECURITIZATION FORUM

Targeted Adjustments to the Basel III Framework

1. In the LCR, 15% draw-downs on the undrawn portions of the borrowing bases in committed credit and liquidity facilities for customer-sponsored securitization transactions lacking market-value triggers

2. **In the leverage ratio, exclude commitments (including liquidity facilities)**

3. Proposals to come in the near term on (a) enhancing the composition of Level 1 and Level 2 assets in the LCR and (b) mitigating potentially adverse nth-order effects of the NSFR

American SECURITIZATION FORUM

The interaction of the LCR and the proposed leverage ratio results in a duplicative capital requirement, which unnecessarily depletes the credit that can be made available to customers.

A problematic nth-order effect of the LCR arises from its interaction with the proposed leverage ratio, which results in banks being compelled to hold duplicative capital.

- The first part of the double count is due to Paragraph 162 of the Basel III Capital Standard, which provides that "commitments (including liquidity facilities)" are among the off-balance-sheet items included in the proposed leverage ratio.
    - This reflects a change even in those jurisdictions that currently have a leverage ratio (*e.g.*, the United States and Canada).
    - Direct credit substitutes are separately covered in the proposed leverage ratio.
- The second part of the double count is due to the increase in Level 1 and Level 2 assets on each bank's balance sheet, which must be acquired and held under the LCR to defease every commitment.
    - Notably, the cost of this required increase will be exacerbated in another second-order effect under the Basel III Capital Standard – namely, the expected rise in risk weights for sovereign exposures and other Level 1 assets that are currently set at 0%.

This duplicative capital requirement can be resolved by excluding unfunded commitments from the proposed leverage ratio.

The consequence of this treatment under the proposed leverage ratio is that, for every US$1 in unfunded commitments, a bank would be forced to hold:

- capital under the leverage ratio on the US$1 commitment
- ≥100% of the US$1 commitment in unencumbered Level 1 or Level 2 assets to defease the commitment
- capital under the leverage ratio on the ≥US$1 of Level 1 or Level 2 assets

We note, in addition, that ***the proposed Net Stable Funding Ratio would add to this double count*** by requiring banks that finance their customers through ABCP or other securitization facilities to separately raise long-term funding to cover the commitments (5% required stable funding factor) and the acquired customer receivables (100% required stable funding factor for most).

As a result, we propose that Paragraph 162 of the Basel III Capital Standard exclude "commitments (including liquidity facilities)" from the leverage ratio.

American SECURITIZATION FORUM

Targeted Adjustments to the Basel III Framework

1. In the LCR, 15% draw-downs on the undrawn portions of the borrowing bases in committed credit and liquidity facilities for customer-sponsored securitization transactions lacking market-value triggers

2. In the leverage ratio, exclude commitments (including liquidity facilities)

3. **Proposals to come in the near term on (a) enhancing the composition of Level 1 and Level 2 assets in the LCR and (b) mitigating potentially adverse nth-order effects of the NSFR**

American SECURITIZATION FORUM

Evidence preliminarily suggests that systemic and institutional risks can be reduced if the LCR incents more diverse diversification in the Level 1 and Level 2 assets that comprise a bank's liquidity buffer.

Diverse diversification in bank liquidity buffers, including an expansion of the eligibility criteria for Level 1 and Level 2 assets, may be able to resolve a number of problematic nth-order effects of the LCR.

- Evidence suggests that herding bank investments into a narrow band of asset classes – even if perceived as optimal for an individual bank (a premise which itself has not been firmly established) – increases the probability of multiple bank failures and associated systemic and societal risks.

- If banks were compelled to build a liquidity buffer using only a narrow band of asset classes, the market for those asset classes would necessarily become illiquid as banks stockpile and refrain from trading them.

- Even as sovereign-debt issuance has reached historically high levels, it is not clear whether a sufficient inventory of Level 1 and Level 2 assets exists to enable banks to meet the LCR's minimum standard.

Evidence is beginning to mount that ***this diverse diversification can be achieved while at the same time enhancing the quality of an individual bank's liquidity buffer***.

- Some asset classes whose quality was never or rarely questioned – *e.g.*, OECD sovereign debt – have exhibited material risks.

- Other asset classes whose quality has been critiqued in a sweeping way – *e.g.*, mortgage- and asset-backed securities – have proven to contain subsets with low credit and market risks as well as broad and deep secondary markets.

ASF has commenced a study to confirm the benefits of diverse diversification and to ascertain the optimal composition of Level 1 and Level 2 assets in the LCR.

Working with Martin Nowak and David Rand at Harvard University, we have commenced a study (1) to gauge the systemic and institutional risks arising from the existing composition of Level 1 and Level 2 assets and (2) to analyze whether these risks can be reduced by altering that composition.

- We have initially used price stability as a proxy for an asset's liquidity and are exploring whether reliable data exists on bid-ask spreads.
- In the first stage of our study, we have used a basket of U.S. Treasuries as our baseline and have assessed the effects of diversifying into other asset classes.
  - Sovereign Debt: 2-Year Yield Data from Bloomberg
  - Corporate: Barclays U.S. Corporate Intermediate Index
  - MBS: Barclays Agency MBS Index
  - ABS: Barclays Aaa Auto and Credit Card Index
  - Municipal: Barclays Municipal Bond 3 Year Index
- In addition, as part of that first stage, we have examined the effects of imposing haircuts on asset classes other than U.S. Treasuries.

Taking data from June 1, 2003, to January 4, 2012, we captured the frequency of 30-day price changes in the selected asset classes.

We then assessed the probability of a 30-day price change across five hypothetical baskets of high-quality liquid assets.

American SECURITIZATION FORUM

We then altered the diversification in each basket and compared the the probability of a 30-day price change below -1.00%.

	Undiversified	*10% Diversified*	*20% Diversified*	*30% Diversified*
Corporate Intermediate	1.91%	2.05%	2.85%	4.38%
MBS	1.91%	1.91%	1.91%	2.15%
ABS	1.91%	1.63%	1.73%	2.24%
Municipal	1.91%	1.49%	1.21%	0.93%

American SECURITIZATION FORUM

We then examined the effect of imposing a 5.00% haircut on all asset classes other than U.S. Treasuries.

	Undiversified	*10% Diversified*	*20% Diversified*	*30% Diversified*
Corporate Intermediate	1.91%	0.09%	0%	0.23%
MBS	1.91%	0.05%	0%	0%
ABS	1.91%	0%	0%	0%
Municipal	1.91%	0%	0%	0%

ASF expects to propose targeted adjustments to the LCR numerator in the near future. ASF also has begun to assess potentially adverse nth-order effects of the NSFR.

Our study is ongoing, and we expect to propose targeted adjustments to the LCR numerator in the near future.

- In subsequent stages of our study, we anticipate that the following will be considered: (1) how does liquidity flow from sources of capital into the market for high-quality liquid assets? (2) what facilitates and impedes these channels of liquidity for particular sources of capital and particular asset types? (3) what correlations exist among sources of capital, channels of liquidity, and asset types? (4) what supplies of high-quality liquid assets exist? (5) what is the effect of varying haircuts for different high-quality liquid assets? (6) what is the effect of banks being precluded from encumbering the required stock of high-quality liquid assets?

We also have begun to assess potentially adverse nth-order effects of the Net Stable Funding Ratio.

- Under the LCR, banks that sponsor ABCP or other securitization facilities to finance their customers will need to raise Level 1 and Level 2 assets in order to defease both the customer commitments and any ABCP or other asset-backed instruments coming due in 30 days.

- At the same time, the NSFR proposes to require these banks to raise long-term funding for the same commitments (5% required stable funding factor), the acquired customer receivables (100% required stable funding factor for most), and the Level 1 and Level 2 assets (5% to 100% required stable funding factor for most).

- The NSFR also works against other regulatory initiatives (*e.g.*, Solvency II).

APPENDIX

Sources of Data for ASF's Cash-Outflow Analyses

ASF collected material data from the ABCP market, including data from the worst of the recent crises, in connection with undertaking the cash-outflow (LCR denominator) analyses.

Data was supplied to ASF by 14 North American and European financial institutions.

- Combined they hold over US$18.6 trillion in consolidated assets (FY 2010).
- 9 were counted among the largest 50 financial institutions in the world (FY 2010).

For each data point in our cash-outflow analyses, at least 12 of these financial institutions were able to supply reliable data. We did not exclude any reliable data in conducting the analyses.

We also relied on publicly available data from the Federal Reserve Board to gauge usage of the Commercial Paper Funding Facility by these financial institutions.

Data Parameters for ASF's Cash-Outflow Analyses

Review Period: end-of-month data from January 31, 2005, to December 31, 2010

Granularity: transaction-level data

Lenders: ABCP conduits, excluding structured investment vehicles and security arbitrage vehicles, that were sponsored by financial institutions and that were active at any time during the review period

Borrowers: special purpose vehicles that were sponsored by customers of financial institutions

Customer-Sponsors of Borrowers: financial institutions and non-financial corporate entities

Categories of Facilities: trade receivables, securities, warehouse, term financing, and a catch-all "other" category

Appendix B

American SECURITIZATION FORUM

OPTIMIZING THE LIQUIDITY COVERAGE RATIO

WITH A FOCUS ON QUALIFYING BANK CUSTOMER SECURITIZATIONS

ADDITIONAL ANALYSES AND RESPONSES TO FOLLOW-UP INQUIRIES

APRIL 2012

Based on both quantitative and qualitative analyses during the observation period, we are proposing three targeted adjustments to provisions of the Basel III framework that impact liquidity.

Based on both quantitative and qualitative analyses during the observation period, we have concluded that three targeted adjustments to the Basel III framework could prevent unnecessary harm to bank customers that sponsor securitization transactions to finance the credit that they extend to their own clients (*e.g.*, consumers with auto loans and credit cards and corporations with trade credit and working capital lines).

- PARAGRAPH 97 OF THE BASEL III LIQUIDITY STANDARD: **Insert "15% draw-downs on committed credit and liquidity facilities to special purpose vehicles in qualifying bank customer securitizations: Banks should assume a 15% draw-down of the currently undrawn portion of each of these credit and liquidity facilities."**
- PARAGRAPH 162 OF THE BASEL III CAPITAL STANDARD: **Exclude "commitments (including liquidity facilities)" from the leverage ratio.**
- SECTION II.1(2)(A) OF THE BASEL III LIQUIDITY STANDARD: **Incent diverse diversification in the high-quality liquid assets that populate each bank's stock and the system as a whole, including through an expansion of the eligibility criteria for Level 1 and Level 2 assets.**

American SECURITIZATION FORUM

Grounds for our Targeted Adjustments to the Basel III Framework

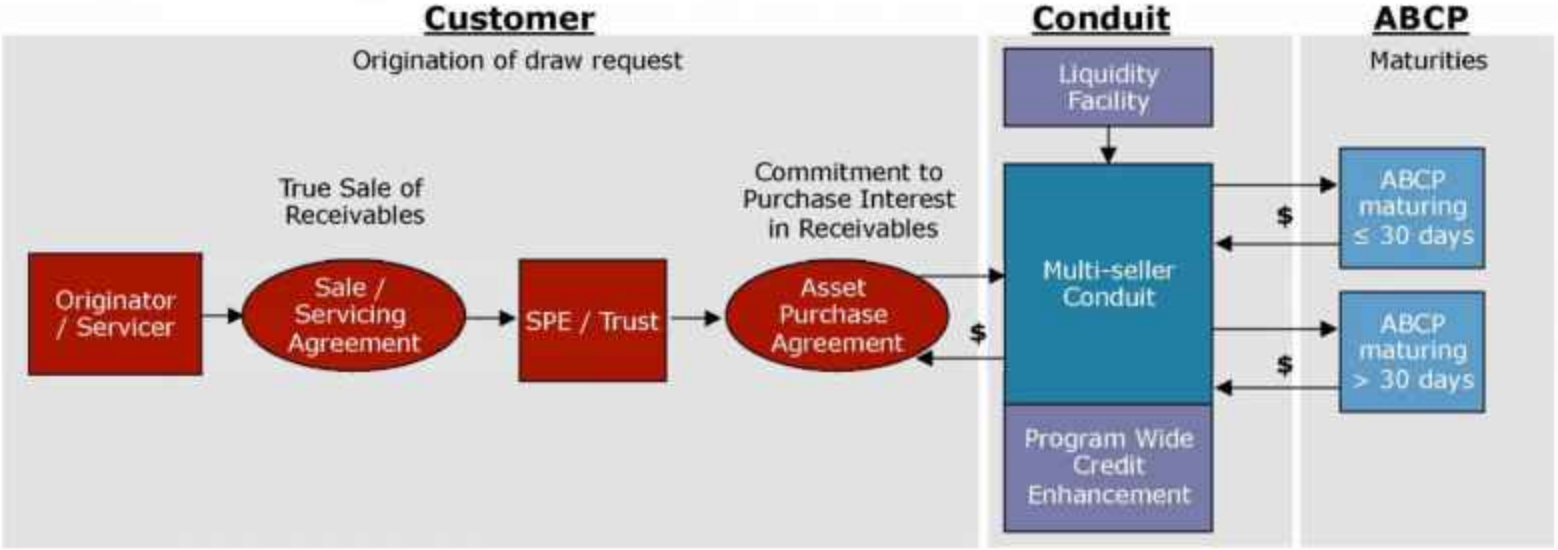
1. **Brief Summary of our Initial Cash-Outflow Findings**
2. Follow-up Inquiries from Regulatory Authorities
3. Responses to Follow-Up Inquiries
4. Preview of our LCR Numerator Study

American SECURITIZATION FORUM

Earlier in 2012, we highlighted the LCR's adverse effect on the pricing and the availability of credit for customers that sponsor securitization transactions to finance their receivables and other financial assets.

We have found that the risk of a surge in draws is more limited in customer-sponsored securitization transactions than in general credit and liquidity facilities. ***Even during periods of liquidity stress or economic shock, draws by customers under committed credit and liquidity facilities in securitization transactions are limited –***

- by the pool of eligible (performing and otherwise unencumbered) receivables and other assets owned by the customer's special purpose vehicle, which establishes a ceiling (borrowing base) on draws,
- by the performance of the receivables and other assets and the material first-loss exposure retained by the customer, which constrain the advance rate and the customer's risk appetite, and
- by the working capital and other financing needs of the customer.



Based on aggregate data analyses, we found that the assumed draw-down for customer-sponsored securitization transactions should be set at no more than 15%.

Findings Based on Aggregate Data

Based on our analyses of data supplied by 12 North American and European banks that sponsored ABCP conduits between January 2005 and December 2010, we found that the aggregate monthly change in customer usage as a percentage of total commitments – even during periods of significant liquidity stress – ***never exceeded 3.84% (August 2007)***.

Based on this same data, we discovered that the monthly change in usage was not volatile and did not meaningfully vary between customer-sponsors that are financial institutions and those that are non-financial corporate entities. The change in usage as a percentage of total commitments ***never exceeded 4.63% for financial institutions (December 2006) and 4.39% for non-financial corporate entities (September 2006)***.

Our analyses also highlighted the ***idiosyncratic (non-systemic) nature of utilization*** in the context of customer-sponsored securitization transactions.

Dividing 3.84% (the maximum aggregate monthly change in customer usage as a percentage of total commitments) by 31.32% (the average unused percentage of total commitments in the data set) yields a ***draw-down of 12.26% at the worst of the crises***.

Back-testing revealed that, for customer-sponsored securitization transactions lacking market-value triggers, ***a draw-down of 15% would have resulted in a reserve more than 20% higher than the worst experience of the recent crises***.

We noted as well that unnecessarily duplicative capital requirements, arising from the interaction of the LCR and the proposed leverage ratio, could be resolved by excluding commitments from the leverage ratio.

A problematic nth-order effect of the LCR arises from its interaction with the proposed leverage ratio, which results in banks being compelled to hold duplicative capital.

- The first part of the double count is due to "commitments (including liquidity facilities)" being included among the off-balance-sheet items in the proposed leverage ratio. This reflects a change even in those jurisdictions that currently have a leverage ratio (*e.g.*, the United States and Canada).

- The second part of the double count is due to the increase in Level 1 and Level 2 assets on each bank's balance sheet, which must be acquired and held under the LCR to defease every commitment. Notably, this cost will be exacerbated in another second-order effect – namely, the expected rise in risk weights for Level 1 assets that are currently set at 0%.

The consequence of this treatment under the proposed leverage ratio is that, for every US$1 in commitments, a bank would be forced to hold: (1) capital under the leverage ratio on the US$1 commitment, (2) ≥100% of the US$1 commitment in unencumbered Level 1 or Level 2 assets to defease the commitment, and (3) capital under the leverage ratio on the ≥US$1 of Level 1 or Level 2 assets.

This could be resolved by excluding "commitments (including liquidity facilities)" from the leverage ratio.

We note, in addition, that ***the proposed Net Stable Funding Ratio would add to this double count*** by requiring banks that finance their customers through ABCP or other securitization facilities to separately raise long-term funding to cover the commitments (5% required stable funding factor) and the acquired customer receivables (100% required stable funding factor for most).

American SECURITIZATION FORUM

Grounds for our Targeted Adjustments to the Basel III Framework

1. Brief Summary of our Initial Cash-Outflow Findings
2. **Follow-up Inquiries from Regulatory Authorities**
3. Responses to Follow-Up Inquiries
4. Preview of our Numerator Study

In discussing our initial findings and proposal with regulatory authorities, we noted meaningful consensus on several points.

In discussing our initial findings and proposal with regulatory authorities, we noted that ***meaningful consensus emerged on several points***:

- A *conservative LCR will be useful* in fireproofing banks against a severe liquidity crisis.
- A *proper calibration of the LCR is crucial* to mitigate adverse effects on bank customers that sponsor securitization transactions to finance their receivables and other financial assets – especially because (1) prudent capital management will compel banks to maintain a liquidity buffer that is materially higher than the 100% floor, (2) the inability to encumber liquid assets will exact significant individual and systemic costs, and (3) the stress scenario assumed by the LCR is already extraordinarily severe and unprecedented.
- *Opportunities for arbitrage should be avoided* – for example, treatment under the LCR should not vary between banks that provide committed facilities to customer-sponsored securitization transactions through ABCP conduits and those that do so directly or between ABCP conduits that are consolidated for accounting purposes and those that are de-consolidated.
- *Banks need not be fireproofed against the end of the civilized world* – that is, beyond the point where government intervention is assured and related moral hazard is tolerable – *but that point is not always clear*, especially for banks whose core business is grounded in maturity transformation and capital intermediation.

American SECURITIZATION FORUM

We are following up now in response to three inquiries about our proposal to effect targeted adjustments to the Basel III framework.

During and after our discussions with regulatory authorities, ***three inquiries were made about our proposal*** to effect targeted adjustments to the Basel III framework:

- Could analyses on individual-institution (rather than only aggregate) data be performed, and if so, what additional insights do they provide?
- How should a qualifying bank customer securitization be defined in order to avoid opportunities for arbitrage, incentives for unstable funding strategies, and destabilizing activities in the shadow banking system?
- In balancing the costs and benefits of fireproofing banks against liquidity crises – especially the impact on customers and other second-, third-, and nth-order effects – how should the incremental cost of the LCR be measured?

American SECURITIZATION FORUM

Grounds for our Targeted Adjustments to the Basel III Framework

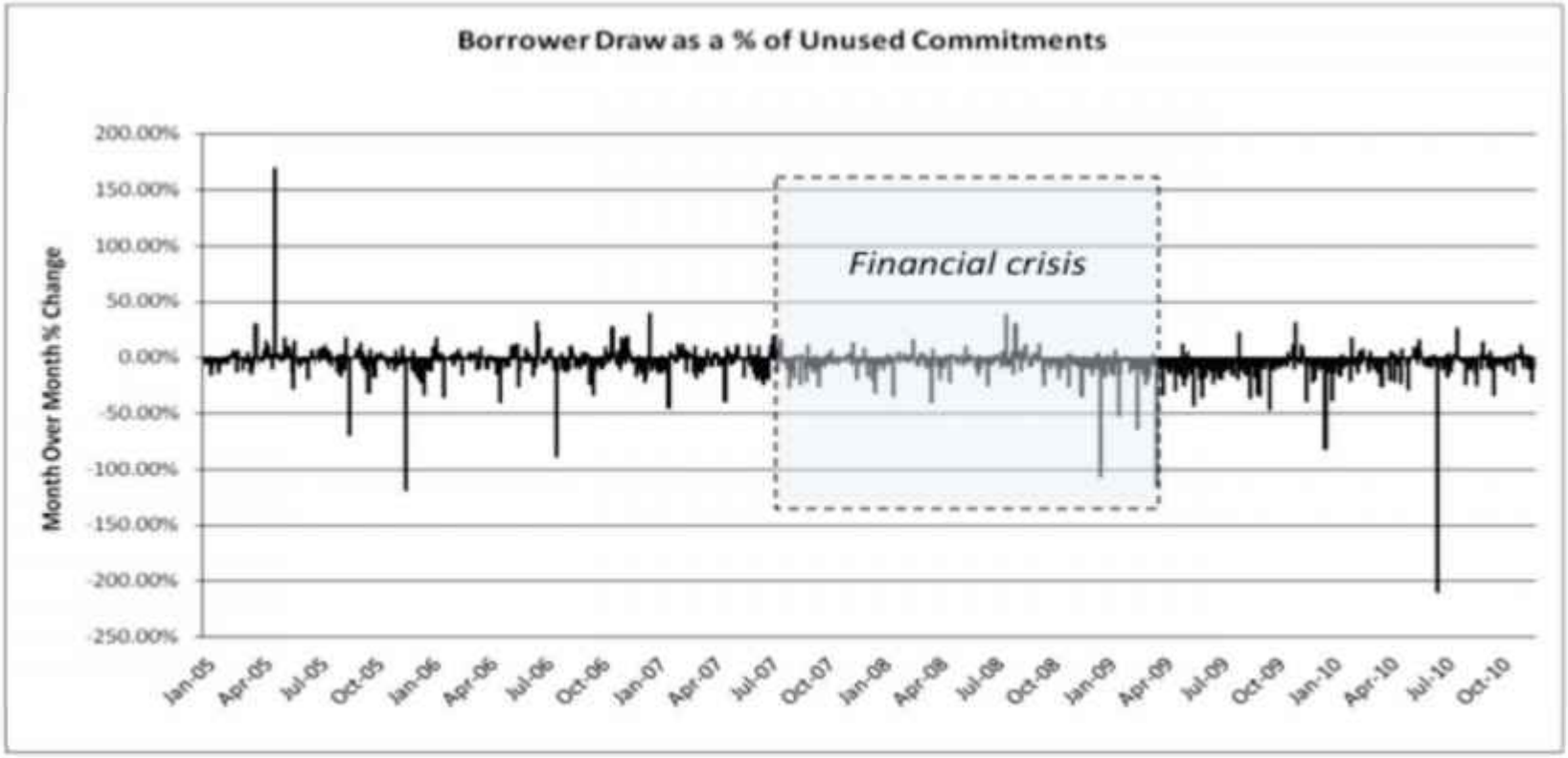
1. Brief Summary of our Initial Cash-Outflow Findings
2. Follow-up Inquiries from Regulatory Authorities
3. **Responses to Follow-Up Inquiries**
4. Preview of our Numerator Study

Client draw activity is uncorrelated across time and not associated with market pressures.

In order to utilize capacity under conduit commitments, clients must source and deliver assets subject to borrowing base calculations.

In times of market stress, clients are not likely to draw more than in normal markets.

As a result, draws are uncorrelated or negatively correlated to market stress conditions.



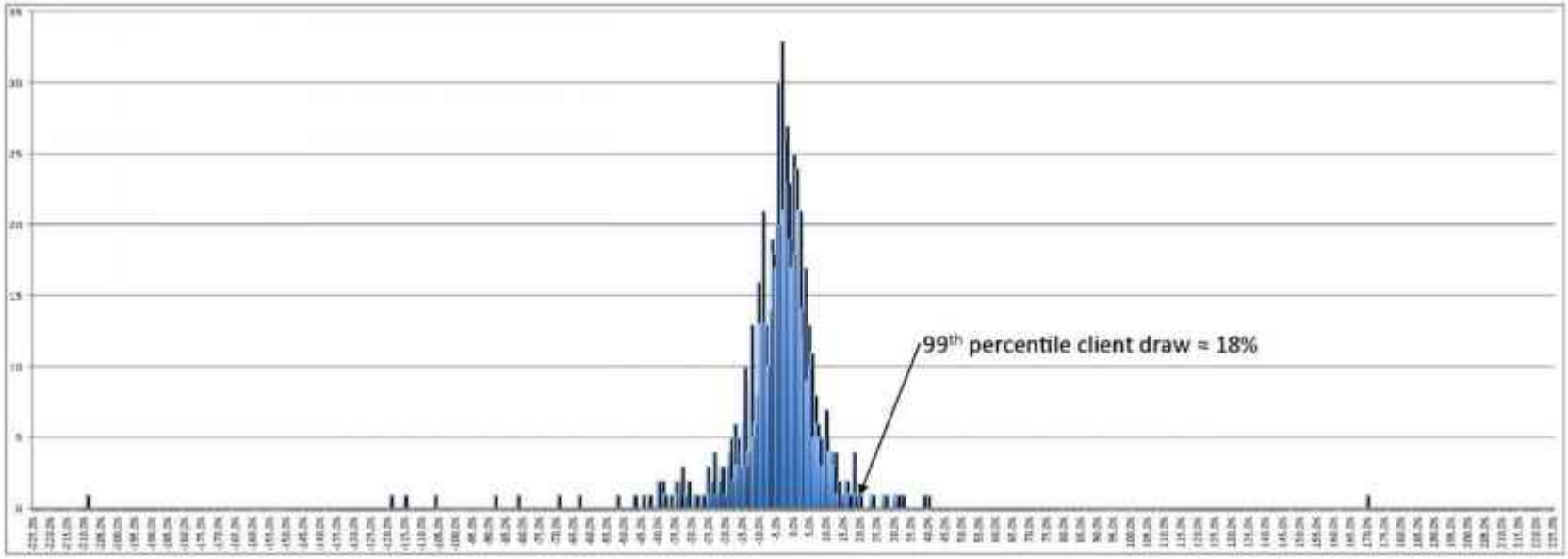
Analyses of individual-institution data reinforced our initial conclusion that the assumed draw-down for qualifying bank customer securitizations should be set at no more than 15%.

Across the banks participating in the ASF data exercise, the aggregate client draws never exceeded 12.5% of the unused balance.

However, individual bank experience could be expected to be more variable. See the Appendix for more detail.

Using the methodology described in the Appendix, the 99th percentile of client draws for individual banks was measured to be approximately 25% of the unused. However, this included data from one bank whose small portfolio was unusually fully utilized (average usage ≈ 93%). This means that small dollar draws observed in this portfolio look like very large percentage draws, a statistic that is not applicable to the rest of the banks in the market.

Removing the anomalous portfolio, the 99th percentile is more accurately estimated as 18%, consistent with the ASF recommendation of 15% as the multiplier for the unused balances.



We favor a conservatively tailored definition of qualifying bank customer securitizations to further the aims of the Basel III framework.

To ensure that the 15% draw-down could not be applied in a manner contrary to public-policy aims, we propose that a ***"qualifying bank customer securitization"*** be conservatively defined as a traditional securitization:

(a) that is sponsored by a financial or non-financial customer of one or more banks,

(b) through which the customer obtains financing either (i) directly from one or more of such banks or (ii) through one or more ABCP conduits that are supported with liquidity facilities from one or more of such banks with commitment amounts (together with commitment amounts from other financial institutions, governmental agencies and government-sponsored entities) that at least cover the face amount of the ABCP used to fund such financing,

(c) where the customer is not one of such banks, or an affiliate of one of such banks, extending the financing or providing a liquidity facility to an ABCP conduit that is extending the financing,

(d) where one or more of such banks or ABCP conduits, or an agent on its or their behalf, negotiates and agrees to the terms of the financing directly with the customer or its special purpose vehicle,

(e) where, before its initial financing is extended, each of such banks approves its or the ABCP conduit's securitization exposure through its ordinary credit approval process for traditional securitizations sponsored by its customers,

(Continued on Following Slide)

We favor a conservatively tailored definition of qualifying bank customer securitizations to further the aims of the Basel III framework.

(Continued from Prior Slide)

(f) where, after its initial financing is extended, each of such banks actively administers its or the ABCP conduit's securitization exposure through monitoring performance of the securitization,

(g) where the terms of the financing are not subject to market value triggers that require securitized assets to be sold,

(h) that contains terms requiring compliance with all applicable laws governing credit risk retention, and

(i) where, after its initial financing is extended, none of such banks or ABCP conduits are required to fund any commitment to such customer or its special purpose vehicle unless eligible securitized assets exist and are available to secure such additional funding as required by the terms of the financing (which is called the "available borrowing base").

American SECURITIZATION FORUM

The total regulatory cost of conduit commitments will increase.

The extent of cost increases will vary dramatically based on calibration and market factors.

Regulators initially implied that costs of debt and equity would fall as a result of regulation. However, rating agency actions downgrading banks in anticipation of reduced profitability caused by increased regulation have caused debt and equity costs to rise.

Borrowers would be only marginally impacted by cost increases implied by the full ASF proposal (3x, not 10x).

Regulators would still see 114% average coverage of the CP < 30 days and worst case (historical) coverage of 108%.

	Basel II	Basel III as currently proposed	Basel III as currently proposed with Higher Debt Cost	**ASF LCR Only Proposal**	**ASF LCR and Leverage Ratio Proposal**
LCR unused multiplier	n/a	100%	100%	**15%**	**15%**
% of Commitment in Leverage Ratio	0%	100%	100%	**100%**	**0%**
Cost of Debt	50 bps	50 bps	125 bps	**50 bps**	**50 bps**
Cost of Equity	12%	15%	15%	**15%**	**15%**
Total Regulatory Cost	13 bps	108 bps	158 bps	**81 bps**	**50 bps**
Reserves as a % of historical CP < 30 days (avg.)	n/a	192%	192%	**114%**	**114%**
Reserves as a % of historical CP < 30 days (min.)	n/a	161%	161%	**108%**	**108%**

American SECURITIZATION FORUM

Grounds for our Targeted Adjustments to the Basel III Framework

1. Brief Summary of our Initial Cash-Outflow Findings
2. Follow-up Inquiries from Regulatory Authorities
3. Responses to Follow-Up Inquiries
4. **Preview of our Numerator Study**

American SECURITIZATION FORUM

Evidence preliminarily suggests that systemic and institutional risks can be reduced if the LCR incents more diverse diversification in the Level 1 and Level 2 assets that comprise a bank's liquidity buffer.

Diverse diversification in bank liquidity buffers, including an expansion of the eligibility criteria for Level 1 and Level 2 assets, may be able to resolve a number of problematic nth-order effects of the LCR.

- Evidence suggests that herding bank investments into a narrow band of asset classes – even if perceived as optimal for an individual bank (a premise which itself is questionable) – increases the probability of multiple bank failures and associated systemic and societal risks.

- If banks were compelled to build a liquidity buffer using only a narrow band of asset classes, the market for those asset classes would necessarily become illiquid as banks stockpile and refrain from trading them.

- Even as sovereign-debt issuance has reached historically high levels, it is not clear whether a sufficient inventory of Level 1 and Level 2 assets exists to enable banks to meet the LCR's minimum standard.

Evidence is beginning to mount that ***diverse diversification can be achieved while at the same time enhancing the quality of an individual bank's liquidity buffer***.

- Some asset classes whose quality and liquidity were never or rarely questioned – *e.g.*, OECD sovereign debt – have exhibited material risks.

- Other asset classes whose quality and liquidity have been critiqued in a sweeping way – *e.g.*, mortgage- and asset-backed securities – have proven to contain subsets with low credit and market risks as well as broad and deep secondary markets.

ASF has commenced a study to confirm the benefits of diverse diversification and to ascertain the optimal composition of Level 1 and Level 2 assets in the LCR.

Working with Martin Nowak and David Rand at Harvard University, we have commenced a study (1) to gauge the systemic and institutional risks arising from the existing composition of Level 1 and Level 2 assets and (2) to analyze whether these risks can be reduced by altering that composition.

In the first stage of our study, we used a basket of U.S. Treasuries as our baseline and assessed the effects of diversifying into other asset classes.

- Sovereign Debt: 2-Year Yield Data from Bloomberg
- Corporate Intermediate: Barclays U.S. Corporate Intermediate Index
- MBS: Barclays Agency MBS Index
- ABS: Barclays Aaa Auto and Credit Card Index
- Municipal: Barclays Municipal Bond 3 Year Index
- S&P 500: Standard & Poor's 500 Index (Large-Cap Equities)

Diversification of reserve high quality asset portfolios away from sovereign debt would reduce systemic risk and costs.

Currently proposed Basel III definitions of high quality assets for the LCR focus on sovereign and sovereign-related securities

The large concentration risks that would be implied by implementation of these rules could create dangerous systemic risks

The analysis below demonstrates that the joint risk of a 1% drop in reserve value over a 30-day period across a sample of two banks is greatly reduced by moving just a portion of the portfolios away from sovereign risks

Bank 1

Bank 2	100% Sovereign	90% Sov, 10% Corporate	90% Sov, 10% MBS	90% Sov, 10% ABS	90% Sov, 10% Muni
100% Sovereign	1.91%	0.09%	0.05%	0%	0%
90% Sov, 10% Corporate		0.09%	0.05%	0%	0%
90% Sov, 10% MBS			0.05%	0%	0%
90% Sov, 10% ABS				0%	0%
90% Sov, 10% Muni					0%

** All results assume 5% haircuts for non-sovereign asset types*

APPENDIX

Methodology for the Individual-Institution Analyses

We sought, in the individual-institution analyses, to ***robustly test our proposal for a 15% draw-down*** in qualifying bank customer securitizations.

To this end, for each of the 12 North American and European banks, we calculated ***the monthly change in customer usage as a percentage of the institution's average unused percentage of total commitments*** from January 2005 to December 2010.

$$\frac{\text{(Draw at Month End - Draw at Month Beginning) / Total Commitment at Month Beginning}}{\text{Average Unused Percentage of Total Commitments}}$$

All submitted data was run through these calculations, except that a ***filter screened discrete data to avoid clearly artificial distortions*** in months when a commitment was originated, increased, or terminated:

- *draws under new commitments arising during the month or draws under existing commitments increased during the month*, which would artificially inflate draw behavior since the new or increased commitment would not be reflected in the total commitment at the beginning of the month,
- *draws under existing commitments terminated during the month*, which would artificially depress draw behavior since the terminated commitment would be reflected in the total commitment for the entire month, and
- *commitments originated in one month but not funded until the following month*, which would artificially depress draw behavior in the first month and inflate draw behavior in the second.

Statistics from the Individual-Institution Analyses

Number of Observations: 852

Number of Draws Greater Than 15%: 23

99th Percentile: 25%

Number of Draws Greater Than 15% after Removing Bank 11: 13

99th Percentile after Removing Bank 11: 18%

Note on Bank 11: The 99th percentile of client draws for individual banks was measured to be approximately 25% of the unused. However, this included data from one bank whose small portfolio was unusually fully utilized (average usage ≈ 93%). This means that small dollar draws observed in this portfolio look like very large percentage draws, a statistic that is not applicable to the rest of the banks in the market.

Methodology for Estimating Regulatory Costs

Tier 1 capital, Leverage Ratio and LCR each contribute to the regulatory cost of extending liquidity

A number of variables will impact the results, including

- Cost of equity
- Facility usage
- LCR multiplier for unused portion
- Cost of debt
- CP maturity profile
- Inclusion of the unused commitment in the leverage ratio

Basel Capital Proposal - Quantitative Example

$100M AAA-rated Securitization Liquidity Facility
Summary of implied costs

	Undrawn Current	Undrawn Proposed	Description
Tier 1 Capital			
Total Capital $	$0.70	$2.00	RAA goes from 7% to 20%, with 10% capital assumed
Capital Cost %	12%	15.0%	Narrowing definition of Tier 1 Capital
Tier 1 Capital Cost bps	**8.4**	**30.0**	
Leverage Ratio			
Add'l Capital for Undrawn plus HQ Assets	$0.00	$2.99	Impact of undrawn plus HQ Assets from liquidity ratio
Capital Cost %	12%	15.0%	
Leverage Ratio Capital Cost bps	**0.0**	**44.8**	
Liquidity Ratio			
Liquidity Reserve above Tier 1 $	$9.30	$66.21	High Quality Assets required for 100% reserve
Cost of 1 yr Debt	0.50%	0.50%	
Liquidity Ratio Debt Cost bps	**4.7**	**33.1**	
Total Regulatory Cost of Lending	**13**	**108**	

Appendix C

Individual versus systemic risk and the Regulator's Dilemma

Nicholas Beale[a,1], David G. Rand[b,1], Heather Battey[c], Karen Croxson[d,2], Robert M. May[e], and Martin A. Nowak[b,f,3]

[a]Sciteb, London W1B 4BD, United Kingdom; [b]Program for Evolutionary Dynamics, Harvard University, Cambridge, MA 02138; [c]Faculty of Economics, University of Cambridge, Cambridge CB3 9DD, United Kingdom; [d]New College and Oxford–Man Institute of Quantitative Finance, University of Oxford, Oxford OX1 3DW, United Kingdom; [e]Department of Zoology, University of Oxford, Oxford OX1 3DW, United Kingdom; and [f]Department of Mathematics and Department of Organismic and Evolutionary Biology, Harvard University, Cambridge, MA 02138

Edited by Jose A. Scheinkman, Princeton University, Princeton, NJ, and approved June 15, 2011 (received for review April 15, 2011)

The global financial crisis of 2007–2009 exposed critical weaknesses in the financial system. Many proposals for financial reform address the need for systemic regulation—that is, regulation focused on the soundness of the whole financial system and not just that of individual institutions. In this paper, we study one particular problem faced by a systemic regulator: the tension between the distribution of assets that individual banks would like to hold and the distribution across banks that best supports system stability if greater weight is given to avoiding multiple bank failures. By diversifying its risks, a bank lowers its own probability of failure. However, if many banks diversify their risks in similar ways, then the probability of multiple failures can increase. As more banks fail simultaneously, the economic disruption tends to increase disproportionately. We show that, in model systems, the expected systemic cost of multiple failures can be largely explained by two global parameters of risk exposure and diversity, which can be assessed in terms of the risk exposures of individual actors. This observation hints at the possibility of regulatory intervention to promote systemic stability by incentivizing a more diverse diversification among banks. Such intervention offers the prospect of an additional lever in the armory of regulators, potentially allowing some combination of improved system stability and reduced need for additional capital.

financial stability | global financial markets | financial regulation

The recent financial crises have led to worldwide efforts to analyze and reform banking regulation. Although debate continues as to the causes of the crises, a number of potentially relevant factors have been identified. Financial regulation was unable to keep pace with financial innovation (1, 2), was fragmented in its nature (2), and did not address important conflicts of interest (1, 3–7). More generally, an issue raised by the crises is that of individual vs. systemic risk: regulation was focused on the health of individual firms rather than the stability of the financial system as a whole (1, 2, 4, 8–10). In this paper, we investigate a particular issue that, although not necessarily at the heart of the recent crises, is of great relevance given the newly found interest in systemic regulation. Specifically, we explore the relationship between the risks taken by individual banks and the systemic risk of essentially simultaneous failure of multiple banks.

In this context, we use a deliberately oversimplified toy model to illuminate the tensions between what is best for individual banks and what is best for the system as a whole. Any bank can generally lower its probability of failure by diversifying its risks. However, when many banks diversify in similar ways, they are more likely to fail jointly. This joint failure creates a problem given the tendency for systemic costs of failure to grow disproportionately with the number of banks that fail. The financial system can tolerate isolated failures, but when many banks fail at one time, the economy struggles to absorb the impact, with serious consequences (11–13). Thus, the regulator faces a dilemma: should she allow banks to maximize individual stability, or should she require some specified degree of differentiation for the sake of greater system stability? In banking, as in many other settings, choices that may be optimal for the individual actors may be costly for the system as a whole (14), creating excessive systemic fragility.

Our work complements an existing theoretical literature on externalities (or spillovers) across financial institutions that impact systemic risk (15–32). Much of this literature has focused on exploring liability-side interconnections and how, although these facilitate risk-sharing, they can also create the conditions for contagion and fragility. For instance, some researchers have shown the potential for bankruptcy cascades to take hold, destabilizing the system by creating a contagion of failure (20, 26). When one firm fails, this failure has an adverse impact on those firms to whom it is connected in the network, potentially rendering some of these susceptible to failure. Most obviously affected are those firms to whom the failed institution owes money, but also, the firm's suppliers and even those companies that depend on it for supplies can be put in vulnerable positions. Another insightful strand of research has emphasized the potential for other forms of interdependence to undermine systemic stability, irrespective of financial interconnections: fire sales of assets by distressed institutions can lead to liquidity crises (28). In a very recent approach, the financial crisis is understood as a banking panic in the "sale and repurchase agreement" (repo) market (33). Other recent studies have drawn insights from areas such as ecology, epidemiology, and engineering (34–39).

The present paper builds on the early work by Shaffer (22) and Acharya (23) to explore the systemic costs that attend asset-side herding behavior. Other recent contributions in this direction have considered situations where assets seem uncorrelated in normal times but can suddenly become correlated as a result of margin requirements (refs. 29 and 32 have comprehensive reviews of relevant contributions). In the current work, we use the simplest possible model to investigate other systemic and regulatory implications of asset-side herding, thereby knowingly side-stepping these and many other potential features of real world financial networks. We do not claim that asset-side externalities were at the center of the recent crisis or were more important than other contributory factors. Also, we do not take any position on the extent to which the asset price fluctuations that we consider are because of external economic conditions altering the fair value of certain assets, fire sale effects temporarily depressing the value of assets, price bubbles leading to banks overpaying for assets whose prices subsequently collapse when

Author contributions: N.B., D.G.R., H.B., K.C., R.M.M., and M.A.N. designed research, performed research, analyzed data, and wrote the paper.

The authors declare no conflict of interest.

This article is a PNAS Direct Submission.

Freely available online through the PNAS open access option.

[1]N.B. and D.G.R. contributed equally to this work.

[2]Present address: McKinsey Global Institute, McKinsey and Company, Inc., London SW1Y 4UH, United Kingdom.

[3]To whom correspondence should be addressed. E-mail: martin_nowak@harvard.edu.

This article contains supporting information online at www.pnas.org/lookup/suppl/doi:10.1073/pnas.1105882108/-/DCSupplemental.

the bubble bursts, general loss of confidence because of uncertainty, global economic imbalances, or other factors. Rather, we study asset-side herding, because it can have very important and not fully explored implications. Possible extensions of our work are discussed in *SI Text*.

We present a framework for understanding the tradeoffs between individual and systemic risk, quantifying the potential costs of herding and benefits of diverse diversification. We then show how systemic risk can be largely captured by two directly observable features of a set of bank allocations: the average distance between the banks in the allocation space and the balance of the allocations (i.e., distance from the average allocation to the individually optimal allocation). We hope that our work may offer insight to policy makers by providing a set of tools for exploring this particular facet of systemic risk.

Model

Consider a highly stylized world, with N banks and M assets. An asset here can be considered as something in which a bank can invest and that can inflict losses or gains proportional to the level of investment. At time $t = 0$, each bank chooses how to allocate its investments across the asset classes. At some later time, $t = 1$, the change in value of each asset is drawn randomly from some distribution. All assets are assumed to be independent and identically distributed. A bank has then failed if its total losses exceed a given threshold. We recognize that many other factors may cause bank failures, including fire sale effects, interconnections between banks, liquidity issues, and general loss of confidence, but these issues are not the focus of the present work.

For illustrative simplicity, we will take the asset price fluctuations to be drawn from a student t distribution with 1.5 degrees of freedom, a long-tailed distribution often used in financial models (40, 41). The distribution is additionally specified by a probability p that a bank will fail if all its investments are in a single asset class. As we will show, our main findings seem remarkably robust to changes in the detailed assumptions used, including the choice of distribution and the probability p.

We define X_{ij} as the allocation of bank i to asset j. We also define V_j as the loss in value between time $t = 0$ and $t = 1$ of asset j (with negative losses representing profits) drawn from a student t distribution as described above. The total loss incurred by bank i at time $t = 1$ is, thus, $Y_i = \sum_{j=1}^{M} X_{ij} V_j$. Bank i is then said to have failed if $Y_i > \gamma_i$ (that is, if its total losses exceed a given threshold γ_i set by its capital buffer). Additional model details are in *SI Text*.

Results

We now examine the outcomes of this system. Fig. 1*A* illustrates how the probability of individual bank failure depends on the

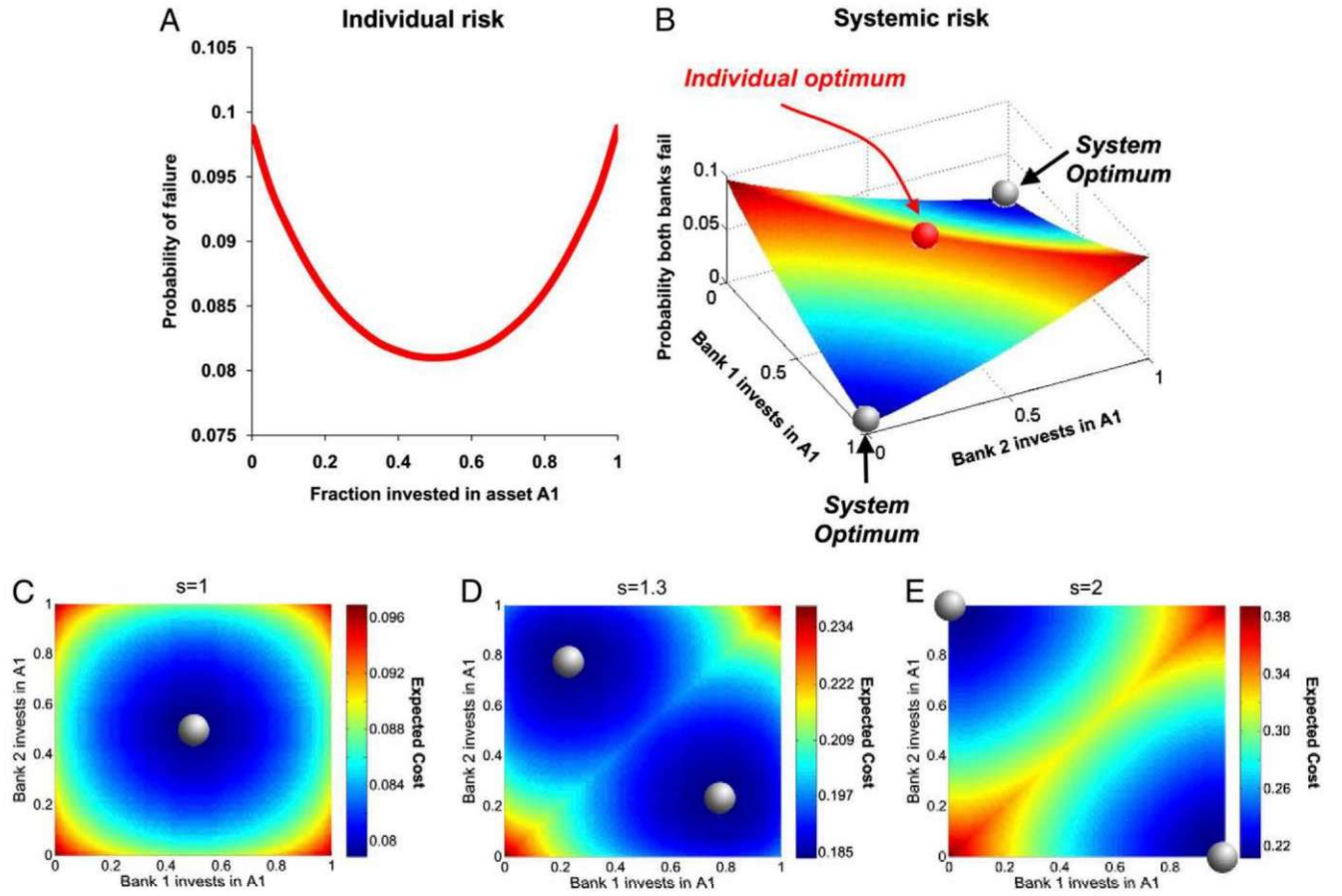


Fig. 1. Probability of bank failure with two banks and two asset classes, A1 and A2. A fundamental tension exists between individual and system risk. Shown are the results of simulations in which the initial value of each asset is one; the loss incurred by each asset after some time t is sampled from a student t distribution with 1.5 degrees of freedom with mean = 0 and a 10% chance of being great than 1; and both banks have capital buffers such that a total loss greater than 1 causes failure. Shown is the average fraction of failures over 10^6 loss samplings. Each bank's individual probability of failure is minimized by investing equally in A1 and A2 (i.e., diversifying uniformly) (*A*). Uniform diversification, however, does not minimize systemic risk. Instead, the probability of joint failure is minimized by having one bank invest entirely in A1, whereas the other invests entirely in A2 (*B*). We next consider the cost function $c = k^s$, where k is the number of failed banks, and with s moving from (*C*) a linear system cost of bank failure ($s = 1$) to (*D* and *E*) a system cost that is progressively convex ($s = 1.3$ in *D*; $s = 2$ in *E*). The lowest cost configurations are marked by a gray sphere.

allocation between two asset classes when $p = 10\%$. The individually optimal allocation for any given bank, in the sense of minimizing risk for expected return, is to distribute equal amounts into each asset class. We call this individually optimal allocation O^*, and we call the associated probability of individual failure p^*. When all banks are at the individual optimum, we call the configuration uniform diversification, because all banks adopt a common diversification strategy. Uniform diversification, thus, represents a state of the banks maximally herding together in the sense of adopting the same set of exposures. Readers familiar with the standard finance literature will recognize these allocations as those allocations selected under modern portfolio theory (42).

Fig. 1*B* illustrates the probability of total system failure in this system of two banks, p_{SF} (i.e., the probability that both banks fail simultaneously). Unlike individual failure, we find that the probability of joint failure is not minimized by uniform diversification. Instead, a reduction in the probability of joint failure can be achieved by moving the banks away from each other in the space of assets. Indeed, the minimal probability of joint failure is achieved by having each bank invest solely in its own unique asset, which we will call full specialization. Thus, we observe a tension between what is best for an individual bank and what is safest for the system as a whole. The regulator faces a dilemma: should she allow institutions to maximize their individual stability or regulate to safeguard stability of the system as a whole?

To explore this dilemma, we introduce a stylized systemic cost function $c = k^s$, where k is the number of banks that fail and $s \geq 1$ is a parameter describing the degree to which systemic costs escalate nonlinearly as the number of failed banks increases. When many banks fail simultaneously, private markets struggle to absorb the impact. Instead, society incurs real losses, and the economy's long-term potential may be affected (13). Our particular choice of cost function is, of course, an illustrative simplification, but as we show below, our results are robust to considering alternative nonlinear cost functions, and our model is easily extendable to consider any particular cost function of interest.

Fig. 1 *C–E* shows the expected systemic cost of failure C for two banks and two asset classes using various values of s. For a linear cost function ($s = 1$), expected cost is minimized under uniform diversification. In this special case, individual and systemic incentives are aligned. However, when we consider more realistic cases where the cost function is convex (so that the marginal systemic cost of bank failure is increasing), the configuration that minimizes C is no longer uniform diversification but rather, a configuration with diverse diversification. As s increases, an increasingly larger departure from uniform diversification is required to minimize C.

In Fig. 2, we illustrate a more general case of five banks investing in three assets, randomly sampling 10^5 asset allocations. For varying degrees of nonlinearity s, we show the configuration with the lowest expected cost C. When the cost function is linear, the lowest cost configuration is again uniform diversification O^*, where each bank allocates one-third of its investments to each asset. As we increase s, we find that pushing the banks away from uniform diversification to diverse diversification reduces C.

To further explore the relationship between the positioning of banks in asset space and the expected systemic cost, we define D as the average distance between the asset allocations of each pair of banks, scaled so that the distance between banks exposed to nonoverlapping sets of assets is one. We also define a second parameter G to describe how unbalanced the allocations are on average, which is defined as the distance between the average allocation across banks and the individually optimum allocation O^*. *SI Text* has more detailed specifications of D and G. Note that, if all banks adopt the individually optimum allocation, both D and G are zero. Thus, in this case, all banks either survive or fail together, and the system behaves as if there were only a single representative bank. This finding is true regardless of assumptions about how the asset values fluctuate, but of course, it may not extend to more complex models with features such as stochastic heterogeneity across banks.

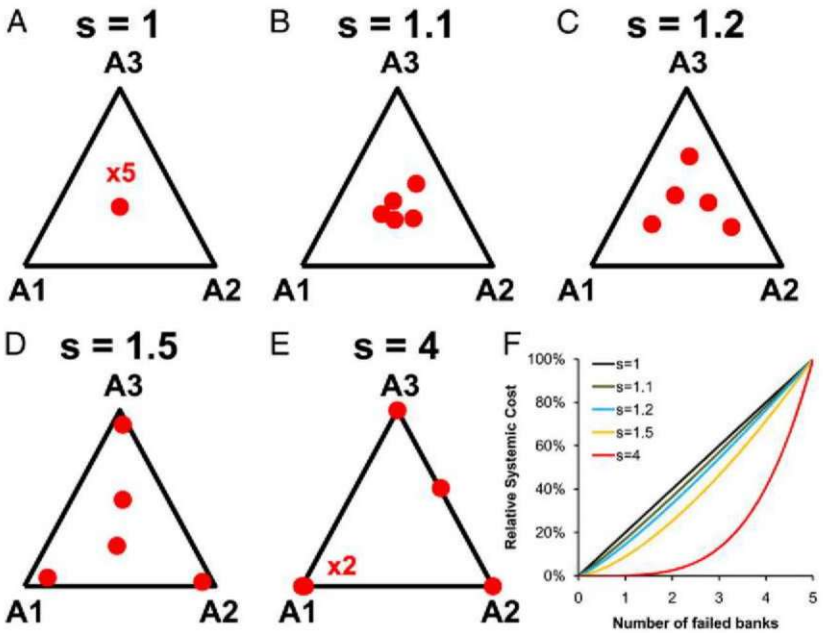


Fig. 2. Lowest expected cost configurations for different levels of cost function nonlinearity s. (*A–E*) We consider five banks investing in three assets, with losses drawn from a student t distribution with 1.5 degrees of freedom having a mean = 0 and a 10% chance of being great than the banks' failure threshold of 1. Shown is the lowest expected cost allocation of 10^5 randomly selected allocations over 10^6 loss samplings. As s increases, the lowest expected cost configuration moves farther from uniform diversification. The cost function for various values of s is shown in *F*.

In Fig. 3, we show expected cost C as a function of D and G across 10^5 random allocations of five banks on three assets. As we have already seen in Fig. 2, in the special case of $s = 1$, expected cost is minimized by uniform diversification at $D = G = 0$; thus, expected cost is increasing in both distance D and imbalance G. At larger values of s, expected cost remains consistently increasing in imbalance G, but the relationship between cost and distance D changes. At $s = 1.2$, cost is large for distances that are either too small or too large. The relationship between distance and cost is clearly nonlinear, and cost is lowest at an intermediate value of D. As s increases to $s = 4$, cost is now lowest when distance is large, and thus, cost is decreasing in D. Providing additional evidence for the ability of D and G to characterize systemic cost, regression analysis finds that D, D^2, and G together explain over 90% of the variation in $\log(C)$.

All of this information suggests that it may be possible in principle, and it could provide a useful guide in practice, to regulate expected systemic cost. For a given level of capital, regulators might set a lower bound on distance D and an upper bound on imbalance G. As shown in Fig. 4, fixing $G = 0$ and requiring D to exceed some value of D_{Min} results in a substantial reduction in the capital buffer needed to ensure that the worst-case expected cost remains below a given level. We particularly consider the worst-case expected cost to take into account potential strategic behavior on the part of the banks. This most pessimistic case shows that, even if the banks are colluding to purposely maximize the probability of systemic failure, regulating D and G creates substantial benefit for the system. Fig. 4 also illustrates the robustness of our results to model details. We observe similar results when varying model parameter values, including the number of banks and assets (Fig. 4*A*), the nonlinearity of the cost function (provided that s is not too low) (Fig. 4*B*), and the value of p (Fig. 4*C*). We also observe similar results when varying the distribution of the asset prices (provided that the tails of the distribution are heavy enough) (Fig. 4*D*) and when considering assets with a substantial degree of correlation (Fig. 4*E* and *SI Text*). Furthermore, Fig. 4*F* shows that our results continue to hold when considering alternate cost functions in which (*i*) the system can absorb the first i bank failures without incurring any cost, with systematic cost then increasing linearly for subsequent failure ($i = 2$ in our simulations), and (*ii*) each of the first i failures causes a systemic cost C_1, whereas each additional failure above i causes a larger systemic cost C_2 ($i = 2$, $C_1 = 5$, and $C_2 = 30$ in our simulations; *SI Text* has discussion of the various cost functions). This robustness is extremely important, because many of these features are difficult to determine precisely in reality. Because our results do not depend on the details of these assumptions, the importance of diverse diversification may extend beyond the simple model that we consider here.

Regulatory changes under discussion are estimated to require banks to increase their Core Tier One capital substantially in the major developed economies (43). In this context, the potential ability of diverse diversification to reduce capital buffers is of great economic significance. Estimates suggest that, for each 1% reduction that does not compromise system stability, sums in excess of $10 billion would be released for other productive purposes, with the economic benefits likely to be substantial (43, 44).

Discussion

There is a growing appreciation that prudent financial regulation must consider not only how a bank's activities affect its individual chances of failure but also how these individual-level choices impact the system at large. The analysis presented in this paper highlights a particular aspect of the problem that a systemic regulator will face: when the marginal social cost of bank failures is increasing in the numbers of banks that fail, systemic risk may be reduced by diverse diversification. This nonlinearity of the systemic cost is a natural assumption. The societal costs of dealing with bank failures grow disproportionately with the numbers that fail. Hence, the regulator may wish to give banks incentives to adopt differentiated strategies of diversification.

These results also have implications beyond the financial system. For example, the tension between individually optimal herding and systemically optimal diversification is a powerful theme in ecological systems (45, 46). Natural selection pressures organisms in a given species to adapt (in the same way) to their shared environment. However, maintenance of diversity is essential for protecting the species as a whole from extinction in the face of fluctuating environments and emergent threats such as new parasite species. Herding is also an issue for human societies in domains other than banking. In the context of innovation, for example, people often herd around popular ideas

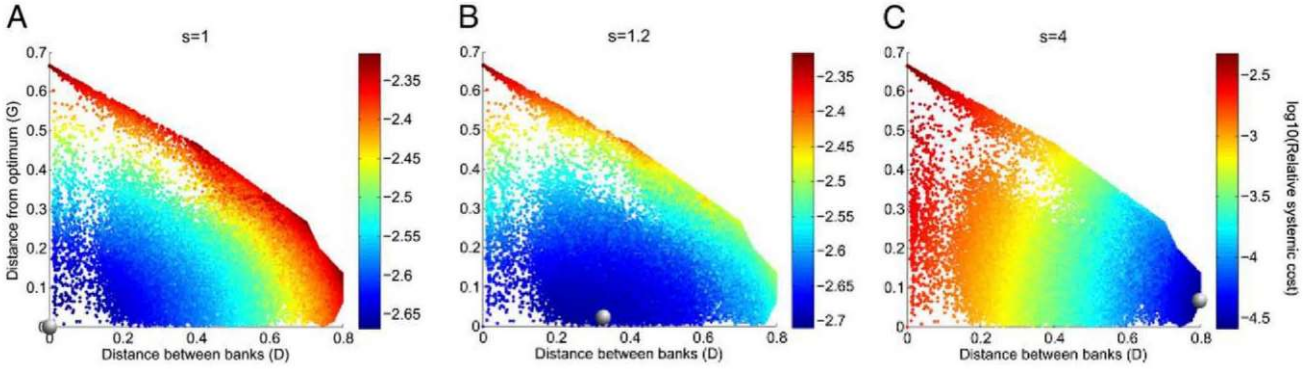


Fig. 3. The systemic risk presented by a given set of allocations is largely characterized by two distinct factors: (*i*) the distance between the banks' allocations D and (*ii*) the imbalance of the average allocation G, defined as the distance between the average allocation and the individually optimal allocation. Shown is the expected cost C associated with 10^5 randomly chosen allocations as described in Fig. 2. When the cost function is linear ($s = 1$), the configuration that minimizes system cost has the banks herding in selecting the portfolio that minimizes individual risk of failure, $\left(\text{that is, } \frac{1}{3}, \frac{1}{3}, \frac{1}{3}\right)$ (*A*). As the cost function becomes more nonlinear ($s = 1.2$), the cost-minimizing distance between the banks becomes larger. Here, the configurations that minimize system cost are associated with having banks at an intermediate distance from each other, while still having low imbalance G (*B*). With stronger nonlinearity ($s = 4$), the cost-minimizing configuration puts banks as far apart from each other as possible in asset space—large D (although still keeping the average location as close as possible to the individual optimum, i.e., small G) (*C*). Regressing $\log(C)$ against D, D^2, and G explains 97% of the variation in cost at $s = 1$, 90% of the variation in cost at $s = 1.2$, and 99% of the variation in cost at $s = 4$.

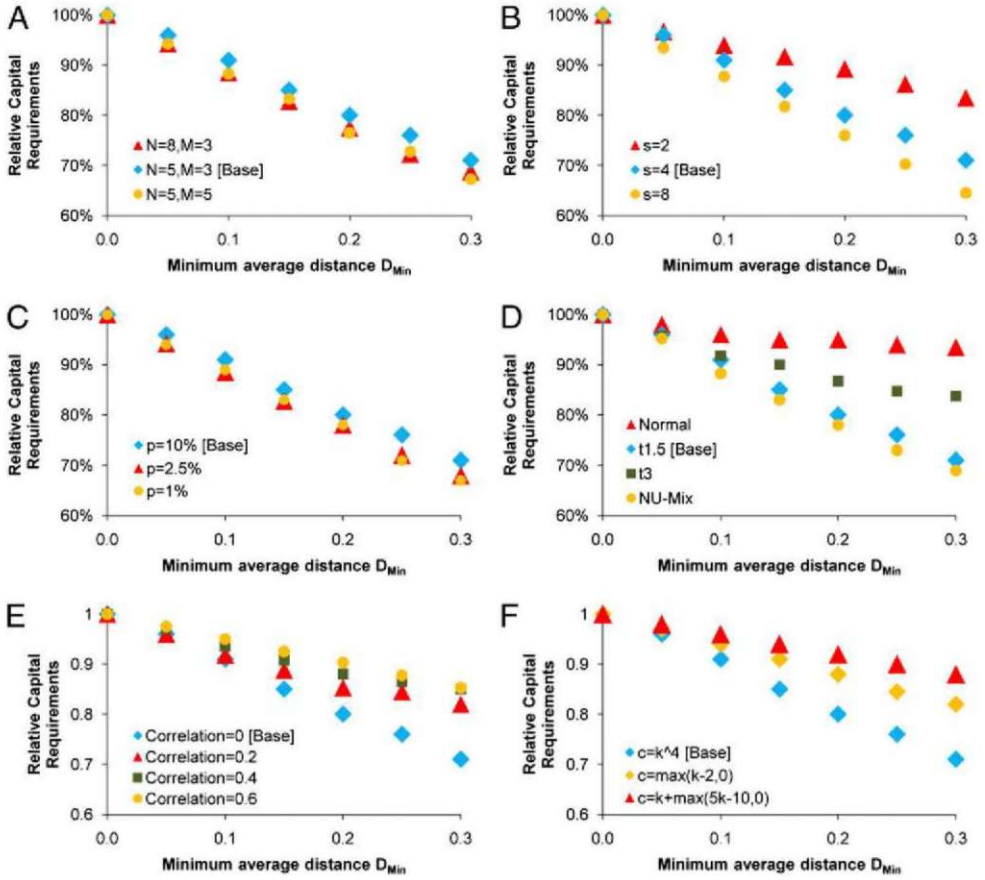


Fig. 4. Imposing a minimum on the distance D can appreciably reduce the capital needed to ensure a given maximum expected cost in our model. For a given set of parameters M, N, and p and a given asset price distribution, we calculate the expected systemic cost C when all banks act to minimize their individual risk (uniform diversification with $G = 0$ and $D = 0$). We then impose a minimum average distance D_{Min}, while keeping $G = 0$. Forcing the banks apart from each other lowers the expected cost for a given level of capital. Thus, for each value of D_{Min}, we find the level of capital for which the worst case (highest expected cost) of 10^6 random allocations still gives an equivalent expected cost (within 2%) to that incurred under uniform diversification. Simulation results were also verified using nonlinear optimization. Shown in blue is the result for a base case of five banks, three asset classes, $s = 4$, and the asset prices each generated independently from a student t distribution with 1.5 degrees of freedom having $p = 10\%$ probability of failure for a bank invested only in one asset. We see that, as D_{Min} increases, banks need to hold less capital in reserve to ensure the same level of system stability. We then show that this result is qualitatively robust to varying the model parameters M and N (A), the nonlinearity of the cost function s (B), the type of distribution (student t with 1.5 degrees of freedom, student t with 3 degrees of freedom, normal distribution, or a mix with the loss having a 5% probability of being from a uniform distribution in the range 0–10 and a 95% probability of being from a normal distribution; D), the degree of correlation between the asset price fluctuations (E), and the choice of cost function, where k is the number of failed banks (F). The alternative cost functions are discussed in greater detail in *SI Text*. In all of the above cases, the loss distributions on a single asset have a mean = 0 and a $p = 10\%$ chance of being greater than the failure threshold of 1. Our results are also robust to changing this failure probability p (C).

and fads, creating systemic costs by making it difficult for new ideas to be appreciated (47).

In our model, the expected systemic cost of bank failures is largely explained by two global parameters of risk exposure and diversity. Both these parameters can be derived by the regulator without the need for complicated calculations of systemic risk, and they can be decomposed into their contributions from individual actors. We also show that a given level of expected systemic cost can be achieved with a more efficient use of capital if the regulator is able to encourage a suitable level of diversity between banks in the system. Thus, this framework presents a potentially useful tool for systemic regulation; our analysis points to the possibility of regulation that combines knowledge of system aggregates and individual bank positions to identify and induce the desired degree of diverse diversification. The practical design of this aspect of regulatory strategy can only emerge from a fuller program of research.

In the meantime, it is our hope that the insights developed in this paper can weigh on the deliberations that are gathering pace surrounding the reform of financial regulation. Active discussion is under way regarding the design of capital surcharges based on an individual bank's contribution to systemic risk (4, 10, 48). Meanwhile, it is increasingly recognized that financial reporting must improve significantly to support the function of the systemic regulator, and discussion has turned to the practical details of data gathering and analysis (1, 4, 8–10). The basic notion that common diversification strategies can increase systemic risk is not entirely absent from current policy thinking (7), and it predates the recent crisis (49); however, it has received relatively little attention in the literature. A priority for future research is to convert theoretical insights into practical approaches for regulators.

ACKNOWLEDGMENTS. We thank John Campbell, Chris Chaloner, Ren Cheng, Sally Davies, Andy Haldane, Sujit Kapadia, Jeremy Large, Edmund Phelps, Simon Potter, Roger Servison, Bernard Silverman, and Corina Tarnita for helpful discussions. We also thank the editor and four anonymous referees for helpful comments. D.G.R. is supported by a grant from the John Templeton Foundation. N.B. is grateful for support from the Man Group and Fidelity Management and Research. This work was completed while K.C. was based at New College, Oxford University, and the Oxford-Man Institute of Quantitative Finance. Financial support from both institutions is gratefully acknowledged.

1. French KR, et al. (2010) *The Squam Lake Report: Fixing the Financial System* (Princeton University Press, Princeton).
2. Hillman R (2009) *Financial Regulation: Recent Crisis Reaffirms the Need to Overhaul the U.S. Regulatory System* (United States Government Accountability Office, Washington, DC), Testimony Before the Committee on Banking, Housing, and Urban Affairs GAO-09-1049T.
3. Makin JH (2008) *Risk and Systemic Risk* (American Enterprise Institute for Public Policy Research, Washington, DC).
4. Bank of England (2008) *The Role of Macroprudential Policy*. Bank of England Discussion Paper (Bank of England, London, UK).
5. Bolton P, Freixas X, Shapiro J (2009) *The Credit Ratings Game*. National Bureau of Economic Research Working Paper 14712 (National Bureau of Economic Research, Cambridge, MA).
6. Thanassoulis J (2009) This is the right time to regulate bankers' pay. *Economist's Voice* Vol 6, Issue 5, Article 2.
7. Haldane A (2009) Banking on the state. *BIS Rev* 139:1–20.
8. Lo A (2009) *The Feasibility of Systemic Risk Measurements*. Written Testimony for the House Financial Services Committee on Systemic Risk Regulation. Available at http://ssrn.com/abstract=1497682.
9. Sibert A (2010) A systemic risk warning system. *Vox*, http://voxeu.org/index.php?q=node/4495.
10. International Monetary Fund (2010) *Global Financial Stability Report: Meeting New Challenges to Stability and Building a Safer System*. (International Monetary Fund, Washington, DC).
11. Brunnermeier M (2009) Deciphering the liquidity and credit crunch 2007–2008. *J Econ Perspect* 23:77–100.
12. Reinhart CM, Rogoff KS (2009) The aftermath of financial crises. *Am Econ Rev* 99:466–472.
13. Acharya VV, Richardson M (2009) *Restoring Financial Stability: How to Repair a Failed System* (New York University Stern School of Business, New York).
14. Nowak MA (2006) Five rules for the evolution of cooperation. *Science* 314:1560–1563.
15. Bhattacharya S, Gale D (1987) Preference shocks, liquidity and central bank policy. *New Approaches to Monetary Economics*, eds Barnett WA, Singleton KJ (Cambridge University Press, Cambridge, UK).
16. Rochet J-C, Tirole J (1996) Interbank lending and systemic risk. *J Money Credit Bank* 28:733–762.
17. Kiyotaki N, Moore J (1997) Credit cycles. *J Polit Econ* 105:211–248.
18. Friexas X, Parigi B (1998) Contagion and efficiency in gross and net interbank payment systems. *J Financ Intermed* 7:3–31.
19. Freixas X, Parigi B, Rochet J-C (1999) *Systemic Risk, Interbank Relations and Liquidity Provision by the Central Bank*. Working Paper of the Universitat Pompeu Fabra (Universitat Pompeu Fabra, Barcelona).
20. Allen F, Gale D (2000) Financial contagion. *J Polit Econ* 108:1–33.
21. Gai P, Kapadia S (2010) Contagion in financial networks. *Proc R Soc Lond A Math Phys Sci* 466:2401–2423.
22. Shaffer S (1994) Pooling intensifies joint failure risk. *Res Financ Serv* 6:249–280.
23. Acharya VV (2009) A theory of systemic risk and design of prudential bank regulation. *J Financ Stab* 5:224–255.
24. Stiglitz JE (2010) Risk and global economic architecture: Why full financial integration may be undesirable. *Am Econ Rev* 100:388–392.
25. Battiston S, Delli Gatti D, Gallegati M (2009) *Liaisons Dangereuses: Increasing Connectivity, Risk Sharing, and Systemic Risk*. National Bureau of Economic Research Working Paper (National Bureau of Economic Research, Cambridge, MA).
26. Castiglionesi F, Navarro N (2007) *Optimal Fragile Financial Networks*. Discussion Paper of the Tilburg University Center for Economic Research (Tilburg University, Tilburg, The Netherlands).
27. Lorenz J, Battiston S (2008) Systemic risk in a network fragility model analyzed with probability density evolution of persistent random walks. *Networks Heterogeneous Media* 3:185–200.
28. Diamond DW, Rajan R (2007) *Fear of Fire Sales and Credit Freeze*. National Bureau of Economic Research Working Paper, 86:479–512 (National Bureau of Economic Research, Cambridge, MA).
29. Shin HY (2010) *Risk and Liquidity, Clarendon Lectures in Finance*. (Oxford University Press, Oxford).
30. Allen F, Babus A, Carletti E (2010) *Financial Connections and Systemic Risk*. National Bureau of Economic Research Working Paper (National Bureau of Economic Research, Cambridge, MA).
31. Greenwald B, Stiglitz JE (1986) Externalities in economies with imperfect information and incomplete markets. *Q J Econ* 101:229–264.
32. Allen F, Gale D (2007) *Understanding Financial Crises, Clarendon Lecture Series in Finance* (Oxford University Press, Oxford).
33. Gorton G, Metrick A (2010) *Haircuts*. National Bureau of Economic Research Working Paper (National Bureau of Economic Research, Cambridge, MA).
34. May RM (2006) Network structure and the biology of populations. *Trends Ecol Evol* 21:394–399.
35. May RM, Levin SA, Sugihara G (2008) Complex systems: Ecology for bankers. *Nature* 451:893–895.
36. May RM, Arinaminpathy N (2010) Systemic risk: The dynamics of model banking systems. *J R Soc Interface* 7:823–838.
37. Haldane A (2009) *Rethinking the Financial Network*. Speech delivered at the Financial Student Association, Amsterdam, April 2009 (Bank of England, London, UK).
38. Haldane AG, May RM (2011) Systemic risk in banking ecosystems. *Nature* 469:351–355.
39. Sheng A (2010) Financial crisis and global governance: A network analysis. *Globalization and Growth Implications for a Post-Crisis World*, eds Spence M, Leipziger D (World Bank, Washington, DC), pp 69–93.
40. Owen J, Rabinovitch R (1983) On the class of elliptical distributions and their applications to the theory of portfolio choice. *J Finance* 38:745–752.
41. Blattberg RC, Gonedes NJ (1974) A comparison of the stable and student distributions as statistical models of stock prices. *J Bus* 47:244–280.
42. Elton EJ, Gruber MJ (1995) *Modern Portfolio Theory and Investment Analysis* (Wiley, New York).
43. Institute of International Finance (2010) *Interim Report on the Cumulative Impact on the Global Economy of Proposed Changes in the Banking Regulatory Framework, June 2010*. (Institute of International Finance, Washington, DC).
44. Basel Committee on Banking Supervision (2010) *An Assessment of the Long-Term Economic Impact of Stronger Capital and Liquidity Requirements, August 2010* (Basel Committee on Banking Supervision, Basel, Switzerland).
45. Levin S (1998) Ecosystems and the biosphere as complex adaptive systems. *Ecosystems* 5:431–436.
46. Elmqvist T, et al. (2003) Response diversity, ecosystem change, and resilience. *Front Ecol Environ* 9:488–494.
47. Pech R (2001) Reflections: Termites, group behaviour, and the loss of innovation: Conformity rules! *J Manag Psychol* 7:559–574.
48. Adrian T, Brunnermeier M (2009) *CoVar*. Federal Reserve Bank of New York Staff Report 348 (Federal Reserve Bank of New York, New York).
49. Gieve J (2006) *Financial System Risks in the UK: Issues and Challenges*. Centre for the Study of Financial Innovation Roundtable, Tuesday 25 July 2006 (Bank of England, London, UK).