БАНКОВСКОЕ ДЕЛО

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NATURAL MONOPOLY REGULATION PRINCIPLES' APPLICATION TO REDUCE SYSTEMIC RISK IN BANKING

1. Introduction

The pandemic of 2020 raised concerns over the stability of the financial system. There are warning indicators. For instance, (Aramonte, Avalos, 2020) claim that the risk correlation exceeded in 2020 the levels observed during the Great Recession of 2007–2009. They used CDS quotes data. The international statistical body predicts –5.4% p.a. decline in the world GDP for 2020 (World Bank, 2021, pp. 4, table 1.1). As a result, there come proposals to once more revise the banking regulation and create a supra-national regulator (Pettifor, 2020). Such ideas were first born after the 2007–2009 crisis (Dewatripont, Rochet, Tirole, 2010).

Nevertheless, there are alternative signals and opinions. They contradict to the first ones and are more optimistic. For instance, the Swiss researchers (Eckert, Mikosch, Stotz, 2020) do not observe a spike in defaults in 2020. The representatives of the regulatory authorities state that banks are solid enough. They have accumulated capital cushions to on-board large losses (Borio, 2020), (Buch, 2020). The world prudential banking regulation standards setter — the Basel Committee on Banking Supervision (BCBS) — requested banks to accumulate those ones after the 2007–2009 crisis.

However, the very same Swiss researchers provide a disclaimer. They warn the reader that the situation may worsen rapidly when the generous support measures are lifted away (Eckert, Mikosch, Stotz, 2020). Additionally half a year after the (Borio, 2020) statement, the chairman of the Basel Committee announced at the start of 2021 that it is yet too early to evaluate the efficiency of the accumulated buffers (Mendez-Barreira, 2021).

Thus, overall we observe an unprecedented rise in the systemic risk in 2020, see Figure 1. The laboratory from the New York Stern University developed a respective proxy indicator. It equaled to around USD 1.0 trln prior to the 2007-09 crisis. It rose to USD 3.8 trln afterwards. During the recent year of 2020 it was USD 5.6 trln at the highest point.

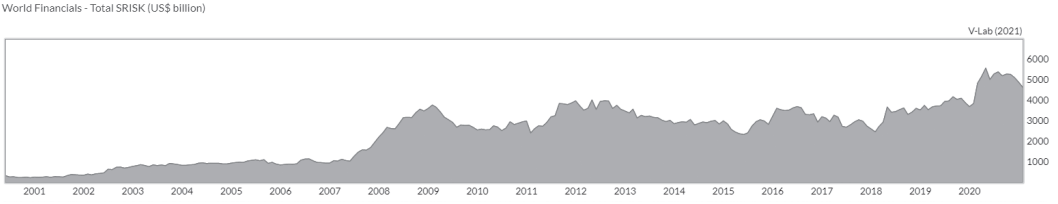

Fig. 1. The Systemic Risk Rose World-Wide During the Pandemic Times of 2020

Source: https://vlab.stern.nyu.edu/welcome/srisk; accessed on February 09, 2021.

The striking point here is that the post-2007–2009 banking regulation targeted reducing the systemic risk. We may read the following statements from the Basel III document (italics are added by the author):

DOI

> "...the Committee is introducing a number of macroprudential elements into the capital framework to *help contain systemic risks* arising from procyclicality and from the interconnectedness of financial institutions" (BCBS, 2011, pp. 2, par. 7);
>
> "...These reforms will raise the capital buffers backing these exposures, reduce procyclicality and provide additional incentives to move OTC derivative contracts to central counterparties, thus *helping reduce systemic risk* across the financial system" (BCBS, 2011, pp. 3, par. 13);
>
> "Moreover, *to address systemic risk* within the financial sector, the Committee also is raising the risk weights on exposures to financial institutions relative to the non-financial corporate sector, as financial exposures are more highly correlated than non-financial ones" (BCBS, 2011, pp. 4, par. 14(d)).

Then there comes a question. Is there something wrong with the banking regulation against the systemic risk? Or is there something wrong with our measure of systemic risk? May there be a problem with both issues?

However, may there be no problem at all? For instance, we need to keep in mind that we did not observe the systemic risk proxy indicator dynamics in the absence of the systemic risk regulation. Perhaps, if we were able to do this, we could have seen a much larger increase. To be fair, we may compare the systemic risk proxy rise in 2009 and in 2020. The former spike was (3.8/1.0) — 1 = 280%, whereas the latter was only (5.6/3.8) — 1 = 47%. Thus, we may wish to conclude that the systemic risk regulation might be efficient as the rise is smaller. Nevertheless, we should not forget that we are unable to control for the comparable economic environment.

Thus the question is still there. What is the optimal banking regulation against the systemic risk? To answer it, we wish to offer a stylized concept. Its attractive feature is its applicability to real-life. To do this we review the literature in section 2. Then we explain our concept in section 3. The concept implications follow in section 4. We conclude by discussing the perspective applications in section 5.

2. Literature Review

When studying the systemic risk, we should depart from its concept. Then we wish to describe the current prudential approach to systemic risk treatment. We lay down the discussed alternative regulatory options. After that we introduce the seemingly non-adjacent domains of the institutional analysis and development (IAD) and the natural monopoly regulation. This will help us to elaborate our stylized regulatory framework in section 3.

2.1. Systemic Risk Concept

The systemic risk hub suggest that "Systemic risk generally refers to the risk of a disruption to the flow of financial services that is (i) caused by an impairment of all or parts of the financial system and (ii) has the potential to have serious negative consequences on the real economy" (http://www.systemic-risk-hub.org/). (Tarullo, 2011) argues that it is the shadow banking that exacerbates the systemic risk implications.

It seems that the paper by (Penati, Protopapadakis, 1988) was the first to introduce the notion of the systemic risk. After that a number of authors considered it. They include (Carey, Gordy, 2003), (IMF/BIS/FSB, 2009b, p. 5), (Acharya, 2009), (Mayordomo, Rodriguez-Moreno, Pena, 2014), (Li, Marin, 2014), (Acemoglu, Ozdaglar, Tahbaz-Salehi, 2015), (Tente, von Westernhagen, Slopek, 2019), (Duprey, Ueberfeldt, 2020), (Meuleman, Vennet, 2020), (Fatica, Heynderickx, Andrea, 2020). Each of them justify an own quantitative measure of the systemic risk. In essence they are similar in a way that they measure the financial actors' interconnectedness. The employed tools include centrality measures, Shapley vector etc.

The key implication here is that the systemic risk is only proxied. The cause of such an approach is that we cannot explicitly observe the systemic risk. We will explain later how to handle this properly if ever possible.

Current Systemic Risk Regulation

The banking regulation with respect to the systemic risk departs from the theoretical findings on the interconnectedness and the "too big to fail" anti-concept. This means that conceptually the larger the financial institution is; the more it transacts with other actors; the more jurisdictions it covers; the more systemic risk it bears; the more systemically important (SI) it is considered. This is a concise idea of the assessment methodology adopted by the Basel Committee (BCBS, 2014b). As a result, the regulator annually reviews the composition of the SI list. As of end 2019, there are 30 global systemically important banks world-wide (FSB, 2019).

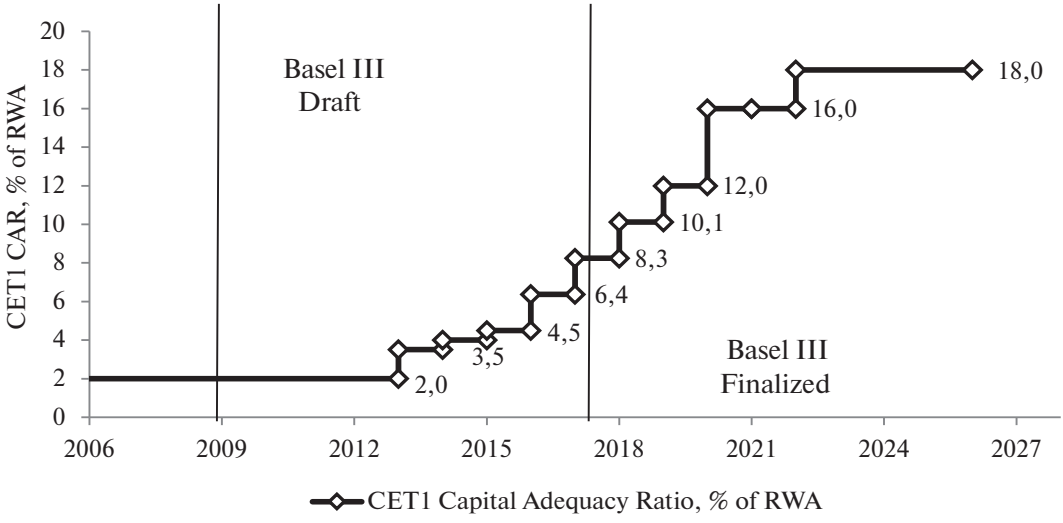

Fig. 2. The Minimum CAR Level Rose Nine Times in 15 Years

Note: common equity tier-one (CET1) capital as a percent of risk-weighted assets (RWA) was 2% during the Basel II era of 2004–2006 (Caruana, 2010). Basel III required banks to raise it to at least 4.5 percent and to 12 percent with all three capital buffers fully phased in (BCBS, 2009c). Later a new capital level was introduced, known as total loss absorbing capacity (TLAC). It required raising the capital base to 18 percent of RWA (BCBS, 2016a, p. 10).

The more systemically important the bank is, the more the regulator decides to limit its activities. To do so, the Basel Committee prescribes more elevated minimum levels for a prudential capital ratio (CAR) for such banks. Simplistically, the ratio benchmarks the banks' own funds to the amount of risks taken. The larger the ratio that the bank attains, the less amount of loans the bank may grant. As a response to 2007–2009 crisis, the regulator augmented the minimum ratio level from 2% to 18% for SI banks, see Figure 2.

As we already said, we cannot evaluate whether the introduced systemic risk regulation was efficient in curbing systemic risk or not. We cannot robustly do this in the absence of the control observations for the same time and jurisdictions. However, several authors claim that the regulation failed. For instance, (Moosa, 2010), (Dewatripont, Rochet, Tirole, 2010, pp. 53, footnote 83), (Lall, 2012), (Cathcart, El-jahel, Jabbour, 2017).

To counter-balance we may once again refer to Figure 1. As we calculated, the systemic risk did not rise as much in 2020 in the presence of regulation, as it was in its absence in 2007–2009. Besides, we may hypothesize that the systemic risk could have been larger in 2020 in the absence of the discussed regulation.

The key implication here is that we cannot evaluate the systemic risk regulation efficiency properly. Thus, we can neither agree, nor disagree with (Pettifor, 2020) claim that we need the regulation revision.

Systemic Risk Regulation Options

Above we attempted to explain that we cannot observe the systemic risk by itself and we cannot robustly evaluate the efficiency of its regulation. Nevertheless, there are options discussed in the literature on how to alternatively regulate the systemic risk. Those originate from the 2007–2009 crisis experience. There are two streams: legal and taxing ones.

First, (Liikanen, 2012) suggested restoring the separation of banks on the corporate banks and the investment ones. He argued that this should help in the systemic risk reduction. Thus, he claimed for the revival of the Glass-Steagall Act. Interestingly, the US researchers indirectly support his proposal (Ludwig, Monge-Naranjo, Slavik, Sohail, 2020). Their rationale is that the Act abolishment in 1999 led to a negative consequence at the economy level. It implied a significant increase in the income inequality distribution.

Second, (ECB, 2010) proposed to tax banks for the systemic risk. The taxing rule is simple in concept. The larger the bank's contribution to the systemic risk is, the larger the tax payment is. (Poledna, Bochmann, Thurner, 2017) and (Ordoñez, 2018) extend this idea. For instance, (Poledna, Bochmann, Thurner, 2017) argue that such a tax is more efficient than the above described capital ratio minimum requirement augmentation. (Ordoñez, 2018) elaborates on the idea when there is a shadow banking area in the economy.

When thinking of these alternative regulatory options, we need to remember the following. To properly incentivize banks, we need to correctly evaluate the systemic risk and contribution to it, respectively.

However, we remember that we cannot observe the systemic risk by itself. That is why we switch to discussing the two domains that deal with the unobserved indicators. Such domains are the institutional analysis and development (IAD) and the natural monopoly regulation. Let us explain why these domains are important when dealing with the systemic risk.

2.2. Systemic Risk as a Public Bad

The foundation of the IAD is the goods topology, see Table 1. (Ostrom, Ostrom, 1977) first introduced it. The idea is to map all the goods (or bads) into a two-dimensional space. (Ostrom, 2009) gives the examples of each cell goods' types. For instance, she brings peace, security, national defense, knowledge as the pure public good examples.

We wish to focus on the pure public goods. Look at the peace and security concept. It is quite similar to the notion of the financial stability in banking. Actually, several people with no direct reference to this goods' typology also called the financial stability a public good, see (Camdessus, 1999), (Shirakawa, 2012), (Demetriades, 2012), (Pettifor, 2020). The systemic risk is an opposite concept to financial stability. If the latter is the public good, then the former is the public bad.

There is a particular feature of the presented goods topology that is not explicitly discussed by (Ostrom E., 2009). The drastic difference of the pure public goods is that they are intangible and immeasurable. Take peace as an example. We may use a proxy indicator for it. For instance, it may be the number of war conflicts in the particular geographic area. Alternatively, we may ask the expert panel to rank the regions by the degree of peace. However, all these approaches deliver us the peace proxies. The peace itself is felt, but is not observed.

Table 1

Original Goods' Topology Accepted in IAD.

		Subtractability of Use	
		high	low
Non-Excludability	high	Common-pool resource	[Pure] public good
	low	[pure] private good	Club good

Source: (Ostrom, 2009, p. 413).

Now recall that the systemic risk is a public bad. The reader may easily trace how perfectly it fits the above topology. Primarily, this is due to the same discussed feature. The systemic risk by its nature is intangible, though its realizations are quite tangible.

Key implication here is that we do not observe the systemic risk by itself. Thus it is a stylized example of the public bad. To design the optimal regulatory framework for it we need to review another domain that actually handles or regulates the public bad.

2.3. Natural Monopoly Regulation

The natural monopoly is the name originally given to a single entity in the economy that produces the natural resource (Berg, 2008). Being a monopoly, it tends to establish the non-competitive price levels. Conventionally it implies the consumer welfare deterioration also known as the dead-weight loss.

The governments wish to achieve the competitive price levels and restore the welfare loss. However, the wide-spread anti-trust solutions are non-applicable because of the production process specifics. This means that the regulator cannot break down the company into smaller entities. A canonical reason might be the case that there is only a single oil well, for example. This implies the need for the government to co-exist with the natural monopoly.

Then the regulator decides to introduce restrictions to its activities. However, there is another challenge also. The regulator knows that the price equals to marginal costs when there is perfect competition. Then the regular has to be knowledgeable of the true costs to request the natural monopoly to set the competitive prices. But those are hidden within the natural monopoly. The novelty of Tirole was the justification for the regulatory framework in such a case (Tirole, 2014). He explained that when the costs are unobservable, the second-best solution is to request the natural monopoly to consequently decrease its retail prices. From one side, when such a rule is a long-lasting one, the monopoly may adjust to its benefit. It may raise efficiency to earn profit even when the output tariffs gradually decrease. From another side, the consumers also benefit by paying lower prices all else being equal. The interested reader may refer to the extended review of such regulations by (Joskow, 2014). The (Avdasheva, Orloba, 2020) evaluate such regulation efficiency for the case of the Russian electricity market.

Still there are opponents to the natural monopoly regulations. For instance, (Posner, 1999) thinks that it does not pay off and should be abolished. In contrast to him, (Avdasheva, Shastitko, 2005, p. 32, par. 3) argue that the entire abandonment is not a remedy. At worst the regulation should be superseded by another one that distorts incentives to a lesser extent.

Key implication here is the existence of a workable solution to handle the public bad negative consequences. The idea originates from the natural monopolies regulation. It suggests requesting steady end tariffs' decrease to de-stimulate high costs incurred by a natural monopoly.

3. Conceptual Regulatory Framework

The key implications from the literature review are as follows. We agree that the systemic risk exists as a concept. Its realization may bring devastating consequences. To prevent those there is the existing regulation and the alternative proposals. However, all of them rely on the systemic risk proxy indicators. In the absence of the control observations, we fail to robustly evaluate the efficiency of the existing rules. For the fairness sake, there are two types of evidence. The first type indicate that it may be efficient, the alternative ones show the opposite. Same time we learned that there is already experience in handling the negative consequences of the unobserved events. The natural monopoly regulation suggests demanding the regular price decreases. Thus the entity is forced to work on the cost optimization. Consequently, it may still earn profit, whereas the end consumer benefits from the lower prices.

To properly transplant the derivations from the natural monopoly regulation we need to consider the following. We remind that the systemic risk is unobserved. However, we know that the more risks the bank takes on-board, the more risk augments entity-wise. When every systemically important bank acts in this way, the risk augments economy-wise. The obstacle here is that we cannot properly measure it. There are only rare its rare cases of its detrimental realizations at our disposal.

Thus, the natural monopoly regulation experience suggests us the following options. To regulate the risk-weights or the lending rates. If we wish the systemically important bank to permanently decrease risk-weights, it is likely to indirectly decrease the borrowers default probability. However, the risk-weight has the same shortcoming as the systemic risk does. We do not observe it. We derive it analytically from a model. When we change a model, the risk-weight estimate may change as well. Besides, we should recall the Volkswagen company scandal (Crete, 2016). The company manipulated software estimates to get its cars being sold to the US in larger quantities. This means when the regulation tackles the unobserved indicators, the indicator may be prone to manipulation. Of course, the observed indicators may be vulnerable to fraud actions too. We may recall the losses by the Barings Bank (1994) or by the Société Générale (2007). Nevertheless, the observed indicator seems a preferred option. That is why we focus on targeting lending rates and particularly on a rule requiring banks to steadily curb it. Here we illustrate the probable schedule for the illustrative purposes, see Figure 3. Particular calibration falls out of the paper scope.

We start asking banks to lower the loan price from time No. 9. The first decrease is by 5%, next year by 10% etc. The important point is that we do not ask for an absolute rate decrease. We suggest requiring the relative decrease. Then the rule is applicable forever, including in the times of the near zero interest rates.

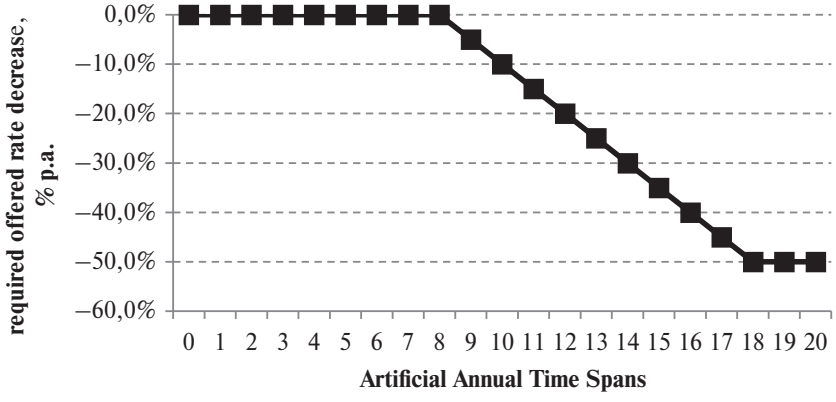

Fig. 3. The Regulatory Rule Is To Reduce the End Rate By the Predefined Per Cent As Scheduled Here.

Then our research objective is to benchmark the suggested regulatory rule against the existing one. The suggested one prescribes to regularly cut the lending rate. The existing one is the increase in the minimum capital ratio as depicted in Figure 2. We would prefer the option that results in lower probability of default for the approved bank borrowers.

4. Model Implications

We utilize the following model setting. When reviewing the banking economics and accounting, we see the bank strategy drivers. Then the following loan pricing rule of a typical bank applies (the interested reader may see the derivation details in the technical annex):

$$r_A = r_D + (ROE - r_D) \cdot CAR \cdot RW,$$

From the above formula we see that the larger the required capital ratio minimum (CAR) is, the larger the lending rate is (r_A). The larger the risk evaluation (the risk-weight, RW) is, the larger the end rate also is. This holds true given the same deposit rate (r_D) and the profit target (ROE). For calibration we take two profit targets: 10% and 20% p.a. as a share of the invested capital.

When thinking about the loan pricing and the lending market equilibrium properties, we should consider the two other facts. First, the larger the loan offered rate is, the less creditworthy borrowers come (Repullo, 2013). That is why the bank stops granting loans when the rate is exorbitantly high. As a result the loan supply curve is a backward bending (Freixas, Rochet, 2008, p. 174, fig. 5.2). Second, the risk measure depends upon the borrower's creditworthiness degree. Namely, upon its probability of default (PD). That is why we utilize the Basel Committee formula for the risk-weight, see (BCBS, 2019c, p. par. 31.4). For simplicity we assume common maturity of all loans. It equals to 2.5 years. The loss given default is 45% of the credit exposure amount. All loans are the standard corporate ones. The borrowers are the standard corporate firms, not SMEs. Third, for simplicity we take the probability of default equal to the bank lending rate. The rationale is as follows. The higher the lending rate is, the riskier the borrower has to be. This means that the borrower is more likely to earn more, as well as the same time he is more prone to default.

Let us look at the two forms of the visual representation. Figure 4 shows the relationship of changes in the capital ratio and the default probability of the borrowers. Figure 5 mirrors the dependence by benchmarking the offered loan rate to the average borrower PD.

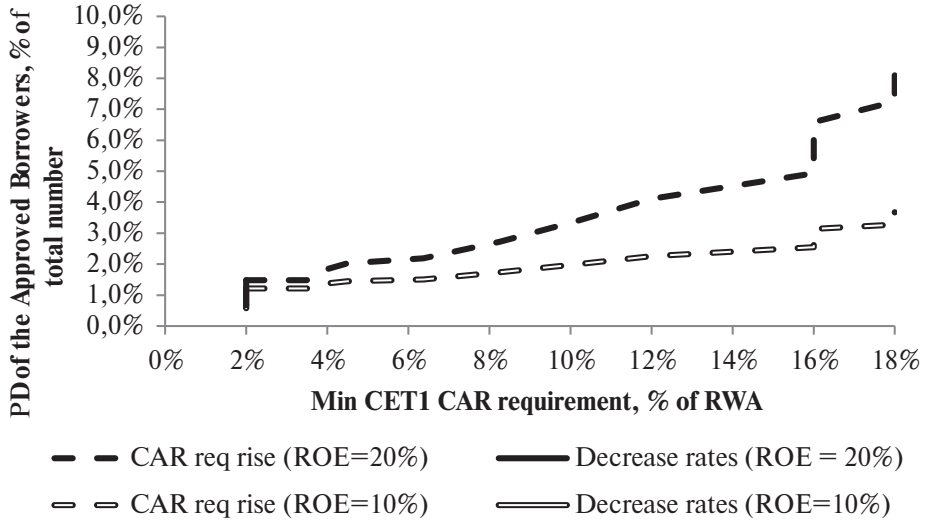

Figure 4. The larger The Capital Ratio Is, The Higher The Ultimate PD of the Borrowers Is.

We may see that the implication of the existing regulatory rule is the permanent rise in the lending rates and consequently the borrower PD. Specifically, the larger the ROE target of a bank is, the larger the growth in PD is. For instance, the end minimum requirement of 18% of the risk amount results in PD equal to 3.6% for ROE of 10% and in PD equal to 8.3% for ROE of 20%. The change in PD is non-linear in ROE. Of course, the bank shareholders may decide to downward adjust the profit targets. However, this may have a downward pressure on the bank valuations. The fall in the bank stock quotes may produce a cascade (contagion) effect. Then we will have another — earlier unforeseen — form of the systemic risk realization, i.e. the fire sales.

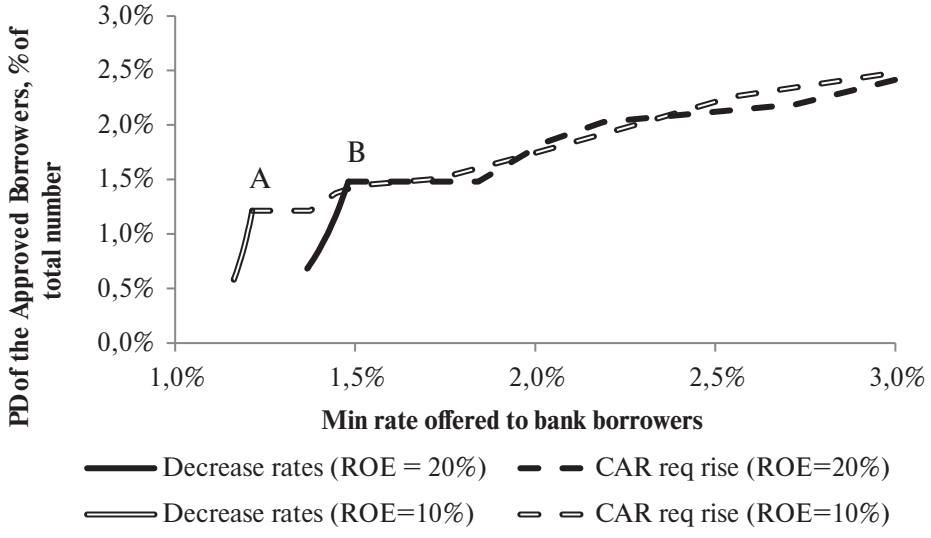

Fig. 5. Higher Lending Rates Imply More Borrowers With Higher Risk and Vice Versa

The suggested regulatory rule has advantages over the existing one. When implementing one, we do not embed the schedule of the capital ratio increase. As we may see from Figure 4, banks experience the decrease in the borrowers' default probabilities with no decreases in capital ratio requirements. This is a mere reflection of lending rate restriction, as may be seen from Figure 5. The difference in ROE targets imply different starting points. For instance, see point A for ROE equal to 10% and point B for ROE of 20% at Figure 5. The difference in ROE implies lending rate level variance, though it results in the comparable decrease of the end borrowers' default probabilities.

We have demonstrated that the banking economics implies banks to accumulate the total risks when the regulator asks to hold more and more capital as a proportion of risks taken. One of its reflections is the rise in the average borrowers' default probability. However, requesting for an alternative we end up with the lower risks. When banks are forced to decrease their lending rates all else being equal, they have to search for the more creditworthy borrowers to continue earning profits and not scoring losses. To generalize and implement the paper findings in the real life we should request the proportionate shrinkage in all the banking tariffs. This will assure us that the banks do not use cross-subsidies. This means that they do not reduce the tariffs for one product type, while raising it for the rest ones. For instance, to reduce the lending rates, but increase the deposit ones.

5. Discussion and Conclusions

The pandemic of 2020 is associated with the rise in the systemic risk proxy indicators. This is disregarding the presence of the systemic risk regulation. We have no control

data to evaluate the existing regulation efficiency. However, we may learn from the peer domains of the institutional economics and the industrial organization how to handle reduce the unobserved systemic risk. In order to do so, we should request the banks to permanently decrease the cost of their services, e.g., to decrease the lending rates and increase the deposit ones. In other words, make their tariffs lower and the products more affordable. We should apply these rules primarily to the systemically important banks.

5.1. IRB

Our findings have two distinct implications: for the banks with own models and for the insurance companies. We have demonstrated the benefits from the suggested regulatory framework over the existing approach using the assumption of the co-monotone dependence of the risk-weight and the default probability. This is definitely true for the banks using internal data and internal models. It is also known as the Internal-Ratings-Based (IRB) approach. When the bank uses the fixed risk-weights under the conventional standardized approach, such a rule may not yield the outcome as fast as expected. This is because the predefined risk-weight are less variable and there are 'cliff effects', i.e., there are discrete jumps between RW categories. Under the IRB those are smoother. That is why we may suggest the following two-step solution. First, the systemically important banks all transit to IRB. Second, all of them are subject to regulation and to regular price decreases' requirement.

5.2. G-SIIs

Above we talked on the economics of banking. We have demonstrated why the suggested framework prescribing decrease in the offered services' tariffs dominates the existing regulation with the regular rise in the capital ratio minimum requirement. Though we focused on banks, we may recall that the international regulators also delineated the globally systemically important financial institutions out of the insurance companies (FSB, 2016). Larger discussion on the identification can be found here (CIPR, 2021). However, our principal findings hold true for the insurance companies also. To reduce the systemic risks produced by them, the regulator has to request reducing the end services rates, i.e., the insurance premiums, primarily. Similar to IRB, the Solvency II accord promotes the use of own data and models. Thus, all the systemically important insurance companies should run Solvency II and be subject to requirement to decrease regularly their tariffs.

Technical Annex on Banking Prudential Accounting

A — total assets (we omit considering off-balance sheet items for simplicity of representation);

K — bank own funds (here we assume that equity equals core equity tier 1 capital), these are the funds that the shareholders wish to earn profits on. With respect to these funds they set ROE targets.

D — Deposits (we have no need to distinguish sight and time deposits here);

π — Bank's annual profit (we omit other income for simplicity);

ROE — Return on equity (for the simplicity of representation we omit time indicators remembering that proper return is this year profit over the end of last year equity; there are alternative benchmarks like the return over average equity; considering those does not change the principal findings). We consider ROE targets of 10% and 20%;

CAR — Capital adequacy ratio minimum prudential requirement (for representation simplicity we omit deducting expected losses from both the numerator and denominator as the key prudential regulatory rule is preserved);

RW — Risk-weight (the prudential measures of potential losses related to particular asset type); the risk-weight and asset product is called the risk-weighted assets (RWA).

r_A — lending rate, % p.a. We chose the values of 1.12% and 1.48% for ROE targets of 10% and 20%, respectively;

r_D — deposit rate, % p.a. For simplicity we set it equal to 1%.

O — other income and expense elements, including fee and commission income, trading gains, operational expenses;

Bank balance sheet composition:

$A = K + D$

$D = A - K$.

Bank profit decomposition:

$$\pi = r_A \cdot A - r_D \cdot D + O \approx r_A \cdot A - r_D \cdot D$$
$$\pi = r_A \cdot A - r_D \cdot D = r_A \cdot A - r_D \cdot (A - K) = (r_A - r_D) \cdot A + r_D \cdot K$$
$$\pi = (r_A - r_D) \cdot A + r_D \cdot K.$$

Rewrite the return on equity

$$ROE = \frac{\pi}{K}$$
$$ROE \cdot K = \pi.$$

Add to the ROE implication the bank profit decomposition:

$ROE \cdot K = (r_A - r_D) \cdot A + r_D \cdot K$

Derive the interest rate margin $(r_A - r_D)$:

$(r_A - r_D) \cdot A = ROE \cdot K - r_D \cdot K = (ROE - r_D) \cdot K$

$(r_A - r_D) \cdot A = (ROE - r_D) \cdot K$

$$\left(r_A - r_D\right) = \left(ROE - r_D\right) \cdot \frac{K}{A}.$$

The capital adequacy requirement is as follows:

$$\frac{K}{RWA} \geq CAR.$$

At worst to pass the prudential criteria the bank needs right the amount of capital equal to the prudential risk amount:

$$CAR = \frac{K}{RW \cdot A}.$$

Then we can derive the capital-to-asset ratio as follows:

$$CAR \cdot RW = \frac{K}{A}.$$

Now we join the interest rate margin representation and the capital-to-asset ratio:

$$\left(r_A - r_D\right) = \left(ROE - r_D\right) \cdot \frac{K}{A} = \left(ROE - r_D\right) \cdot CAR \cdot RW.$$

The final pricing equation for a bank loan is as follows:

$r_A = r_D + (ROE - r_D) \cdot CAR \cdot RW$.

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