

Assessing Large Financial Firm Resolvability

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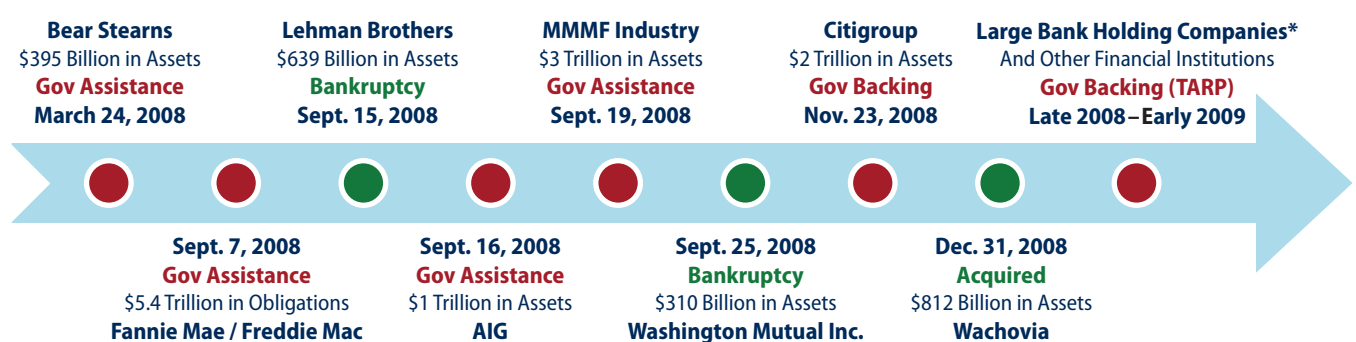
A large financial institution may be said to be “resolvable” if, in the event of failure, policymakers would allow it to go through bankruptcy without financial assistance from the government. The choice between bankruptcy or bailout trades off different sets of costs on the economy. This *Economic Brief* presents a new tool that could assist policymakers with this evaluation, potentially helping to curb the “too big to fail” problem, serving as a useful complement to the “living wills” process, and making the resolution process more transparent.

How should policymakers respond when a large financial firm fails? During the 2008–09 crisis, financial troubles at large, critical financial institutions—along with the government’s response to each troubled firm—garnered significant public attention. The U.S. government’s decision to intervene in the financial system to prevent the collapse of troubled firms is commonly attributed to the fear that the failure of such firms could be very damaging to financial stability and the real economy. However, these types of interventions raise important concerns about the implications for redistribution, as well as the

fact that the prospect of emergency lending provides incentive for firms to engage in excessive risk-taking. The latter problem, known as “moral hazard,” arises when shareholders and creditors expect public support in the event of financial distress, creating an implicit safety net that they expect will protect them from losses.¹

As described in Figure 1, the government chose an array of resolution methods during the financial crisis. Some failing firms were allowed to go through bankruptcy or be acquired with minimal government assistance, while some firms were

Figure 1: Size Was Not the Only Determinant of Resolution Method during the Crisis



Note: **Red dots** indicate substantial financial assistance from the government. **Green dots** indicate minimal financial assistance.

* Bank holding companies with \$100 billion or more in assets

deemed too big or systemic (important to the financial system) to fail and received sizable emergency lending or “bailouts.”

As Figure 1 shows, size was not the only determinant of how the government dealt with each firm. Rather, the differential treatment by policymakers suggests that these firms had different characteristics or failed under different circumstances, which policymakers believed implied different effects on the economy in the event of bankruptcy. In essence, a resolution method is a cleanup technology. Bankruptcy may leave a substantial mess, which may include disruptions in the provision of key services (such as payments, asset custody, lending relationships, brokerage, counterparty provision of derivatives, or hedging), as well as contagion to other financial institutions. Contagion to other firms may occur either because they are direct creditors of the failing firm or because the values of certain classes of their assets are depressed due to a sudden flooding of the market when the firm fails (so-called “fire sales”). By contrast, bailouts make things exceptionally clean but potentially with more messes to clean up in the future due to the increased risk-taking that bailouts may encourage. The choice between resolution methods trades off these costs.

The above facts give rise to some questions: How are resolution *decisions* made by policymakers? What *information* do they have when making the call? Is it possible to *anticipate* and *influence* whether firms will be “resolvable” in the sense that the government would allow them to go through bankruptcy without government financial support? The 2010 Dodd-Frank Act responded to these questions in three key ways. First, it stated that unassisted bankruptcy should be the preferred method—that is, the default *decision*—for resolving firms in financial trouble. Second, it created the Orderly Liquidation Authority (OLA) with some access to government funds to assist particularly difficult resolutions and reduce bailouts. Third, it mandated that large firms craft “resolution plans,” also called “living wills,” which would provide *information* on how they would be resolved through the bankruptcy process. The idea is for living wills to help regulators *anticipate* the con-

sequences of unassisted bankruptcy and *influence* those consequences—that is, to change the structure of the firm if necessary, such as through divestiture and other prudential measures, to make bankruptcy the preferred resolution method.

In practice, however, living wills are lengthy, hard to digest, and opaque. They include significant amounts of qualitative information and nonstandardized content across firms, and only a small portion of the information is made public.²

This *Economic Brief* discusses a recent paper by Richmond Fed economists Arantxa Jarque and John Walter and former research associate Jackson Evert that addresses these concerns.³ They present a framework to help clarify what makes a firm resolvable. In particular, they model the decision-making process of policymakers who are trying to evaluate the links between a firm’s structure and the impact on the economy from its failure. Their research introduces the idea of an “impact score” that is intended to capture the severity of outcomes should a given firm fail. One can then compare the impact score resulting from the bankruptcy process versus the impact score for resolution involving various levels of government support to determine whether a firm is resolvable.

The score developed by these researchers takes objective measurements of firm characteristics, such as size and reliance on short-term funding, and adds them together using subjective weights that reflect how problematic a high level of each characteristic may be in the event of failure. Inevitably, because there have not been a large number of bank failures from which to form empirical estimates, there is room for disagreement as to what these weights should be. Yet, the task of choosing a resolution method implicitly forces policymakers to take a stand on such matters.

The weights assigned to each characteristic typically will vary with the resolution method being evaluated since different alternatives may be better or worse at “cleaning up the mess” implied by a given characteristic.⁴ For example, if a failing firm relies

heavily on short-term debt, the fact that resolution through the OLA allows access to government funds may permit the continued functioning of a “bridge” company, hence the repayment to those debt holders. This implies a lower level of contagion than resolution through bankruptcy, which would put many short-term debt holders in line with other creditors.

The weights also may vary depending on the crisis scenario being considered. For example, a widespread crisis may be more likely to encourage the international coordination of regulatory authorities to deal with a failing firm doing business in several countries. A policymaker with such a view may assign a lower weight to a firm’s measure of cross-jurisdictional activity in an aggregate shock compared to a case in which the failure is an isolated episode and coordination is less likely to happen. On the other hand, the potential for disruption due to the failure of a key provider of payment services is likely to be larger in a widespread crisis, when no other financial firm may be able to make the investments necessary to absorb the business in a timely manner.

A broader benefit of an impact score is that it could support accountability in the living wills process. Many aspects of living wills are inherently qualitative and confidential, but an impact score could help clarify the many aspects of firm structure that are measureable and nonconfidential. The impact score determinations could then be compared to the resolvability determinations made by the Federal Deposit Insurance Corporation and the Board of Governors of the Federal Reserve System, informing the public discussion on resolution policy. Thus, an impact score along the lines proposed by Jarque, Walter, and Evert can both serve as a tool for policymakers in the resolution decision as well as increase transparency about resolution policy.

Firm Characteristics and the Impact of Failure

The first step in constructing an impact score is to select firm characteristics that are informative about costs of failure. The authors propose to start with those used by international regulatory authorities in the designation of global systemically important banks (GSIBs) and add a few new characteristics

pertaining to the financing structure of firms.⁵ The “GSIB score” collects information on firm characteristics that are thought to be correlated with economy-wide disruptions in the event of failure. These characteristics fall into five conceptual categories:

1. **Size:** a measure of total exposures, reflecting the firm’s importance or value to the economy
2. **Interconnectedness:** amounts borrowed from (and lent to) other firms in the financial sector, which are informative about the magnitudes of likely fire-sale and contagion effects
3. **Substitutability:** captures the financial services the firm provides to other firms
4. **Complexity:** captures the amount of loans and other assets owned by the firm that may be hard to value on short notice by outsiders
5. **Cross-jurisdictional activity:** amounts owed to and from foreigners

Figure 2 on the following page lists how each of these characteristics is measured and the costs to the economy that may be associated with each characteristic in the event of a firm’s failure. Ranking the firms by any of these five categories yields a different order than ranking them by size, suggesting that each item yields additional information on the firm’s structure not captured by size alone.⁶

In addition to these baseline characteristics from the GSIB score, the authors propose to include in their impact score five new firm characteristics that may capture valuable information about impact. The five new items all relate to additional aspects of the structure of a firm’s short-term debt:⁷

1. **Amount of qualified financial contracts (QFCs):** this captures the borrowing that the firm does using contracts exempt from bankruptcy’s “automatic stay.” The stay prevents most creditors from attempting to collect on their claims upon a debtor’s bankruptcy filing.⁸ QFCs include repo loans, commodity contracts, forward contracts, and swap agreements. If, instead, the failing firm is resolved through the OLA, regulators can impose a two-business-day stay on QFCs that would make it possible to sell those debt con-

tracts instead of liquidating them and hence would avoid the need for debt holders to sell the collateral backing the QFCs.

2. **QFCs/assets:** the proportion of assets that is financed with these special contracts is informative about the risk of inefficient liquidation of assets backing these QFCs under the exemption, which would translate into lower recovery rates for other claimants subject to the stay.
3. **Non-QFC short-term borrowing:** if any of this debt gets caught in bankruptcy’s automatic stay, it would have an impact on counterparty liquidity. This is also debt that would be likely to run in the days leading to insolvency, prompting liquidation of assets in the troubled firm.

4. **Non-QFC short-term borrowing/assets:** the proportion of assets financed with this type of debt is informative about the potential impact of failure on the value of the firm’s assets due to rushed liquidation to meet non-QFC short-term debt obligations that are not being rolled over.

5. **Short-term debt/liquid assets:** liquid assets can be sold quickly without suffering losses. If short-term debt, which is prone to run in the event of financial turmoil, is high relative to liquid assets that can be used to pay off that debt, worse outcomes likely would occur for counterparties of the firm that are subject to the automatic stay.

Figure 2: Impacts of Characteristics Reflected in a GSIB Score

GSIB Score Characteristics	Disruption in Provision of Key Services	Contagion To Counterparties	Contagion To Third Parties Through Fire Sales
Size: <ul style="list-style-type: none"> • Assets + derivatives + credit commitments 	Amount of lending and hedging relationships.		
Interconnectedness: <ul style="list-style-type: none"> • Intrafinancial system assets • Intrafinancial system liabilities • Securities outstanding 	Lending relationships in the financial system.	Borrowing from the financial system, and securities outstanding.	Securities outstanding – effect could spill to securities of similar companies.
Substitutability: <ul style="list-style-type: none"> • Payments activity • Assets under custody • Underwritten transactions in debt and equity markets 	Payments, custodian, and underwriting services will need to be replaced.		
Complexity: <ul style="list-style-type: none"> • Assets that may be opaque and hard to value 	OTC derivatives need specialized counterparties. If one such counterparty fails, it will need to be replaced.	Certain complex assets will sell at a discount if they need to be liquidated leading up to failure or in bankruptcy, translating into losses for claimants.	Prices of certain complex assets are very sensitive to information (such as a firm that owns them being in financial trouble); also, fire-sale effects may occur if large quantities are sold.
Cross-jurisdictional activity <ul style="list-style-type: none"> • Cross-jurisdictional liabilities • Cross-jurisdictional claims 		The amount of foreign assets and liabilities are an indicator of how complex the liquidation may be.	

These new measures are presented in Figure 3, which also describes ways in which they may be expected to influence the costs of a firm’s failure. Importantly, differing resolution methods (bankruptcy, OLA, or bailout) likely would influence the impact that each of these firm characteristics would have on the economy in the event of bank failure, as discussed next.

Using the Score to Evaluate Firm Resolvability

As discussed, the impact score could be used to determine whether a firm’s structure is acceptable for resolution in bankruptcy. Jarque, Walter, and Evert say that a firm is “resolvable” if its impact score under bankruptcy is equal to or less than its impact score under resolution involving bailouts or some other

Figure 3: Impacts Reflected in Additional Characteristics Proposed by the Authors

New Characteristics Proposed by the Authors	Disruption in Provision of Key Services	Contagion To Counterparties	Contagion To Third Parties Through Fire Sales
<p>Amount of Qualified Financial Contracts (QFCs)</p> <ul style="list-style-type: none"> • Borrowing through repurchase agreements (repo borrowing) • Derivatives purchased that currently have a negative fair value • Derivatives sold that currently have a negative fair value 	<p>Repos may run in the days leading up to failure, and all QFCs will be allowed to be liquidated after failure under bankruptcy (or after OLA’s ministay); this translates into lack of funding that may hinder the ability of the firm to continue providing critical functions during wind-down.</p>	<p>Counterparties of QFCs may suffer if there is a ministay on the QFCs (for example, under the OLA); short-term creditors in particular may experience liquidity problems.</p>	<p>If there is a run on short-term QFC debt of the troubled company in the days leading up to failure, or if collateral gets liquidated after bankruptcy due to QFCs’ exemption from bankruptcy’s automatic stay, there might be downward pressure on assets used as collateral.</p>
QFCs/Assets		<p>Assets used as collateral for QFCs would be liquidated at a discount under bankruptcy. Therefore, a higher proportion of QFC/assets would imply lower remaining asset values for meeting non-QFC claims.</p>	
<p>Amount of Non-QFC Short-Term Debt</p> <ul style="list-style-type: none"> • Commercial paper • Other borrowings with remaining maturities of one year or less • Uninsured deposits 	<p>Short-term debt may run in the days leading up to failure; this translates into lack of funding that may hinder the ability of the firm to continue providing critical functions during wind-down.</p>	<p>Counterparties of short-term debt that gets caught in bankruptcy’s automatic stay may experience liquidity problems.</p>	<p>If there is a run on short-term debt of the troubled company in the days leading up to failure, there might be downward pressure on liquid assets that will be liquidated to deal with the run.</p>
Non-QFC Short-Term Debt/Assets		<p>More assets funded with debt that runs will imply more inefficient liquidation of assets, translating into lower recovery rates for claimants who don’t run.</p>	
<p>Illiquidity Non-QFC short-term debt plus repo borrowing, all divided by the amount of high-quality liquid assets.</p>		<p>The less liquid the firm, the higher the expected losses as assets are sold to repay withdrawing creditors; this translates into lower recovery rates for claimants who don’t run.</p>	

degree of government support in all crisis scenarios being considered. Put differently, a firm is resolvable if the anticipated costs to the economy stemming from bankruptcy are less than the costs stemming from a method featuring government support.

For a given list of firm characteristics being analyzed, weights need to be assigned to each of them to create a summary impact score. This is no easy task. Selecting weights under different resolution methods and scenarios requires not only quantifying the impact associated with each firm characteristic, but also the costs of government intervention.

The costs of government intervention include both “outrage” costs tied to distributional concerns and moral hazard costs. The authors argue that these costs may be greater when a firm is bailed out after a firm-specific shock than if the bailout follows an aggregate shock.⁹

Resolution under the OLA also may carry these costs, although to a lesser extent since the OLA provides some degree of protection for creditors. If a firm instead goes through bankruptcy, the authors assume that the moral hazard cost is zero given that no government assistance is provided.

The authors illustrate how policymakers’ different beliefs about the impact associated with each firm characteristic would translate into different resolvability determinations by combining raw firm data for a sample of large firms in 2015 with different sets of weights chosen to represent different views to produce different sets of scores.¹⁰

These score calculations illustrate, for example, the consequences of disagreements among policymakers about the importance of fire sales. In the impact score, such a difference of opinion would translate into different weights on interconnectedness, complexity, and on the five new characteristics related to short-term debt. (See explanations in Figures 2 and 3.)

The authors provide weights that would lead to disagreements between a policymaker who worries about fire sales and a policymaker who does not.

Given such weights, the policymaker who is concerned about fire sales would choose OLA for U.S. Bancorp, PNC Financial Services, and Capital One Financial, while the policymaker who is unconcerned about fire sales would choose bankruptcy. This is the case for these firms because, for the characteristics for which policymakers agree on weights, the measured values are low enough that a disagreement on other weights—specifically, on the interconnectedness, complexity, and new debt-related terms—tilts the comparison between costs of bankruptcy and costs of OLA. The policymaker not concerned with fire sales gives these three firms much lower partial scores based on their interconnectedness, complexity, and debt structure in bankruptcy, and this makes the bankruptcy score the lowest and the firms resolvable. For the largest six companies, on the other hand, their high numbers on size, substitutability, and cross-jurisdictional activity drive the comparison of the scores, even for the policymaker who discounts the fire-sale effect from the rest of the characteristics. This can also be understood by focusing on HSBC and Bank of New York Mellon (BoNY), which are similar in size to PNC. While the partial score attached to short-term debt items is also low for these two firms when fire sales are not considered, their measures of complexity (HSBC) and substitutability (BoNY) are at least one order of magnitude higher than those of PNC and hence the advantages of OLA for dealing with complexity and substitutability end up implying that these firms are not resolvable.

The authors also illustrate how looking beyond size can affect resolvability determinations. For this purpose, they compare determinations based on their full impact score with those of a score based only on size. This is reminiscent of the fact that much systemic risk regulation is size-based, indicating that the simplicity of such straightforward cutoffs can be attractive to policymakers. Naturally, for policymakers who only consider size, the preferred resolution method is bankruptcy for smaller firms (which are assigned a fairly low impact from failure), OLA for middle-sized firms (that benefit enough from the better cleanup technology of the OLA to compensate for the moral hazard cost), and bailout for the largest firms (for

which the impact under bankruptcy or the OLA is the largest). Such a policymaker would not consider TD Group resolvable, while a policymaker who evaluates all firm characteristics would think of TD Group as resolvable. This disagreement can be tracked to the fact that while this is a fairly large firm, it has fairly low readings on nonsize characteristics (such as interconnectedness, substitutability, and non-

QFC short-term debt/assets, values that are shaded green in Figure 4).

More generally, Figure 4 displays raw data on how firms differ across the key characteristics in the impact score. This can provide further insight into how a policymaker's choice of weights may influence resolvability determinations. For example, while the

Figure 4: Raw Data on the GSIB Firm Characteristics and the New Characteristics Proposed by the Authors

Numbers (except ratios) are in billions of dollars as of 2015.

The figure is coded to represent a heat map: red corresponds to larger numbers, yellow to intermediate numbers, green to smaller numbers. Firms are ranked by size of total exposures.

GSIB Firms*	Size	Interconnectedness	Substitutability	Complexity	Cross-Jurisdictional Activity	QFC Debt/Assets	QFC Amount	Non-QFC S-T Debt/Assets	Non-QFC S-T Debt	S-T Debt/Liquid Assets
JPMorgan Chase	3,127	434	101,983	16,231	573.7	0.48	1,124.9	0.31	736	1.91
Bank of America	2,809	308	36,635	13,403	315.3	0.41	887.5	0.28	604	1.67
Citigroup	2,377	385	94,891	14,925	762.8	0.45	775.6	0.21	357	1.37
Wells Fargo	2,146	305	12,540	1,989	128.2	0.09	168.8	0.28	507	1.38
Goldman Sachs Group	1,350	252	4,592	14,231	316.2	0.94	805.5	0.09	78	1.57
Morgan Stanley	1,108	170	4,448	8,696	288.7	0.66	519.7	0.09	72	1.22
U.S. Bancorp	519	57	3,156	70	19.1	0.01	4.5	0.39	164	2.29
HSBC North America Holdings	450	57	923	2,232	19.5	0.50	137.2	0.34	94	3.11
PNC Financial Services Group	423	38	912	119	4.8	0.02	5.7	0.27	97	1.29
Bank of New York Mellon	402	139	73,641	354	142.6	0.09	35.5	0.37	147	0.87
Capital One Financial	373	46	252	38	5.1	0.01	2.1	0.30	99	2.11
TD Group U.S. Holdings	297	9	183	77	15.6	0.01	2.6	0.26	71	1.35
State Street	253	95	33,331	442	106.3	0.07	17.8	0.40	98	0.96
BB&T	234	25	258	25	0.9	0.01	2.0	0.35	73	2.43
SunTrust Banks	233	16	259	72	1.9	0.04	7.1	0.33	63	2.24
American Express	189	49	50	16	19.0	0.00	0.2	0.13	20	1.15
Charles Schwab	188	21	874	8	4.9	0.00	0.0	0.18	33	0.69
Fifth Third Bancorp	170	15	467	26	1.9	0.02	3.1	0.36	51	2.82
Ally Financial	162	44	51	22	0.6	0.01	1.2	0.15	24	2.36
Citizens Financial Group	160	10	672	20	1.4	0.02	2.3	0.33	45	2.07
Regions Financial	146	9	263	27	0.6	0.01	0.8	0.28	36	1.74
BMO Financial	145	22	1,829	10	6.0	0.04	5.6	0.41	52	2.87
Santander Holdings USA	142	18	17	22	1.7	0.01	0.7	0.28	35	2.31
MUFG Americas Holdings	139	15	373	44	3.3	0.02	1.8	0.44	51	2.80
M&T Bank	139	16	626	7	0.2	0.02	2.3	0.31	38	1.87
Northern Trust	137	28	15,930	132	41.6	0.03	3.6	0.29	34	0.80
KeyCorp	125	10	390	22	1.0	0.02	1.5	0.40	38	2.76
Discover Financial Services	105	28	98	3	0.1	0.00	0.0	0.09	7	0.65
Bancwest	105	6	199	7	1.2	0.01	1.4	0.40	38	2.23
BBVA Compass Bancshares	102	7	87	11	1.9	0.01	1.1	0.30	27	2.06
Comerica	88	9	113	7	1.7	0.01	0.7	0.47	34	2.48
Huntington Bancshares	79	8	155	13	0.9	0.01	0.8	0.28	20	2.41
Zions Bancorporation	67	4	138	2	0.2	0.01	0.4	0.41	24	1.91
Deutsche Bank Trust	57	16	21,992	2	1.2	0.03	1.8	0.75	40	3.80

* These are the thirty-four firms that were required to submit data to U.S. regulators for calculating GSIB Scores.

amount of QFC debt is fairly proportional to size, this is less true for QFC debt as a proportion of assets. Even more markedly, while the amount of non-QFC debt is proportional to size, the ratio of this type of debt to assets displays an almost inverse relationship to size. An inverse relationship is also somewhat present in the illiquidity measure. A policymaker who weighs heavily any of these characteristics that are inversely related to size may have different resolvability determinations from a policymaker focused more intensely on size.

Conclusion

Policymakers need to weigh choices that make the failure of a firm less disruptive against choices that make the firm efficient and useful to society in good times.¹¹ An important starting point for understanding these issues is to study the firm choices that make resolution through bankruptcy disruptive.

Naturally, any method for quantifying the impact of firm choices on the ease of resolution has limitations. Quantitative tools can't easily capture relevant information about firm choices that is not measurable or verifiable by regulators. In addition, it would be hard for any tool to capture all possible failure scenarios that may influence the impact in an important way or include all characteristics relevant to the costs of a firm's failure.

However, the 2008–09 crisis demonstrated that if policymakers want to prevent future bailouts and curb the “too big to fail” problem, they need some way of anticipating and influencing the costs that a firm's structure may pose to the economy in the event of failure. The impact score discussed in this *Economic Brief* proposes a tool for a baseline evaluation of resolvability that could be used on an ongoing basis to complement the living will review process. It also may enhance policymakers' ability to communicate to financial market participants and the public about likely actions in the event of financial distress. ■

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Endnotes

- ¹ See Borys Grochulski, “[Financial Firm Resolution Policy as a Time-Consistency Problem](#),” Federal Reserve Bank of Richmond *Economic Quarterly*, Second Quarter 2011, vol. 97, no. 2, pp. 133–152.
- ² There have been calls to make more information public regarding either the evaluation framework or the results of the living will process. For example, see Thomas Hoenig, “[Financial Supervision: Basic Principles](#),” Remarks presented to the Institute of International Bankers Annual Washington Conference, Washington, D.C., March 2, 2015; and U.S. Government Accountability Office, “[Resolution Plans: Regulators Have Refined Their Review Processes but Could Improve Transparency and Timeliness](#),” April 2016.
- ³ See Arantxa Jarque, John R. Walter, and Jackson Evert, “[On the Measurement of Large Financial Firm Resolvability](#),” Federal Reserve Bank of Richmond Working Paper No. 18-06, March 2018.
- ⁴ In the authors' analysis, the main relevant dimensions in which resolution methods differ are the expected duration of the wind-down, the availability of funds to finance a bridge company, the possibility of delaying the exemptions to the automatic stay for QFCs, the possibilities for international coordination among the authorities involved in the wind-down, or the adherence to bankruptcy's established debt priorities.
- ⁵ The Federal Register notice containing a description of the quantitative score used by regulators for the designation of GSIBs can be found at: <https://www.gpo.gov/fdsys/pkg/FR-2015-08-14/pdf/2015-18702.pdf>.
- ⁶ See Jarque, Walter, and Evert (2018) for comparisons of these rankings.
- ⁷ A revised version of the GSIB score being phased out also collects information on the importance of short-term debt, though the exact measurement of this item differs from the one proposed by the authors. See Jarque, Walter, and Evert (2018) for details.
- ⁸ QFCs are exempt from bankruptcy's stay so that counterparties can keep assets used as collateral and in this way be spared from contagion, while, at the same time, said collateral is such that it can be removed from the failing firm without largely affecting its liquidation value.
- ⁹ The authors consider a set of crisis and resolution scenarios, but the framework is flexible enough to accommodate many others not explicitly considered.

¹⁰ The sample consists of thirty-four firms based in the United States with assets over \$50 billion at the end of 2015. These firms were required to submit the data needed for U.S. regulators to calculate GSIB scores. The data obtained for these firms are displayed in Figure 4. See Jarque, Walter, and Evert (2018) for extensive examples of how different assumptions may change resolvability considerations for each of the thirty-four firms.

¹¹ A broader framework for how living wills can help evaluate this trade-off can be found in "[Understanding Living Wills](#)," by Arantxa Jarque and Kartik B. Athreya, Federal Reserve Bank of Richmond *Economic Quarterly*, Third Quarter 2015, vol. 101, no. 3, pp. 193–223.

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