How To Measure The Change In Financial Stability Risk Resulting From A Merger: Some Technical Considerations.

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Baer, Nelson, and Paridon (2022) discusses the legal basis for the requirement that the U.S. banking agencies consider the financial stability implications of a proposed bank merger or acquisition as well as the broad set of factors that the agencies should include in considering a proposed merger's potential effect on financial stability. This note discusses some technical considerations about how to go about comparing the financial stability risks of two banks before a merger to the possible risks posed by the bank created by the merger. The comparison uses the "expected systemic cost of failure" – which is simply the probability of failure times the systemic cost of failure (SCF). In particular, the sum of the expected SCF of each of the two merging banks should be compared with the expected SCF of the merged entity. An alternative approach would be to ignore the probability of failure and simply assess whether the SCF (not the *expected* SCF) of the merged entity exceeds some threshold, but such an approach would be incorrect.

As described in Baer, Nelson, and Paridon (BNP), when evaluating a potential merger, the Fed is required to factor in the extent to which the merger would result in greater risk to financial stability. The Fed is not instructed to identify a dispositive criterion, but rather, seemingly has discretion to consider both qualitative and quantitative measures of financial stability that will be factored in with other non-financial-stability considerations the Fed is required by law to weigh. Financial stability is generally understood as a state in which financial intermediaries facilitate the smooth flow of funds between savers and investors. A risk to financial stability can be something that increases the susceptibility of that smooth functioning to shocks, or something that increases the likelihood or severity of a shock.

Thus, when considering a merger between, for example, Gringotts Bank and the Fidelity, Fiduciary Bank to form Consolidated Bank, the Fed needs to consider how the stability of the financial system would be changed by the merger, in what direction and by what amount, if Gringotts and FFB were replaced by Consolidated. As discussed in BNP, financial stability can be changed in a variety of ways by a merger, but this note focuses on changes in the risks to financial stability associated with the failure of any of the institutions.

The financial stability consequences of the failure of an institution are referred to as the "SCF." When a firm fails there are internal costs, such as losses to creditors to the firm, and external costs – costs borne by other parties. In general, a firm has an incentive to factor its internal cost of failure into its decision-making because creditors require wider risk spreads when those costs of failure are higher. Conversely, a firm generally does not have an incentive to factor in the externalities caused by its failure. The SCF includes the external consequences of the failure of an institution that can contribute to financial instability. For example, if the liabilities of the institution are held by other institutions in material amounts, a default on those liabilities could weaken those other institutions sufficiently to contribute to financial instability.

While the systemic costs of failure of Gringotts, FFB, and Consolidated are important inputs into assessing the change in financial stability risks associated with the merger, two challenges are immediately apparent. First, how should the comparison adjust for differences in the probability of failure of the three institutions? If two institutions have the same systemic costs of failure but one of them has a much lower probability of failure, surely that institution presents a smaller amount of financial stability risk. Second, and relatedly, how can the SCF of two institutions be compared to one institution? It wouldn't make sense to just compare the sum of the SCF of Gringotts and FFB to the SCF of Consolidated because that the sum of the systemic cost of the failure of Gringotts and FFB would only be incurred if they failed at the same time, which is extremely unlikely. Both of these challenges are overcome by using the *expected* SCF – the probability of failure times the SCF.

EXPECTED SCF

As noted above, and as defined in the Fed's GSIB surcharge regulation, the expected SCF is the probability of failure times the SCF. The concept is similar to the expected loss on a bond, which equals the probability of default times the loss given default.

The GSIB regulation states that limiting the expected SCF of an institution is consistent with the Dodd-Frank Act's objective "to prevent or mitigate risks to the financial stability of the United States that could arise from the material financial distress or failure, or ongoing activities, of large, inter-connected financial institutions."[1] It would seem logical, then, that assessing the *change* in the expected SCF resulting from a merger would be one way to assess the *change* in financial stability risks resulting from a merger as the law requires.

The assessment should compare the expected SCF of the merged entity to the sum of the expected SCF of the each of the merging institutions. For reasons discussed in BNP, generally, a merger will reduce the probability of failure and increase the SCF. If the SCF of the combined entity is roughly the sum of the SCF of the merging institutions, then the expected SCF will go down as long as the probability of failure goes down.

A numerical example may provide additional clarity. Suppose the probability Gringotts will fail in any particular year is 1 percent and the SCF of Gringotts in the event that it fails would be $100. The expected SCF of Gringotts – 1 percent X $100 – is $1. Suppose further that the probability that FFB fails is also 1 percent, and its SCF is $200. The expected systemic cost of its failure would be $2. The expected SCF from the two institutions in any year is $3, which is independent of the correlation of the failures of the two institutions.[2]

While that may seem counterintuitive, it is also true that the expected loss on a portfolio of two bonds is just the sum of the expected loss of each of the individual bonds, irrespective of whether they are likely to fail together or fail separately.

Moreover, because of diversification and an increase in regulatory stringency and a variety of other reasons discussed in BNP, Consolidated bank will probably have a lower probability of default than Gringotts and FFB. If the SCF of Consolidated equals the sum of the SCF of Gringotts and FFB, then the *expected* systemic loss given default of Consolidated will be less than the sum of the expected systemic loss given default of the Gringotts and FFB – again, because Consolidated will have a lower probability of default. Suppose Consolidated's probability of failure was 0.8 percent (lower than the two other banks) and its SCF is $300 (the sum of the two other banks), then its expected systemic loss given default would be $2.40, which is less than the sum of the expected systemic loss of

[1] Page 4 of GSIB whitepaper https://www.federalreserve.gov/aboutthefed/boardmeetings/gsib-methodology-paper-20150720.pdf

[2] The expected systemic cost of Gringotts and FFB equals the probability that Gringotts but not FFB fails times the SCF of Gringotts plus the probability that FFB but not Gringotts fails times the SCF of FFB plus the probability that both of them fail times the sum of their SCF. The sum is independent of the probability that they fail simultaneously because if it goes up, the probability that they fail individually goes down.

failure of Gringotts and FFB ($3). Using expected systemic loss given default as the measure of the financial stability risk posed by the institutions, the merger would cause financial stability risk to decline.

There are a few reasons situations that might cause the SCF of Consolidated to be higher than the sum of the SCF of Gringotts and FFB – for example, if the merging entities each provide the same service, and were the only providers of that service, then if the merged entity failed there would be no providers of the service, which would impose a greater systemic loss than if either of the merging entities failed prior to the merger. On the other hand, as described in BNP, there are several factors that would reduce the SCF of the larger institution relative to the merging institutions – in particular, the tighter liquidity requirements and resolution requirements that could apply. Similarly, there are many consequences of the merger – in addition to greater diversification – that would cause the probability of failure of Consolidated to fall including more stringent capital and liquidity regulations.

The net effect of all the changes to SCF and probability of failure should be a key focus of an assessment of the change in financial stability risks resulting from the merger. Even if it were not possible to come up with a quantitative estimate, a qualitative estimate should be part of the assessment.

THE MERGER OF TWO GSIBS OR THE BREAKING UP OF A GSIB

GSIB surcharges are calibrated so that the probability of failure is lower for GSIBs to offset the relatively higher SCF of those institutions (see the Fed whitepaper "Calibrating the GSIB Surcharge"). In fact, the surcharges are designed so that the *expected* SCF – the probability of failure times the SCF – of all GSIBs are the same and are equal to the expected SCF to a reference non-GSIB.

As a result, the one type of merger that would *have to* reduce the *expected* SCF is a merger between two GSIBs. The expected SCF of each of the parent entities is required to equal the expected SCF of the reference non-GSIB so the total expected cost of failure of the two entities would be twice that amount. The combined entity would be subject to an even higher GSIB surcharge than either of the two GSIBs were subject individually so that its expected SCF would also equal the expected SCF of the reference non-GSIB. *The merger would thus cut the expected SCF in half*.

An example may help demonstrate the result. The GSIB surcharges are designed so that each GSIB's expected SCF equals that of a reference non-GSIB, call it Regional Bank. Suppose GSIB 1, Giant Bank, and GSIB 2, International Bank, are merging to form Mega Bank. Giant Bank and International Bank each already must satisfy capital requirements that include GSIB surcharges that reduce their probabilities of failure far enough below the probability of failure of Regional Bank so that the expected SCF of either bank equals the expected SCF of Regional Bank. The expected SCF of the two banks is therefore twice the expected SCF of Regional Bank. Mega Bank, the result of their merger, would have to satisfy a capital requirement that was even tougher than the requirements of Giant Bank and International Bank, respectively. In particular, Mega Bank's GSIB surcharge would have to be sufficiently high so that that its expected SCF was also equal to the expected cost of failure of Regional Bank. Because *ex ante*, each of the merging institution's expected SCF would have to equal that of Regional Bank, but *ex post*, only one institution would remain that would have to equal the expected SCF of Regional Bank, the merger would cut the expected SCF in half.

For exactly the same reasons, but in reverse, breaking up a GSIB into two smaller GSIBs would double the expected SCF. The original GSIB has a GSIB surcharge calibrated so that its expected SCF equals the expected SCF of Regional Bank. Each of the two new GSIBs would have lower systemic costs of failure and therefore lower GSIB surcharges. Those new GSIB surcharges would be calibrated so that in each case, the expected SCF is the same of Regional Bank. Since there are now two institutions, the expected SCF doubles.

Importantly, this illustration is based *only* on the GSIB surcharge. As described in BNP, there are also many other reasons why the probability of failure of a merged institution would be lower relative to the respective probability of failure of each of the merging institutions while the probability of failure of the entities created by breaking up a GSIB would be higher relative to the probability of failure of the GSIB.

ESTABLISHING A THRESHOLD FOR THE SCF FOR MERGERS

One way – a bad way – to factor financial stability risk into consideration of a proposed merger would be to deny all mergers that created an entity with a SCF (not the *expected* SCF) above a certain level. For example, mergers that created a bank above a certain size or with a GSIB score above some threshold, could be banned. Such an approach would be incorrect for several reasons. First, the law requires the banking agencies to consider the *change* in risks to financial stability resulting from a proposed merger, which would not be accomplished by a threshold-based approach.

More broadly, the rationale for such an approach would seem to be that the failure of the merged institution (regardless of probability of this failure) would be so intolerably costly that the merged entity would be too big to fail, with the attendant moral hazard and financial stability consequences that flow from that designation. However, the post-GFC banking reforms have ensured that no institution is TBTF, and an extensive literature has documented its demise (see Covas and Nelson (2021) for a review). Moreover, it would be illogical, and inconsistent with the current approach for regulating large banks, for the evaluation to be blind to the probability of default. If a small increase in the SCF resulted in a large reduction in the probability of default, surely it would reduce, not increase, risks to financial stability, even if the merger pushed the SCF over an arbitrary threshold.

OTHER CONSIDERATIONS

As discussed in BNP, a merger will influence financial stability for reasons unrelated to the failure of the merging or merged entities. Consequently, comparing the expected SCF of the merging banks to the expected SLGF of the merged bank should be only one component of an assessment of the financial stability consequences of a merger. In some cases, such as the change in the SCF of other institutions (if, say, the merger reduces the unique importance of those other institutions), the consequences can be included in the expected SCF analysis by widening it out to consider the change in the expected SCFs those other institutions as well.

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