HABILITATION THESIS

Preserving financial stability in an environment with multiple structural changes and overlapping crises

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SUMMARY

The year I defended my PhD thesis coincides with the onset of the Global Financial Crisis and the emergence of financial stability as a major objective for the authorities. To a certain extent, I was prepared to deepen this new avenue of research, because since December 2014 I headed the macroprudential risk division within the Financial Stability Department of the National Bank of Romania. Consequently, my major post PhD research has focused on financial stability issues, systemic crises, and macroprudential policy. As detailed in the habilitation thesis, over the last decade, I have engaged in studies aimed at (i) enhancing knowledge concerning macroprudential tools, (ii) conducting deeper investigations into the interconnections established between the financial system and the real economy, (iii) identifying macroeconomic developments likely to generate financial tensions or systemic crises, and (iv) identifying vulnerabilities in the architecture or functioning of financial systems that propagate significant problems for the entire system.

I start my habilitation thesis with a topic where Romania is frontrunner within the European Union: borrower-based macroprudential instruments. Setting up these measures almost one decade before the majority of European countries also allowed innovative research on designing, implementing and calibrating such macroprudential instruments, our focus being on loan-to-value (LTV) and debt service-to-income (DSTI) caps. Our work is based on the Romanian experience with the use of these instruments from 2004 onwards. We find that the DSTI and LTV caps have been relatively effective in: (i) curbing high lending activity and (ii) ensuring that both debtors and creditors are able to cope with possible adverse shocks in real estate prices, domestic currency depreciation, or interest rate hikes. The latter point explains why the LTV and DSTI caps should be used both in the upswing and the downswing of the credit cycle. We learn that ”one-size-fits-all” approach is not very effective. It is more useful to tailor the DSTI and LTV measures according to the specific patterns of possible risks. The caps for these instruments should be differentiated according to the debtors’ disposable income (low, medium

and high), the currency of indebtedness (domestic or FX loans) and the destination of the loan (mortgage or consumer).

As an overall picture, both borrower-based macroprudential instruments (described above), and capital-based measures, are tools to reach macroprudential intermediate objectives, among which those related to the management of credit risk and liquidity risk are essential. An important part of my research activity is to deepen these two above-mentioned risks from the financial stability perspective. I study credit risk in order to capture the relationship between financial stability and real economy. We build a macroprudential tool to assess whether a banking sector is prepared to orderly withstand losses from the corporate sector developments, in a given macroeconomic scenario. The tool is constructed in two steps. First, we model a logit 1-year ahead probability of default (PD) model for the corporate sector using micro data, with Basel II definition of default and following a bottom-up approach. Second, we bridge the PD model with a macroeconomic module, in order to capture the feedback effects from the macro stance into the banking sector, through the corporate sector channel. The tool is also able to (i) evaluate corporate risk at the sectorial and aggregate economy levels, (ii) gauge the trend of the overall default rate for the corporate sector, highlighting the most likely direction in the banks' non-performing loan ratio and (iii) complement the macroprudential approach with a micro perspective, in order to compute the portfolio at risk of those entities that might put pressure on the financial stability (e.g. systemically important institutions). We test the tool for the Romanian economy. The main micro factors identified to impair companies from servicing their bank debt are: deterioration in the receivables turnover ratio, sales to total assets ratio, short-term bank debt to total assets and debt to equity, while the macroeconomic factors affecting the corporate default rate are annual GDP growth, change in the real effective exchange rate, CORE1 annual inflation rate and the FX interest rate spread. The tool proposed in the paper helps the macroprudential policy makers mainly in the following directions: (i) to signal whether the level of some macroprudential instruments (such as solvency ratio or provisions for credit risk) might reach critical benchmarks in the near future, (ii) to give a flavor of the trend and the speed of the corporate sector non-performing loans, or (iii) to flag the need for adjustments in some macroprudential measures (change in the LTV ratio, better credit risk management to avoid unsustainable credit growth, etc.).

In close connection with the instruments dealing with systemic credit risk are liquidity stress-test tools. These assess how the overall banking sector can withstand liquidity shocks and how adverse developments are spread between the real economy and the banking sector. The paper we drafted capturs this transmission channel. We construct our macroprudential tool using microdata and the balance sheet approach. The novelty of our tool resides in the specific features that characterize an

emerging European market. We include feedback from the real economy also affected by a liquidity shock, quantify the impact of the drop in the support from the banking group through foreign funding and the link between liquidity and solvency that matches emerging market features. The tool tests the capacity of the banking sector to withstand liquidity stress, assesses the impact on banks' credit supply, and evaluates the most suitable policy options, including the estimation of the liquidity deficit a central bank should accommodate. We apply our macroprudential stress-testing tool to the Romanian economy. While the stress test model is able to correctly identify the banks with possible liquidity strains during a crisis due to their vulnerabilities and to evaluate possible policy options, it does not fully capture the magnitude of the liquidity drain on the economy.

Next step in the research activity is to investigate within another study the optimal moment the macroprudential authorities should act on the financial stability front. We adapt a structural model to assess the macroprudential stance by analyzing borrower-based measures (loan-to-value, LTV) and capital-based instruments (countercyclical capital buffer, CCyB). Our approach includes a novel forward-looking rule for the CCyB that takes into account lagged expectations and uncertainty in the decision-making process. We also modify the structure of the shocks to reflect the fact that financial cycles are more volatile than economic cycles and test our approach on an emerging economy in Europe (Romania). Our primary goal is to determine the optimal levels of the LTV and CCyB in order to interpret the macroprudential stance as the difference between the current level of these instruments and their optimal level. We use the welfare criterion to find the optimal settings for the macroprudential instruments, and we employ a loss function approach in the case of dynamic rules. One key finding is that macroprudential policy makers must consider the broader impact of their decisions in order to have a robust and consistent approach over time for evaluating the macroprudential stance. According to the welfare maximization criterion, changes in the LTV or capital charges have steady-state effects that are more significant in terms of welfare compared to cyclical effects. In the case of static rules, the optimal parameters vary significantly depending on whether the policy maker's objective is defined using a welfare or loss-based approach. Tighter macroprudential policy (low LTV ratio and high CCyB charges) may be necessary to achieve a minimum level of volatility. However, we also found that when policy makers face Bayesian uncertainty, there is an excess of volatility compared to the case of no uncertainty. Dynamic rules deliver lower level of volatility compared to static rules.

Systemic crises have underpinned that evolutions from the macroeconomic front and the banking sector might significantly impair financial stability. Therefore, one important theme we investigate is about risks triggered to financial stability by high indebtedness level. We employ a series of

multivariate panel logit regressions in order to assess the evolution of the recession probability for various debt levels. The marginal response of the dependent variable (that is, the probability of recession) is computed for six distinct debt categories whose values range from 20 to 200 per cent of GDP. In most countries under scrutiny, the probability of an economic decline exceeds 50 per cent when public debt values are well below the limit established in the Maastricht criteria (60 per cent of GDP). In Romania, the public debt threshold above which the probability of recession exceeds 50 per cent is computed around 45 per cent of GDP.

Another research capturing macroeconomic consequences on financial stability is about climate change and the role of authorities. In the last years, greening the financial system is very high on policy agenda. We investigate the characteristics of firms that have taken green loans in Romania, and whether these loans carry less credit risk compared with non-green loans. We use a novel micro database, covering all green exposures of the largest financial institutions, during the period between 2010 and 2020. The outcomes we observe for the Romanian market call for prudence in setting lower capital requirements for green loans compared with non-green loans.

As mentioned above, along with macroeconomic developments, those taking place in the banking sector may also affect financial stability. We deepen these topics in two research papers that focus on human resources' developments with consequences on the stability of the system. In the first study we reach that preserving adequate human quality in banks proves to deliver important positive consequences on maintaining financial stability. We find causal evidence that increasing training expenses is beneficial in terms of revenue efficiency, although it implies lower levels of cost efficiency. Moreover, empirical findings supported by the survey data reveal that banks allocating higher training budgets to total staff expenses witness milder increases of non-performing loans (NPL) in the downturn. The channel is underpinned by the idea that bank' staff with better understanding of risks regarding credit activity would adequately screen clients and would properly inform them on lending risks (FX risk, interest rate risk, etc.), contributing to lower NPLs in the future. This conclusion is important from a macroprudential policy perspective, because one of the highest vulnerabilities delivered by systemic crises to the banking sector is represented by the elevated level of non-performing loans.

The same conclusion about the importance of human resources we reach in a second study when we analyze the top management of banks. Based on a panel of banks from five CEE countries (Croatia, Czech Republic, Hungary, Poland and Romania), we study how the country origin of the banks' managers matter for financial stability. Banks managed by expatriates have a higher inclination for taking risks, as indicated by higher loan-to-deposits level, as well as a larger ratio of risk weighted assets (RWA) and provisions for loan losses (PLL) to total assets. At the same

time, credit institutions with expatriate CEOs invest higher proportions of their balance sheets into loans to costumers. However, the differences among banks' characteristics due to CEO country of origin are in most cases statistically insignificant, including in case of financial interconnectedness with the group. The results highlight a stronger relationship between CEO and risk compared to board composition-risk, in line with previous results from panel fixed-effects models.

As we highlight in several papers, financial markets characteristics and infrastructure may significantly impact financial stability. For example, we discover that the most important factors explaining Romanian CDS spread movements are liquidity risk and regional mood. The specific factor, i.e. the Romanian stance of risk, modestly counts in spread dynamics. The link between changes in fundamentals and spreads is humble. In other paper dedicated to sovereign debt securities spreads in the Central and East European countries, our main findings are: (i) during tranquil times, a rating upgrade does not deliver important adjustments in the way the investors are assessing the risk for a specific country; (ii) there is no clear connection between the clusters based on the macroeconomic fundamentals and the clusters due from the sovereign spreads, and (iii) the correlation increases in volatile times, the distances between spreads being significantly lower than in tranquil periods. Also, the market sentiment explains a much higher percentage of the spreads movements during turbulent times.

We also study the infrastructure for settling securities markets, where systemically important banks are usually largely involved. We assess the efficiency criterion from both the liquidity burden point of view and the level of loss encountered when a default occurs. We conclude that, for the most dynamic segments of the securities markets (i.e. new and complex financial instruments, and cross-border large value transactions), it should be implemented a delivery-versus-payment type 3 procedure (DVP3). The same idea goes when the number of participants in securities settlement systems is low. When the type of securities settled is eclectic, gross settlement should be in place.

As an overall picture, I consider that my research activity in the field of financial stability and macroprudential policy contains several original results. I will briefly present some of these:

1. The investigation into the design, implementation, and calibration of borrower-based macroprudential instruments (loan-to-value and debt service-to-income) was a novelty at the time of publication. Being part of the central bank's team that initiated these measures (Romania implemented them significantly ahead of the majority of other EU countries), I was able to combine theoretical and practical aspects in my research and leverage the innovative elements of macroprudential policy for academic purposes.
2. Financial stability is fundamentally about the interconnections between the financial

system and the real economy. Capturing and modeling these interconnections is a challenging process, as macroeconomic variables are not able to grasp the asymmetries and divergences present at the micro level. My original contribution, developed shortly after the onset of the global financial crisis, is to connect these two components using microdata, complementing the macroeconomic perspective with the banking one.

3. Liquidity risk has proven to generate significant negative consequences for financial stability. My original contribution is to complement the liquidity perspective of the banking sector with that of the non-financial corporate sector. I developed a macroprudential liquidity stress-testing model, using individual data for both credit institutions and firms.

4. Macroprudential policy is a new field, and thus, macroprudential authorities currently lack the same tools as monetary or fiscal authorities regarding policy stance (soft or tight), making it more challenging to determine the optimal timing and intensity of intervention. The original result I presented in a recently published paper quantifies this stance based on systemic risk levels and the macroprudential instruments already in place. The paper also includes an innovative rule regarding the countercyclical capital buffer, calibrated to incorporate expectations and uncertainties into the decision-making process.

5. The high degree of indebtedness, both public and private, is a significant vulnerability to financial stability. I develope an instrument to quantify the critical threshold for total debt and its main components (public debt, external debt, non-financial corporate debt, and household debt), threshold above which the probability of an economic recession exceeds 50%. For instance, in the case of Romania, I find that threshold for public debt as share of GDP should not exceed 45%-50% in order to keep the probability of recession below 50%.

6. Supporting green financing to sustain the climate change agenda requires information about the dynamics of risks generated by this new type of financing. While such data is already available for exposures traded on financial markets (mainly green bonds), information for bank lending is modest. The innovation I apply to reduce this informational asymmetry is to develop a model that investigates the characteristics of companies with green loans and the associated default rate, using microdata over a decade, Romanian case. The conclusion for policymakers is that supporting green financing by the banking sector might be implemented through capital requirements under Pillar II rather than by modifying credit risk weights used in computing the core Tier I capital.

The second part of the habilitation thesis covers professional achievements and teaching coordinates. I am among the BNR-ASE team that has built the protocol between these two institutions for promoting research and academic performance in the monetary and banking field.

The main two areas of the protocol are: (i) developing a master program (BANCAS) specialized in central banks and financial institutions and (ii) organizing an annual conference in each April to present relevant topics within the national and international economic and financial context. My involvement in revising the BANCAS master program curriculum included the developing from scratch of the following disciplines: (i) Financial stability and macroprudential policy, (ii) Modelling the capital requirements and provisioning, and (iii) Microeconomics of banking. For the second discipline mentioned above, I also coordinated the drafting of the manual which has been published by the ASE Publishing House. I plan to publish a similar manual for Financial stability and macroprudential policy discipline and lecture notes on Microeconomics of banking, with a focus on practical examples derived from the Romanian banking sector's case studies.

In the third part of the habilitation thesis, I present my scientific research focus in the upcoming period. There are two main axes of research: (i) financial stability and macroprudential policy, and (ii) the implications of AI on financial systems. To implement the aforementioned projects, I plan to develop studies to be presented at various national and international conferences, as well as publish them in journals with high impact factors. I intend to develop my research activity in collaboration with colleagues from the ASE and central bank, other universities from Romania and abroad, and/or other international entities. The studies I have in mind in this regard are the following: asymmetric effects of macroprudential measures on borrowers' access to finance, macroprudential policy in an emerging economy, development of a Growth-at-Risk assessment framework for Romania, analysis of government economic support policies during the COVID-19 pandemic on credit dynamics, and ethics of artificial intelligence in the banking sector.