Identifying banks with significant negative effects on financial stability in systemic shock scenarios

Judith Eidenberger, Katharina Steiner[1]

We present a method that allows us to assess the effects on financial stability caused by banks exiting the market in a system-wide stress event based on a consistent and conclusive systemic stress scenario. The method fills a gap in the OeNB's toolkit for assessing the financial stability effects of idiosyncratic and systemic bank failures (a method for an idiosyncratic scenario was developed in 2019). The outlined method follows a multistep approach. It is based on the idea that banks that are vulnerable and exposed to a shock get into trouble simultaneously and might even need to exit the market at the same time. In the first step, we define economic and financial shock scenarios. In the second step, we identify banks that are highly exposed to these shocks and are likely to default. The third step considers any potential mitigating (or amplifying) effects on banks' solvency stemming from their membership in an institutional protection scheme (IPS). In the fourth and last step, we identify those banks whose exit causes marginal negative effects on the financial system in the system-wide event. Knowledge about the consequences of banks' simultaneous failure for the financial system provides fundamental input for financial stability analysis, which, in turn, feeds into macroprudential supervision, crisis prevention, crisis management as well as deposit guarantee schemes. For this reason, Austria pursues an integrated approach in order to ensure overall consistency.

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Macroprudential policy aims to identify and mitigate systemic risk.[2] One of its main tools is systemic scenario analysis to assess financial stability. It allows us not only to identify banks that might be threatened under certain economic circumstances and financial conditions but also to evaluate the overall financial stability impact of bank failures. The macroprudential buffer regime[3] aims at ex ante identifying those banks whose failure might have significant negative effects on financial stability.

The general financial stability impact is also a core element of resolution planning and decision-making, which addresses this issue by assessing the resolution objective "avoidance of significant negative effects on financial stability."[4]

This paper outlines a methodology to assess potential marginal effects of banks' market exits in a hypothetical case of multiple bank failures due to a systemic

[1] *Oesterreichische Nationalbank, Financial Stability and Macroprudential Supervision Division, judith.eidenberger@oenb.at and katharina.steiner@oenb.at.* *Opinions expressed by the authors of studies do not necessarily reflect the official viewpoint of the OeNB or the Eurosystem. The authors would like to thank Stefan Schmitz (OeNB) for helpful comments and valuable suggestions.*

[2] *For more details on the goals and instruments of macroprudential policy, see European Systemic Risk Board (2018) or Eidenberger et al. (2014).*

[3] *Set out in the Austrian Banking Act.*

[4] *In Austria, recovery and resolution are set out in the Bank Recovery and Resolution Act (Bundesgesetz über die Sanierung und Abwicklung von Banken, BaSAG).*

event, thereby closing an important gap in financial stability analysis: the need to identify systemically important banks in a system-wide economic or financial event rather than just in an idiosyncratic (shock) scenario.

This paper is structured as follows: Section 1 discusses the integrated approach under which financial stability questions are analyzed in a consistent way. Section 2 outlines the role of systemic scenario analysis in closing the methodological gap of identifying systemically important banks. Section 3 shows an example of the multi-step approach, and section 4 concludes.

1 Financial stability issues captured in an integrated approach

In recent years, a number of new regulations and instruments have been implemented to foster financial stability by addressing negative financial stability effects of banks' failures and to minimize the too-big-to-fail problem: the global systemically important banks (GSIB[5]) and other systemically important institutions (O-SII[6]) buffers, the systemic risk buffer and other macroprudential tools as well as the Bank Recovery and Resolution Directive (BRRD, Directive 2014/59/EU). This framework requires, inter alia, that supervisors proactively identify banks that have the potential to cause negative financial stability[7] effects. This requirement makes it possible that supervisors (re)act in a timely manner and a bank can exit the market in an orderly way.

The potential impact of banks' market exits on financial stability is fundamental not only for macroprudential supervision but also a key element of ex ante crisis prevention (including resolution planning) and ex post crisis management.[8] Furthermore, a risk-mitigating deposit guarantee scheme should be designed in a way that prevents contagious financial stability impacts.[9]

The identification as O-SII has wide-ranging implications for a bank. First, a systemically important bank is more likely to be resolved than to just be sent into insolvency. Consequently, it must have in place a comprehensive resolution plan, which implies higher operational costs. In addition, regulatory requirements (in terms of minimum capital and MREL[10] requirements) are higher than for other banks. Hence, the identification of a bank as systemically important must rest on sound foundations to justify such interventions into property rights.

The "financial stability diamond" depicted in figure 1 illustrates the key elements of financial stability analysis and how they relate to each other. An efficient framework has to ensure consistency between macroprudential regulation, the resolution regime and the deposit guarantee scheme. For regulators, the interplay of measures in these areas is essential. A key question in all of these policy areas is: Which bank is systemically important to such a degree so that its failure causes significant adverse negative effects on financial stability, and which bank is therefore of public interest?

[5] *Basel Committee on Banking Supervision (2013).*

[6] *European Banking Authority (2014).*

[7] *However, the BRRD does not provide a definition of the term "financial stability."*

[8] *Single Resolution Board (2019).*

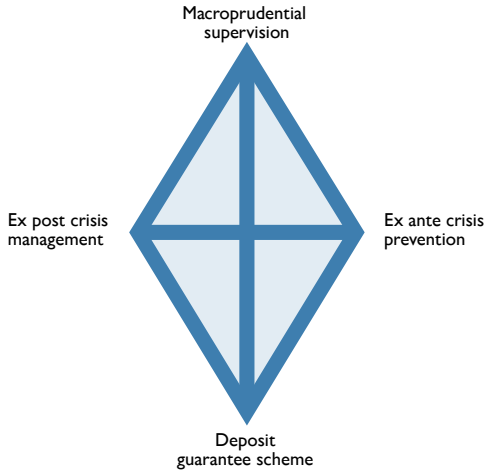
[9] *Schmitz and Eidenberger (2021).*

[10] *MREL stands for minimum requirement for own funds and eligible liabilities.*

In Austria, the OeNB follows an integrated approach: For example, the Austrian macroprudential buffer regime ensures consistency between crisis prevention and management as the calibration of the systemic risk buffer explicitly considers the two contagion risk channels: funding cost shocks due to stress at an Austrian bank and costs emanating from a deposit guarantee scheme event.[11] The multistep approach outlined in this paper represents another instrument to foster the integrated approach.

Figure 1

Financial stability diamond



Source: OeNB.

2 Systemic scenario analysis to identify systemically important banks

A bank might fail either for idiosyncratic reasons or because it is affected by a systemic economic and/or financial shock, both of which may have significant negative implications for financial stability.

The regulatory framework includes guidelines on indicators that can be analyzed to capture financial stability effects but lacks explicit thresholds for individual indicators. This is a drawback for banking systems with a large number of banks, like the Austrian one. Eidenberger et al. (2019) presents a methodology for selecting banks for resolution planning based on the idiosyncratic risks banks pose to the financial system. The thresholds derived from the OeNB approach make it possible to deal with many banks in a consistent and comprehensible way based on the idea of substitutability: If market activities of a failing bank can be substituted by other market participants, financial stability will less likely be at risk. The threshold approach considers more than 20 indicators for the criteria economic importance as well as direct and indirect contagion. As a result, each bank's financial stability impact is classified as high, medium-high, medium-low or low (these four financial stability impact categories are prescribed by the European Single Resolution Board, SRB).[12] The Austrian threshold method mainly focuses on idiosyncratic shock scenarios. In this paper, we develop this method further by identifying banks commonly affected by systemic shocks.

In 2021, the SRB published its "Addendum to the Public Interest Assessment: SRB Approach," in which it clarified that it will consider "system-wide events in resolution planning by assuming that the failure of a bank takes place in a situation where the rest of the banking system is affected by an adverse scenario."[13] Unfortunately, the SRB is not very explicit on the underlying method. The main concept of the SRB's method is to consider a general capital depletion of the banking system

[11] *OeNB (2019).*

[12] *Banks with a high or medium-high impact are classified as being of public interest or systemically important, respectively.*

[13] *Single Resolution Board (2021).*

in line with the outcome of the stress test. The national implementation, especially for less significant institutions (LSIs), rests with national resolution authorities (NRAs) and national competent authorities (NCAs).

The systemic scenario method[14] outlined in this paper on the one hand seizes the idea of general capital depletion due to a systemic adverse scenario and, on the other hand, connects with the national idiosyncratic threshold approach as it makes it possible to assess the marginal effects of all banks on financial stability.

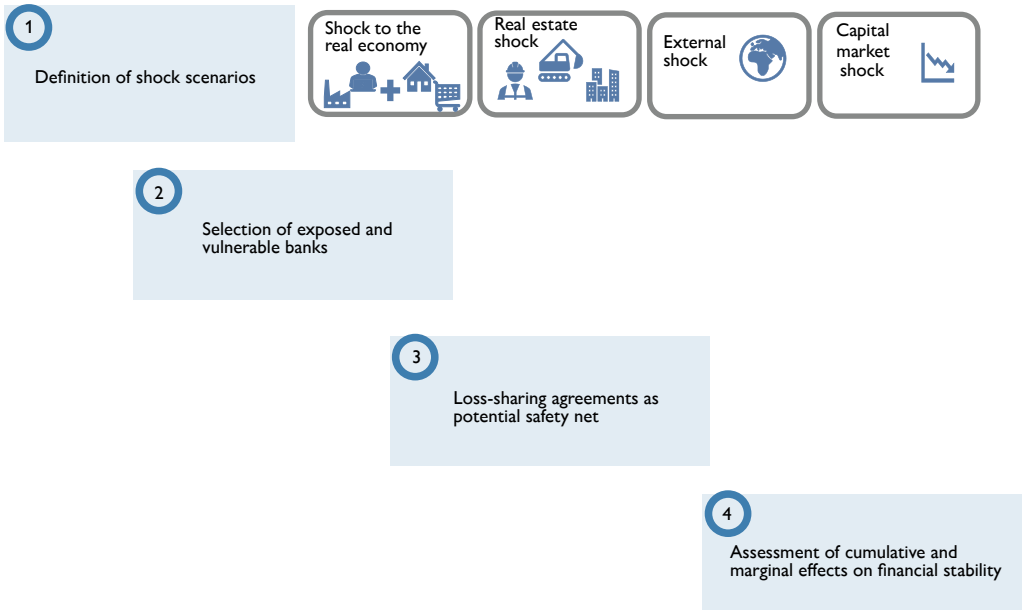
3 The multistep approach to systemic scenario analysis

Given the two major difficulties we are faced with in developing the method – (1) an unlimited number of potential scenarios and (2) an infinite number of potential combinations of failing banks – we chose a multistep approach. We address the first difficulty by aiming to provide for a sound conceptual foundation for the design of consistent and meaningful scenarios. To address the second difficulty, we aim to ensure a consistent framework by selecting systemically important banks not arbitrarily but based on their marginal impact on financial stability. Figure 2 illustrates the four steps that provide the basis for this comprehensible and consistent method.

In the first step, we define the shock scenario. The idea is that the shock causes a rise in insolvencies, partly connected with higher unemployment rates, which affect banks' balance sheets via the credit risk channel. (The COVID-19 shock on the real economy is a recent example of a scenario analyzed for macroprudential

Figure 2

Scenario approach: multistep procedure for the systemic scenario



Source: OeNB.

[14] *Besides scenario analysis, we also tested a cluster approach. A cluster approach – like the scenario analysis – has the advantage of considering that banks are exposed to risks in different ways. But the heterogeneity of banks' exposure to risk persists within the different clusters. Therefore, we did not follow through with this approach.*

policy considerations at the OeNB.) For banks, the shock leads to write-downs, higher loan loss provisions and rising nonperforming loans (NPLs). Ultimately, banks' capital could be depleted. A wide range of potential risk channels and, therefore, economic and financial shock scenarios need to be covered. For a general financial stability analysis, we consider the following plausible scenarios for Austria (for other countries, different scenarios may be appropriate): (1) a shock to the real economy, (2) a real estate shock, (3) a capital market shock and (4) an external shock.

In the second step, we identify the most exposed and vulnerable banks on the basis of the shock scenarios.[15] Given that sound and well capitalized banks are not a threat to financial stability even if they are highly exposed to a shock scenario, we include the criterion "financial vulnerability," combining four dimensions of vulnerability: (1) market view, (2) supervisory view, (3) capital view and (4) focus banks, i.e. banks which are currently under special supervisory monitoring.

1. The market view displays banks' ratings. It considers the OeNB's consensus rating (the OeNB has developed, and maintains, bank rating methods that can quantify the probability of default (PD) of an individual bank). The main advantage of this indicator is that it directly links ratings and PDs. As a rating is not available or robust for all banks, the market view is complemented by the other views.
2. The supervisory view is based on the OeNB's Austrian Banking Business Analysis (ABBA) score. This model uses a set of a bank's specific risk indicators to assess the riskiness of banks.[16] The selection of vulnerable banks is based on the idea that banks with lower scores are more likely to default in a systemic shock.
3. Banks' capital is also taken into account to ensure that banks with low capitalization are included regardless of their rating and ABBA score.
4. It can be assumed that banks which are currently under special supervisory monitoring are more likely to default in case of a systemic shock. Hence, these focus banks are also included in the vulnerability assessment.

Overall, a bank can be classified as vulnerable if the relevant measure under one of these four dimensions reaches a certain level. After the second step, we have a list of banks that are highly exposed to one of the four shocks mentioned above and vulnerable at the same time.

In the third step, a specific characteristic of the Austrian banking system comes into play: loss-sharing agreements like institutional protection schemes (IPS). The three largest banking sectors in Austria have a sectoral loss-sharing agreement in place which should lower the probability of individual bank failures. To reflect this, highly exposed and vulnerable banks whose failure can be prevented by a loss-sharing agreement[17] are of less relevance in our model.

In the fourth step, the cumulative and marginal effects are assessed as illustrated in figure 3. All in all, the effects on financial stability are derived from a potential simultaneous market exit of those exposed to one of the shocks and vulnerable banks – after considering any potential mitigating effects stemming from

[15] *Based on the free capital above early intervention and therefore reasonable NPLs, a threshold as a percentage of total assets is defined for each shock scenario. This allows us to identify the banks exposed to the shock.*

[16] *The output of these models can help microprudential supervisors to prioritize their resources and to identify potentially problematic banks at an early stage. For a general overview, see Fedesin and Resch (2012).*

[17] *Loss-sharing agreement- or IPS-simulation tools are used to assess the absorption capacity.*

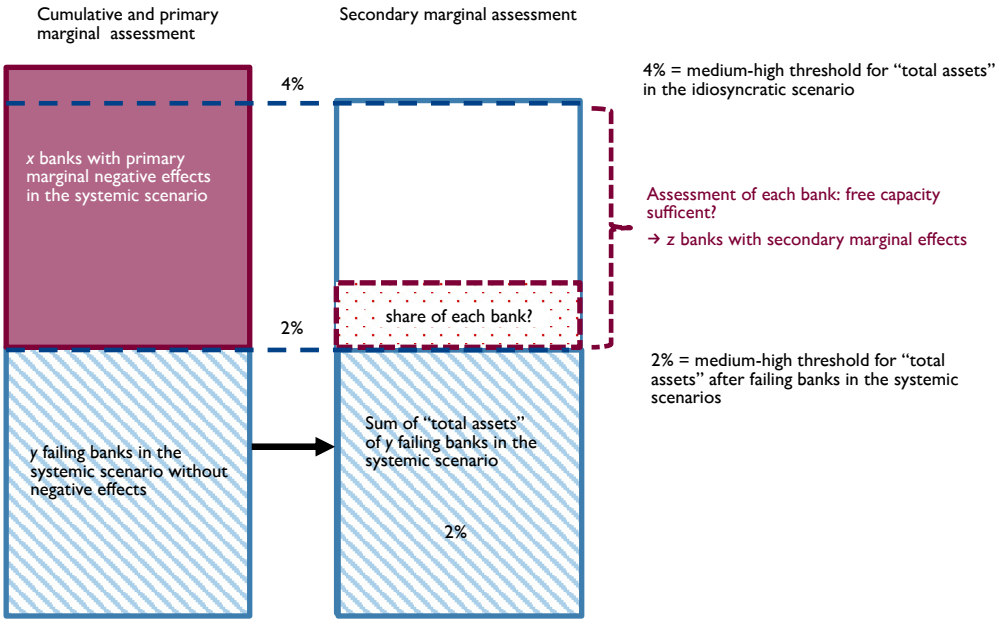
membership in a loss-sharing agreement. As mentioned above, the methodological design needs to take into account the problem of an infinite number of potential combinations of failing banks. If we assume that a rather small and little interconnected bank fails simultaneously with a systemically important bank, we will find that the cumulative impact on financial stability would be adverse but we will not obtain any additional information on the effect on financial stability the small bank would have. Hence, in the fourth step of our assessment, we differentiate between cumulative and marginal effects (primary and secondary). This method of identifying marginal effects helps us capture a bank's individual financial stability effect in a systemic event without relying on arbitrary combinations of failing banks.

Before turning to the identification of marginal effects, we elaborate on the threshold approach which we pick up on. As mentioned above, for the idiosyncratic scenario analysis, the OeNB applies thresholds for each of the more than 20 indicators to classify each bank as having a low, medium-low, medium-high or high financial stability impact. In the end, the highest (worst) indicator value determines a bank's categorization as low, medium-low, medium-high or high regarding its overall financial stability impact. Generally, banks with a high or medium-high impact are classified as having a negative financial stability impact or as being systemically important.

In the following, we describe the analytical steps shown in figure 3, which illustrates the assessment of cumulative, primary marginal and secondary marginal effects on financial stability based on the threshold approach. The illustration is based on the example indicator "total assets."

Figure 3

Assessment of cumulative effects on financial stability based on an example indicator



Source: OeNB.

First, we cumulate the identified banks into one fictitious bank along various bank indicators[18] which are taken from the idiosyncratic scenario analysis to obtain a cumulative effect on financial stability, which is classified as high, medium-high, medium-low or low in analogy to the idiosyncratic scenario. Figure 3 shows an indicator (here: total assets) with a medium-high threshold of 4%[19] in the idiosyncratic scenario. In this example, the cumulative bank's share of total assets (represented by the left bar) exceeds the 4% threshold. As the cumulative impact is high or medium-high, the collective failing of these (aggregated) banks would cause a severe negative financial stability impact.[20]

As a result, any other bank that exits the market simultaneously with those cumulatively failing banks would be assessed (potentially unjustifiably so) as having a significant negative effect on financial stability. Thus, the relevant question is: which banks have a significant marginal negative impact? In our example, the question would be: which banks' individual impact drives the cumulative impact above the 4% threshold? A way of identifying these banks is to look at the O-SII score. The O-SII score represents the systemic riskiness of a bank[21] and therefore is a suitable aggregated indicator for selecting the banks with the largest impact (those with a marginal negative impact). Beginning with the bank with the highest O-SII score, we subtract banks along the O-SII score ranking until the cumulated fictitious bank's financial stability impact falls to medium-low. In the example, an *x* number of banks would be identified as having (primary) marginal negative effects in a system-wide event based on the O-SII score ranking (represented by the purple area of the first bar). A *y* number of banks could exit the market without affecting financial stability (see the light blue area of the first bar). The total assets of these failing banks sum up to 2% in this example and are therefore of less concern to financial stability.

In the next stage, we look at secondary marginal effects. This method allows a consistent impact evaluation of any bank's market exit in a systemic event. This is specifically relevant for a banking system with a large number of banks, like Austria's. The question is: what are the effects of an additional failing bank leaving the market together with this *y* number of banks (the light blue area in the first bar equaling that of the second bar)? We know that the *y* failing banks together account for an aggregate share of 2% of total assets. This leaves a free capacity of 2%[22] (illustrated by the white area of the right bar in the figure) up to the 4% medium-high threshold. Next we test each bank if the free capacity is sufficient to accommodate its failure. In our example, we test if the purple dotted area (whose magnitude

[18] *Those indicators (out of those 20+ idiosyncratic indicators) for which a simple aggregation is not meaningful (e.g., network indicators) are neglected.*

[19] *The 4% threshold is an example; in practice, the threshold should be consistent with the medium-high threshold for the total assets indicator used in the idiosyncratic scenario. In Austria, the indicator is determined by the threshold approach already mentioned based on the substitutability capacity.*

[20] *If the cumulative impact is medium-low or low, the collective failing of these banks would probably not cause a severe negative impact on financial stability; these banks should be able to exit the market collectively without causing financial stability repercussions even in a systemic event.*

[21] *In line with the methodology set out in the EBA Guidelines, a set of criteria and indicators needs to be analyzed. The national assessment can be extended by other quantitative or qualitative factors. For more details on the O-SII score methodology, see European Banking Authority (2014).*

[22] *The free capacity (the white area of the second bar above the light blue area) amounts to the remaining share of 2%: threshold of 4% minus the 2% used by the y number of banks equals 2% free capacity.*

depends on the bank's total assets) is smaller or larger than the white area. If the bank's share of total assets exceeds the free capacity (the purple dotted area is larger than the white area and therefore exceeds the 4% threshold), the bank will be identified as potentially having secondary marginal effects on financial stability. All *z* banks with a share of total assets of more than 2% in that example would be identified as having secondary marginal effects on financial stability.

This logic of calculating the free capacity is applied not only to the indicator "total assets" but to all those original indicators which are suitable for a systemic scenario. Thus, all banks are tested against the free capacity of each of these indicators. As a result, we can identify banks with potentially secondary marginal negative effects.[23]

To sum up, we identify those banks whose market exit has significant primary and secondary marginal negative effects on financial stability in a systemic scenario. In our example, all *x* and *z* banks would have financial stability effects in a system-wide event.[24]

4 Conclusion

Each bank's complexity and system-wide interconnectedness is of special interest from a financial stability perspective, particularly in times of systemic stress. In this paper, we present a method that closes a methodological gap by providing a tool for identifying banks commonly affected by systemic shocks. It assesses the impact of an individual bank's market exit on financial stability in a system-wide event when several banks are affected by a shock at the same time. The definition and financial stability assessment of systemic scenarios are a fundamental part of macroprudential analysis, crisis prevention, crisis management and deposit guarantee schemes. Thus, our method adds to the integrated Austrian approach to safeguarding financial stability, which applies similar methodologies among these policy fields ensuring synergies and consistency.

The outlined method fills a gap in that it makes it possible to design a systemic scenario on the one hand and to evaluate each bank's marginal financial stability impact in such a system-wide event on the other hand. This comprehensible and data-based method should be sufficiently economically and legally robust in order to allow interventions into property rights in terms of regulatory requirements.

[23] *In order not to discriminate between banks causing secondary or primary marginal effects, a robustness check is conducted. Ideally, all z banks should be systemically more important than the y banks which are assumed of not having marginal negative effects.*

[24] *For IPS member banks, the IPSs could be tested as to whether they are capable of absorbing these banks' failures; if yes, the failure of these banks might not endanger financial stability in a system-wide event.*

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