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PERSPECTIVES

The Credit Suisse bailout in hindsight: not a bitter pill to swallow, but a case to follow

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Abstract

In March 2023, Credit Suisse (CS) was bailed out based on the implementation of emergency law to the exclusion of all shareholder rights of the involved banks, likely violating basic principles of monetary order. However, this paved the way for a support plan amounting to 209 billion Swiss francs and the implementation of a state-orchestrated emergency merger with UBS. By the end of August 2023, UBS had fully paid back the support plan and reported the biggest-ever quarterly profit for a bank, amounting to 29 billion US dollars. UBS also started to absorb CS's domestic business, thereby abandoning the branding of an institution with a history of 167 years. Popular accounts claim the plan could be considered a success and that there was no cost because the money was repaid. We critically evaluate the CS bailout, shedding light on key issues such as bailout-induced wealth transfers, the "too-big-to-fail" challenge, the likelihood of bank bailouts, the optimal level of bank equity, the doctrinal separation of solvency and liquidity, and the benefits of ex-ante market-based bank fragility indicators rather than *ex-post* accounting indicators. We infer a financial economist's perspective, in which supervision is expanded by *ex-ante* market-based risk indicators, unweighted capital ratios are increased to adequately reflect large bank risks, and *ex-ante* paid liquidity options are introduced. Finally, we call for a public debate on the willingness of taxpayers to implicitly finance the too-big-to-fail risk of large banks.

Keywords Bank · Bailout · Market indicators in regulation · Emergency liquidity provision · Bank systemic risk · Too-big-to-fail · Credit Suisse bailout

JEL Classification G01 · G21 · G28 · G38

During the press conference on August 11, 2023, related to UBS terminating the loss guarantee and public liquidity backstop, Federal Council Karin Keller-Sutter stated: "UBS made this decision on its own. But this termination is absolutely in the interest of the [Swiss] Confederation. I didn't like making this deal, but it was a bitter pill we had to swallow".

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1 Introduction

On March 19, 2023, the Swiss Federal Council (FC), the Swiss National Bank (SNB) and the Swiss Financial Market Supervisory Authority (FINMA), to whom we will refer collectively as the Swiss trinity,[1] undertook a joint rescue of Credit Suisse (CS) by orchestrating a merger with its domestic rival UBS Group AG (UBS). While most economists recognize a bailout when they see one, the trinity did not and touted this transaction as a "private solution". For the sake of brevity, and in line with our findings and conclusions, we like to think of this merger as a bailout. Lucas (2019, p. 87) defines a bailout as a transaction that "involves [1] a value transfer arising from a government subsidy or [2] an implicit guaranty that is triggered by financial distress, or a [3] value transfer arising from new legislation passed in response to financial distress". We will illustrate that the CS bailout fulfils all three elements of this definition.

The elements of the state-orchestrated merger between UBS and CS are well known and have been extensively discussed within the media.[2] The support plan substantially expanded the scope of the customary emergency liquidity assistance (ELA) in the amount of 50 billion (bn) Swiss francs, which was provided by the SNB on March 15. The latter was granted based on an existing legal framework and secured by first-class collateral, as required under the Guidelines of the SNB on Monetary Policy Instruments.[3] Enabled by emergency law, the Swiss trinity substantially enhanced the customary assistance and launched a support plan that entailed the following additional elements: (1) Access to supplementary emergency liquidity assistance (ELA+) in the amount of 100 bn Swiss francs (created on March 16) based on an emergency ordinance by the FC and approved by the Finance Delegation of the Federal Assembly on March 19, 2023. ELA+ allowed for emergency liquidity assistance without collateral being delivered, instead being secured by means of preferential rights in bankruptcy proceedings. (2) A public liquidity backstop (PLB), equally based on an emergency ordinance by the FC, was created on 16 March, which provided CS with additional access to liquidity of up to 100 bn Swiss francs. This SNB liquidity assistance had preferential rights in bankruptcy proceedings as well, but was otherwise fully secured by a federal guarantee. (3) Moreover, UBS received a federal government second-loss guarantee in the amount of 9 bn Swiss francs to enable UBS to take over CS and to hedge potential losses on a portfolio of difficult-to-assess CS assets. This second-loss guarantee would have taken effect only if UBS had actually incurred losses on the sale of these assets and if these losses had exceeded 5 bn Swiss francs. The second-loss guarantee was granted by the FC, which may decide on such commitments before they are approved by the

[1] We follow the Financial Times (FT), which uses this term in the March 20, 2023, article "How the Swiss 'trinity' forced UBS to save Credit Suisse.

[2] See https://www.snb.ch/en/mmr/speeches/id/ref_20230323_tjnmslamr/source/ref_20230323_tjnmslamr.en.pdf for the remarks by the Governing Board of the SNB that summarize the ELA+ and PLB in more detail.

[3] Richtlinien der Schweizerischen Nationalbank über das geldpolitische Instrumentarium, March 25, 2004 (as of May 5, 2023), Section 6.

Federal Assembly. This required, however, the approval of the Finance Delegation of the Federal Assembly, which was granted on March 19, 2023. When examining emergency credits, the Finance Delegation applies criteria such as legality, necessity, unpredictability and urgency. Obviously, the Finance Delegation's assessment led to the conclusion that these criteria were all met, allowing for extraordinary financial assistance totaling CHF 209 bn Swiss francs. This amount compares to CS's total outstanding deposits of around CHF 233 bn Swiss francs (as at the end of 2022).

The bailout of CS played out over only a few months. To recapitulate, on August 11, 2023, UBS had terminated the loss guarantee and PLB. By then, it had also paid back all emergency loans. Karin Keller-Sutter, FC and finance minister masterminding the rescue of CS commented: "As of today, the federal government and thus the taxpayers no longer bear any risk with regard to the state guarantee. This also renders the emergency law irrelevant". Only a few days later, on August 31, UBS reported the biggest-ever quarterly profit for a bank—recording a $29 bn Swiss franc gain directly linked to the bailout and its takeover of CS. Since rescuing CS in March, UBS shares have risen nearly 40 per cent, while the Euro Stoxx Banks index, which tracks European lenders, increased by only 16 per cent over the same period. At this point, UBS had already started to absorb CS's domestic business, thereby terminating a brand that dates back 167 years. For the first time, two Global Systemically Important Banks (G-SIBs) were merged.

So why all the excitement? Given the magnitude of this merger, the surprisingly short transition from the first announcement to consummation, and the realization of a record gain by the acquirer, it is perhaps inevitable that we should seek to shed light on some key questions surrounding this merger. What were the economic costs? Was this bailout unpredictable, or was the existing bank failure prediction model insufficient? Are there instruments in place to identify such high-probability bank failures *ex-ante*? How can the risk of bank liquidity shortages be at least partially mitigated? We revisit these and other questions from an economist's perspective.[4]

First, we shed light on the likely causes of CS's bank stress. Was it caused by a capital shortfall within CS; the spillover of the regional banking crisis induced by the Silicon Valley Bank (SVB) to Switzerland; or was CS's bank stress caused by a loss of faith in the institution which resulted in a bank run in the sense of Diamond and Dybvig (1983) and Diamond (2007)? *Second*, we evaluate whether the "zero-risk" and "-cost" assessment of the FC conform to an economist's analysis. *Third*, we provide a perspective on the wealth effects of this merger: Who are the winners and losers from this event? The shareholders of UBS or CS, or the bondholders of either bank? We also assess some key transactional questions related to the merger. For example, we discuss the potential reasons for the Swiss trinity seeking to limit the number of bidders involved in this merger, thereby eliminating the "winner's curse effect" in the sense of Roll (1986) and thereby potentially causing a loss to

[4] Our article represents our *perspectives*. While we base our perspectives on empirical facts wherever possible, they may be subjective, and—given the timeliness of our article—must not be confused with an empirical analysis.

CS shareholders. *Fourth*, we ask the question of whether the merger resulted in the creation of a "monster bank"—an expression widely used by both economists and journalists—to describe the merged UBS and CS entities. The controversy in this respect is driven by a variety of perspectives. For example, Sergio Ermotti, who was brought back as CEO of UBS in March 2023, only days after it rescued CS, stated: "For me, the debate nowadays is not 'too-big-to-fail' but 'too-small-to-survive'—and we want to be a winner".[5]

We seek to illuminate the "too-big-to-fail" (TBTF) versus "too-small-to-survive" issue from a financial economist's standpoint. *Fifth,* we show that substantial capital losses are common in the banking sector, making a medium-term necessity for a UBS/CS bailout likely. *Sixth*, we discuss the optimal level of bank equity in a consolidating industry and argue that what is good for bankers is not always good for the economy. Centrally, we argue and illustrate that the weighted average cost of capital (WACC) cost of banks should increase only marginally when equity capital ratios are increased. *Seventh*, we argue that the CS support plan has violated basic principles of monetary order. *Eighth*, we discuss whether the doctrinal separation of capital and liquidity constraints is of practical use when it comes to rescuing banks in a crisis. We instead consider what we term "*ex-ante* liquidity options" to increase financial stability and to transfer some of the TBTF costs from the taxpayer to the banking system. *Finally*, we conclude Sect. 2 by providing evidence that market-based indicators responded at an early stage to the changing financial status of CS. We argue that it would be purposeful to extend the banking supervision framework by *ex-ante* market-based bank fragility indicators, rather than focusing largely on *ex-post* capital adequacy, asset quality, management quality, earnings, and liquidity (CAMEL) requirements.

In Sect. 3 of our paper, we provide a simplified holistic financial economist's perspective on this merger, which is, to the best of our knowledge, still absent today. We acknowledge that our perspective arises from judgement and experience, rather than from analytically sophisticated models or case-specific empirical analysis. We thus echo Rodrik (2015) who asserts that "Relevance does not require complexity, and complexity may impede relevance". In this vein, we provide a simple though, in our opinion, indispensable financial economist's perspective to identify those areas that deserve a more in-depth search for facts, the development of models that reject or support our proposals, and which allow financial economists to accumulate more knowledge with respect to bank regulation. In this sense, our paper provides both input to, and proposals for, necessary reforms. These can be summarized as follows:

First, we propose the introduction of an expanded regulatory mandate for G-SIBs, enriched by *ex-ante* market-based risk indicators, which should oblige FINMA to intervene once pre-defined thresholds are reached. *Second*, we advocate a substantial raise of equity capital for G-SIBs to adequately reflect the level of large bank's risk and to reduce moral hazard arising from implicit TBTF guarantees associated with regulatory minimum capital. *Third*, we argue that the doctrinal separation of capital and liquidity requirements and constraints is of little practical use when it comes to

[5] Quote: press conference of UBS on 29 March 2023, as reported by Associated Press in the article: "UBS brings back Ermotti as CEO with Credit Suisse deal ahead".

rescuing banks in a crisis. We, therefore, suggest that access to emergency liquidity must be contracted with central banks *ex-ante*, at a juncture where solvency is not yet an issue, at market conditions, including the payment of an option premium. In other words, we suggest introducing *ex-ante* priced and paid liquidity options. The size of the merged CS-UBS entity represents a lump sum risk in the event of failure, one that cannot be bailed out by Switzerland at reasonable economic cost. Such *ex-ante* priced and paid liquidity options are not only suitable to arrange for emergency liquidity *ex-ante*, but they may also reduce banks' risk-taking. Moreover, they partially compensate the taxpayer for implicit and oversized TBTF guarantees. *Fourth*, we call for a public debate over whether the Swiss taxpayers accept their inherent financial commitment towards UBS or, more generally, G-SIBs of this size.

Our proposals may also be informative to the Parliamentary Investigation Commission,[6] which is currently inquiring about the management of the FC, the Federal Administration, and other holders of federal tasks in connection with the merger.[7] This commission is legitimized and obliged by the letter of the law to ask (some of) the critical questions that we develop in this paper.

2 Key considerations of the CS bailout

2.1 Considerations of the likely causes for the CS bank run, and how it differs from preceding U.S. bailouts

An important function of banks is to create liquidity by offering deposits that are more liquid than the assets that they hold (Diamond and Dybvig 1983). This liquidity mismatch subjects banks to bank runs, especially if depositors lose their faith in banks (Diamond 2007). The UBS/CS merger is the consequence of such a bank run. However, it differs substantially from what was observed in March 2023 in the USA when SVB, Signature Bank, and the First Republic Bank were confronted with runs as depositors lost confidence in these banks' business collective model (i.e. taking deposits at low rates and investing the proceeds in long-term assets and risky securities to generate a term spread). Presumably, banks in the USA ran into trouble due to losses on their fixed-income security holdings and fixed-rate loans induced by rising interest rates (see Acharya et al. 2023). The latter followed a steep climb, which began at the end of March 2022 and reached a relatively high level in March 2023 when these US regional banks collapsed. For example, the Secured Overnight Financing Rate (SOFR), which is a broad measure of the cost of borrowing cash overnight collateralized by Treasury securities, rose by a substantial 4.5% from 0.3 to 4.8% during this period. This rate increase induced significant losses on bank assets and led to large capital shortfalls. This, in turn, led to potentially large losses for uninsured depositors. A bank run followed which was, to a large extent, induced by *changing macroeconomic conditions*.

[6] Translation of «Parlamentarische Untersuchungskommission» (PUK).

[7] See https://www.fedlex.admin.ch/eli/fga/2023/1366/de for the decision of the Swiss parliament of May 30, 2023.

The CS bank run differs substantially from the US liquidity crisis in that it was triggered by *idiosyncratic mismanagement* rather than by a change in macroeconomic conditions. A series of events had eroded CS's reputational capital over a period of approximately two years preceding the run.[8] Figure 1 shows a timeline of these events, beginning in January 2021 and culminating in the CS bailout. We show the market capitalizations of CS (red line) and its Swiss rival, UBS (black line), both indexed to January 1st, 2023.

The series of events began with (i) a spying scandal in February 2020, coinciding with the outbreak of the COVID-19 pandemic, followed by (ii) the collapse of Greensill Capital; (iii) losses related to the Archegos Capital Management scandal; (iv) dealings related to loans to state-owned companies in Mozambique involving CS kickbacks to bankers and government officials; (v) a global media investigation based on data leaks that involved more than 18,000 bank accounts which provided some evidence of trafficking, corruption, and money laundering involving CS; (vi) the Ivanishvili scandal; (vii) a money laundering scandal on behalf of a Bulgarian cocaine-trafficking ring; (viii) the announcement of a plan to cut 9000 jobs in what Bloomberg described as "Capital After Wild Ride".[9] Despite these scandals, CS was nonetheless able to raise four billion Swiss francs through a fully underwritten rights issue and a private placement to the Saudi National Bank. Only shortly thereafter, however, CS (ix) reported a record loss of 7.3 bn Swiss francs which was paralleled by (x) substantial customer outflows and a reduction of assets under management (AuM) equating to between 20 and 25% in the fourth quarter of 2022. In response, (xi) a longtime CS shareholder (Harris Associates) sold out of the bank. At this point, a bank run was just around the corner: the (xii) delay of CS's annual report in response to a request by the U.S. Securities and Exchange Commission (SEC) on March 8, whereby (xiii) CS admitting "material weaknesses" in its financial controls on March 14, followed by the (xiv) "absolutely not" statement of the Chairman of Saudi National Bank of March 15 when asked by a journalist if they would offer additional financial support to CS, if needed, and (xv) the information disclosed on March 16 that CS needed to borrow up to 50 bn Swiss francs from SNB, subject to the ELA programme, to shore up its liquidity and boost investor confidence.

While banks in the USA ran into trouble due to changing macroeconomic conditions (specifically losses on their fixed-income security holdings and fixed-rate loans induced by rising interest rates), the CS bank run and subsequent bailout followed a series of idiosyncratic events all of which were facilitated by CS's mismanagement.

2.2 Considerations on the "zero-risk and zero-cost" assessment of the Federal Council

On 11 August 2023, UBS terminated the 9 bn Swiss francs loss guarantee and a PLB of up to 100 bn Swiss francs. By then, it had also paid back emergency loans in the maximum amount of up to 100 bn Swiss francs. On the same day, the FC

[8] See Böni et al. (2023) for a more detailed description of these events.

[9] See https://www.bloomberg.com/news/articles/2022-12-08/credit-suisse-investors-take-up-98-of-shares-in-rights-offer#xj4y7vzkg

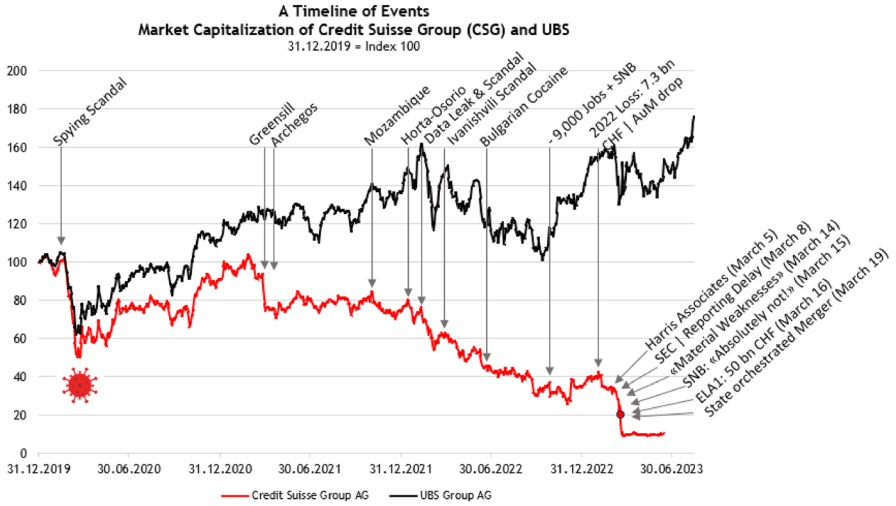

Fig. 1 Credit Suisse: Timeline of events. This figure displays the market capitalization of Credit Suisse Group (CSG) and UBS from 31 December 2019 to 30 June 2023, normalized to the starting date, along with the major firm-specific CS events

claimed that there was no cost associated with the merger because the money had been repaid and Switzerland earned receipts of around 200 million Swiss francs on the guarantees. The FC also stated that the "Confederation and taxpayers will no longer bear any risks arising from these guarantees".[10]

While this may be a popular account of the bailout, we believe that it severely understates its true economic costs. More thorough assessments of bank bailouts were provided after the Global Financial Crisis (GFC) by Veronesi and Zingales (2010), Calomiris and Khan (2015), McDonald and Paulson (2015), and Lucas (2019), and others. What these studies all have in common, is that they assessed the true economic costs of bank bailouts based on the full distribution of possible future cash flows to and from the government (i.e. the taxpayer); that they consider the time value of money; and also the cost of the associated risks. These studies conclude that the true economic costs of bank bailouts are substantially larger than the cash transfers involved and that the actual economic costs typically run into trillions of dollars as they involve wealth transfers from taxpayers to bank claim holders. They stand in sharp contrast to popular accounts that use a simplistic *ex-post* cash viewpoint. As we go on to illustrate in the next section, wealth transfers from taxpayers to bank claim holders have also likely occurred in the context of the CS bailout.

[10] See media release dated August 11 of the FC here: https://www.admin.ch/gov/en/start/documentation/media-releases.msg-id-97300.html

2.3 Considerations on the bailout-induced costs and benefits accruing to stock and bondholders of UBS and CS

Böni et al. (2023) evaluate the direct costs and benefits accruing to the stock and bondholders of UBS and CS using event study methodology. Their results are summarized in Fig. 2 and reveal an important net stakeholder wealth arising from significant cumulative abnormal returns (CAR) over a two-day period. The merger-induced net combined wealth increase amounted to a significant 19.5 bn US dollars (USD) and accrued to CS bondholders and UBS stockholders, while no abnormal returns accrued to UBS bondholders. The combined net wealth increase comprised gains to CS bondholders and UBS stockholders, who experienced a wealth increase of 22.7 bn USD and 5.1 bn USD, respectively, and losses to CS stockholders and AT1 bondholders, who experienced a wealth decrease of −4.4 bn and −3.9 bn USD, respectively. Apparently, this combined stakeholder wealth increase was not borne by any of the bank's shareholders or bondholders and was therefore likely created at the expense of Swiss taxpayers.

Analysing the wealth effects of this merger provides a first indication that its true economic value was largely underestimated by the FC's "zero risk and "cost assessment". From an economist's perspective, the question arises as to who financed these large-scale wealth transfers. As Fig. 2 shows, the abnormal wealth increases of CS bondholders and UBS stockholders cannot fully be explained by the commensurate wealth decreases of any other investor related to the merger. Therefore, it appears plausible that a risk transfer from the involved bank stakeholders to the taxpayer has taken place (i.e. that implicit TBTF guarantees by the state (taxpayer) decreased the risk to investors, thereby leading to an increase in CS bond prices and UBS stock prices). To provide anecdotal evidence for our conjecture, Veronesi and Zingales (2010) showed that recipient bank shareholders and bondholders realized substantial gains from government bailout programmes effected during the GFC.

Yet there are further questions related to the orchestration of this merger and the resulting wealth transfers. Is the takeover return accruing to UBS stockholders altogether surprising? Why was UBS the only bank invited to pitch for CS? Based on extant academic literature, Böni et al. (2023) suggest that the bulk of positive takeover returns typically accrue to the stockholders of the target firm and not the acquiring firm. It can thus be said that the wealth transfers in the UBS/CS case are atypical. They conclude that reducing the number of bidders in this transaction may have reduced the bid price for CS shares in the sense of Roll's (1986) "winner's curse hypothesis". They also point to the fact that there were 23 global systemically important banks (G-SIBs) larger than UBS which could have participated in such an auction. Moreover, there was enough time to involve multiple bidders, as the Swiss government was involved in active merger talks with both UBS and CS as early as December 2022.

While it is not a surprise that politically connected firms are more likely to receive support and government funds in case of distress (see, for example, Faccio et al. 2006; Duchin and Sosyura 2012), prior research has shown that connections between firms and regulators are associated with distortions in investment efficiency, at the public expense, and with a significant increase in risk-taking by

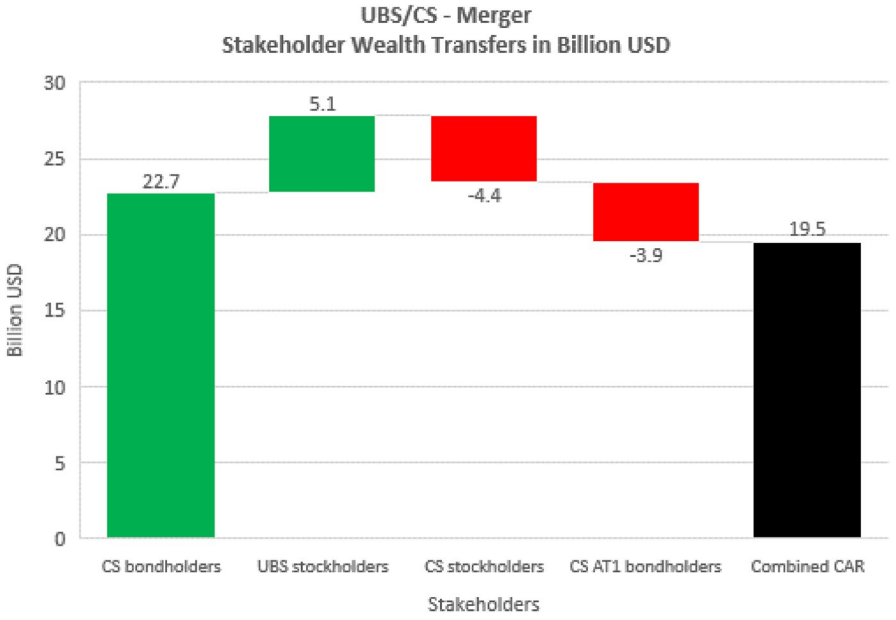

Fig. 2 UBS/CS merger: Stakeholder wealth transfers, in billion USD. This figure is adapted from Böni et al. (2023). It shows cumulative abnormal returns accruing to the stakeholders of UBS and CS over a two-day event window (i.e. the UBS/CS merger-induced wealth effects, presented in bn USD)

recipient banks (see Duchin and Sosyura 2012, 2014). Notwithstanding, the Swiss government decided to limit this merger negotiation to one bidder, UBS, and this likely influenced the price offered by the acquirer.

2.4 Considerations on the creation of a new too-big-to-fail (TBTF) "monster bank"

Monitoring complex financial conglomerates is associated with intensified agency problems which reduce value and increase risk (Laeven and Levine 2007). For example, Afonso et al. (2014) show that banks have higher levels of impaired loans after an increase in government support due to moral hazard derived from implicit TBTF guarantees. In the same vein, Duchin and Sosyura (2014) establish that government bank bailouts adversely affect the risk-taking of banks, initiating riskier loans and shifting assets towards riskier securities in the aftermath of government assistance. Government guarantees thus appear to favour the wealth of equity holders (O'Hara and Shaw 1990) and bondholders (Penas and Unal 2004), ultimately at the expense of taxpayers.

In addition to moral hazard problems, larger banking institutions also experience substantially higher operational losses due to increased complexity and the need to innovate (see Curti et al. 2022). According to their findings, when sorting bank

holding companies into terciles based on total assets (small, medium, and large), the average ratio of losses to total assets for large banks is approximately twice as large as that of medium-sized and more than three times that of small banks. It is noteworthy, however, that bank size does not affect banks' risk-taking prior to the introduction of bank regulation. Braggion et al. (2017), who studied the impact of increasing bank concentration on bank loan contracts over the period from 1885 to 1925, find that, in a lightly regulated environment, higher market concentration, and thus implicitly size, is positively associated with higher bank loan quality. We infer from this that size is above all a problem when it is associated with implicit TBTF guarantees and moral hazard.

An additional complicating factor is that the operational risk of large banks is not only an idiosyncratic problem. Rather, it has systemic implications and threatens financial stability. Operational losses of large banks may affect multiple institutions simultaneously and increase the systemic risk of the banking sector as a whole (see Berger et al. 2022). State-orchestrated bailout mergers are thus prone to amplifying problems associated with moral hazard (implicit TBTF guarantees) and compound the likelihood of operational losses through increased systemic risk.

We use the systemic risk measure (SRISK) as devised by Acharya et al. (2012) and further refined by Brownlees and Engle (2017),[11] to further assess the bailout-merger and answer the question, whether Switzerland could bail out UBS/CS in the future. SRISK is the expected capital shortfall of a bank conditional on a crisis at a given point in time. It determines a bank's contribution to systemic risk and measures how much capital a bank would need in a crisis to maintain a given capital-to-assets ratio. SRISK is regarded as proxy of a bank's contribution to the real-sector costs caused by its own under-capitalization in times of crisis, where the financial sector is under-capitalized as a whole. SRISK is measured using market data on equities and balance sheet data on liabilities, and constructed from size, leverage, and exposure to market risk, the latter based on the co-movements of firm equity value with broad equity market measures (beta), employing a generalized auto-regressive conditional heteroscedasticity or a GARCH model. Figure 3 shows the absolute and normalized systemic risk of UBS after the bailout-merger:

Figure 3A, shows the absolute SRISK of UBS/CS (in USD), conditional on a crisis implying a 40% share price reduction and assuming a 5.5% capital-to-assets ratio (8% for the USA), as compared to that of the largest banks in Italy (UniCredit), the Netherlands (ING), Canada (Toronto Dominion), Germany (Deutsche Bank), Spain (Santander), France (BNP Paribas), the United States (Citigroup) and Japan (Mitsubishi) using the pre-merger data from NYU's Volatility-Lab (April 2023). In absolute terms, the merged entity's SRISK amounts to approximately 60 bn USD, larger than that of the largest peers in Italy, the Netherlands and Canada. This is comparable to that of Germany, though smaller than those of the largest banks in Spain, France, the United States and Japan. However, as shown in Fig. 3B, when normalized by the gross national product (GNP), UBS/CS represents an unmatched SRISK, which amounts to approximately 7.5% of Switzerland's GNP. This SRISK

[11] This is updated daily and available freely on the home page of the Volatility and Risk Institute of New York University (V-Lab, NYU).

is more than ten times the normalized SRISK of the largest US bank (Citigroup) and approximately five times that of UniCredit or Deutsche Bank—larger than any SRISK observed in developed countries. Figure 3C shows the SRISK of UBS/CS normalized by banking sector SRISK as of April 2023. The SRISK of UBS/CS remains large and amounts to an approximate 5%.

To put this into perspective, under the US Emergency Stabilization Act of 2008 which created the Troubled Asset Relief Program (TARP) and Small Business Lending Fund,[12] the single largest bank bailout was that of JP Morgan Chase and Wells Fargo at 25 bn USD each, followed by Bank of America at 25 bn USD, and Morgan Stanley and Goldman Sachs at 10 bn USD each. While these infusions under the TARP were substantial in absolute terms, they were much smaller relative to the economic strength of the USA. TARP infusions, relative to the 2008 US gross domestic product (GDP) of 14.7 trillion USD, ranged from 0.06 to 0.17%, thereby representing a substantially smaller financial burden to the US taxpayer than a potential UBS/CS bailout to the Swiss taxpayer. Even the entire TARP capital purchase programme, which accounted for 178 bn USD (and which also bailed out more than 100 smaller banks), accounted for only 1.2% of the 2008 US GNP. Likewise, the bailout of the government-sponsored enterprises Fannie Mae and Freddie Mac, which comprised a cash-for-shares or preferred stock programme capped at 445 bn USD, amounted to only 3.0% of 2008 US GDP. The bailouts of Fannie Mae and Freddie Mac, while significant, were still much smaller relative to U.S. GDP than the 7.5% SRISK risk of UBS/CS relative to contemporary Swiss GDP (see Fig. 3B).

Acharya et al. (2012) argue that a key consideration in defining the appropriate capital level for an individual financial firm is the additional capital that is expected to need in the event of a crisis (capital shortfall). As we derive from Fig. 3, the capital shortfall of UBS/CS could, in a crisis, reach levels that would be very hard to fund via capital markets, especially if needed swiftly. For example, to the best of our knowledge, the largest ever realized initial public offering (IPO) was that of Saudi Aramco in 2019 (at USD 25.6 bn). The largest bank-seasoned equity offerings (SEOs) were observed throughout the GFC when banks recapitalized. The five largest bank transactions through to 2009 included those of the Royal Bank of Scotland in 2008 (USD 24.4 bn); the HSBC in 2009 (USD 19.4 bn); Fortis in 2007 (USD 19.3 bn); UBS in 2008 (USD 15.4 bn); and Credit Agricole in 2008 (USD 9.3 bn).[13] As these numbers illustrate, it is unlikely that the capital markets could easily, if at all, provide an equity increase (SEO) to fully re-establish the appropriate capital levels for UBS/CS. Considering this, it is likely that the state (taxpayer) will be asked to pay for any necessary recapitalization or, in other words, an implicit TBTF guarantee still exists.

[12] This paragraph draws on the numbers reported in Lucas (2019). See Calomiris & Khan (2015), McDonald & Paulson (2015), and Lucas (2019) for additional analyses of, and information related to the TARP.

[13] See https://www.statista.com/statistics/263289/largest-secondary-equity-offerings-of-all-time/

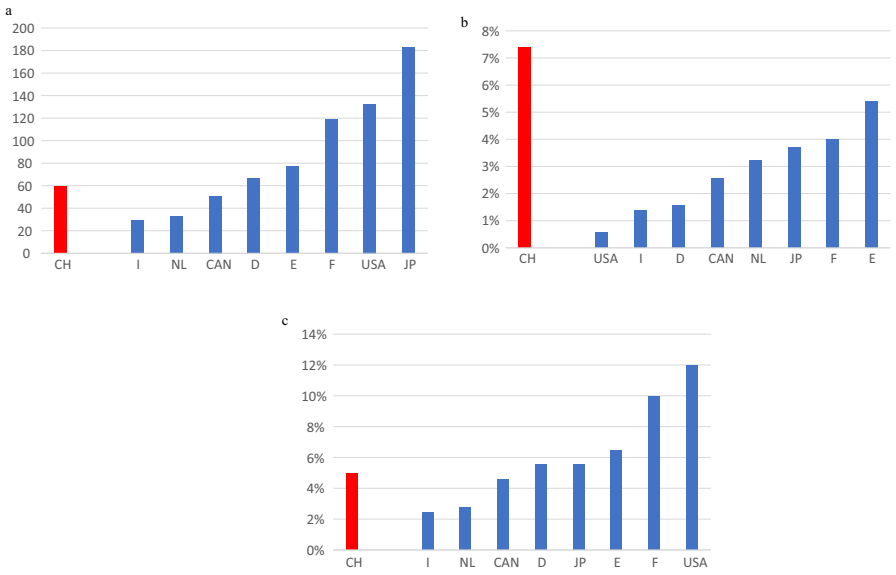

Fig. 3 **A** Systemic risk estimate of CS/UBS, in billion USD, compared to a country's largest bank for selected countries. Systemic risk (SRISK) is the conditional equity capital shortfall and measures how much recapitalization a bank would need in a crisis (i.e. a 40% global stock market decline) to maintain a given capital-to-assets ratio. Details are provided on the website V-Lab. Displayed is SRISK the respective biggest bank in each country (UBS/CS, UniCredit, ING, Toronto Dominion, Deutsche Bank, Santander, BNP Paribas, Citigroup, Mitsubishi UFJ). Data: April 2023, from V-Lab, Volatility and Risk Institute, Stern School, New York University. **B** Systemic risk estimate of CS/UBS combined, compared to the largest bank in selected countries, normalized by GDP. This figure displays systemic risk as measured by SRISK (see A) in relation to countries' GDP. Data: April 2023, from V-Lab, Volatility and Risk Institute, Stern School, New York University. **C** Systemic risk estimate for CS/UBS combined, compared to the largest bank in selected countries, normalized by the banking sector SRISK. This figure displays systemic risk as measured by SRISK (see A) as a percentage of the financial sector capital shortfall in the event of a crisis. Data: April 2023, from V-Lab, Volatility and Risk Institute, Stern School, New York University

2.5 Considerations on the likelihood of a future UBS/CS bailout

How likely is a drop of the market value of UBS/CS's equity by 40% throughout a general or banking crisis, rendering a recapitalization and a future bailout necessary? We use the results of Baron et al. (2021), who examined historical banking crises through the lens of bank equity declines for 46 countries during the period from 1870 to 2016 to answer this question. Based on their research, we provide the bank equity return index relative to its previous peak during banking crisis episodes for the countries included in our prior discussion. Figure 4 provides an overview of the peak-to-trough real total equity returns:

According to Baron et al. (2021), based on 59 banking crises, the expected (historical average) equity return through the crisis amounts to − 37.8%, with a standard deviation of 19.6%. The observed standard deviation indicates that, in the worst-case scenario, banking crises may be associated with substantially higher equity losses.

While the worst bank equity return index amounts to −81.4%, the best to −3.8%, the return index for Switzerland and the banking crises in 1870, 1919, 1931, 1990 and 2008 reveals equity returns in the amounts of −41.8%, −43.2%, −55.9%, −32.6% and −67.6%, or an average equity return of −48.2%. For the 59 crisis observations, the most frequently observed return (modus) and the median equity return amount to −41.8% and −37.1%, respectively. These numbers give credit to the SRISK model as described in Acharya et al. (2012) and Brownlees and Engle (2017), who use a crisis threshold of −40%.

We, therefore, conclude that, aside from the challenging size of the potential bailout, the historical frequency distribution of bank crisis equity returns evidenced by Baron et al. (2021) additionally provides alarming insight that the probability of a future bailout of UBS/CS becoming necessary is high.

2.6 Considerations on the optimal level of equity for bankers versus the optimal level of equity for the economy

It follows from the previous analysis that banking crises are the rule, rather than the exception. So why is it that shortcomings related to banking regulation prevail over such a long period? Shortly after the GFC of 2008, Admati and Hellwig (2014) addressed the fundamental conflict arising between what is good for bankers and what is best for the economy. They illustrated that high leverage is not necessarily a natural feature of a bank's business model, proposed that banks should be broken down into smaller units to reduce rescue costs as well as any potential burden to taxpayers, and discussed moral hazard problems inherent in the banking system, such as time horizon and compensation policy issues. The authors proposed a level of approximately 20 to 30% equity to total assets and claim that the failure to address the discussed shortcomings lies mainly with political dynamics.

Indeed, the capital adequacy rules for banks introduced in Switzerland in 1935 never required a level of 20–30% equity.[14] Rather, capital adequacy rules were, and still are, in conflict with scientific findings. The academic discussion about the optimal level of bank capital and reserves dates to the early contribution of Edgeworth (1888), which can be viewed as the methodological birth of statistical methods to determine the optimal safety level of banks. Academics, as well as practitioners, cared about optimal rather than maximal bank safety well ahead of the introduction of bank regulation. For example, before the introduction of capital adequacy rules, big banks held considerably more equity capital than cantonal banks or Raiffeisen banks. While this ratio was already reduced before the introduction of capital adequacy standards in 1935, it subsequently decreased continuously and converged between the different bank groups.

[14] In Switzerland, with the Implementation Directive (Vollzugsverordnung) of the Swiss Banking Act in 1935, Art. 12, a general capital requirement of 10% was required, except for cantonal banks, cooperatives and credit unions, as well as liabilities secured by domestic real estate collateral where a 5% rate applied. These capital standards were revised and differentiated with the Basel Capital Accords in 1988 (Basel I focusing credit risk), 2004 (Basel II focusing market risk and internal models) and 2010 (Basel III drawing lessons on the GFC).

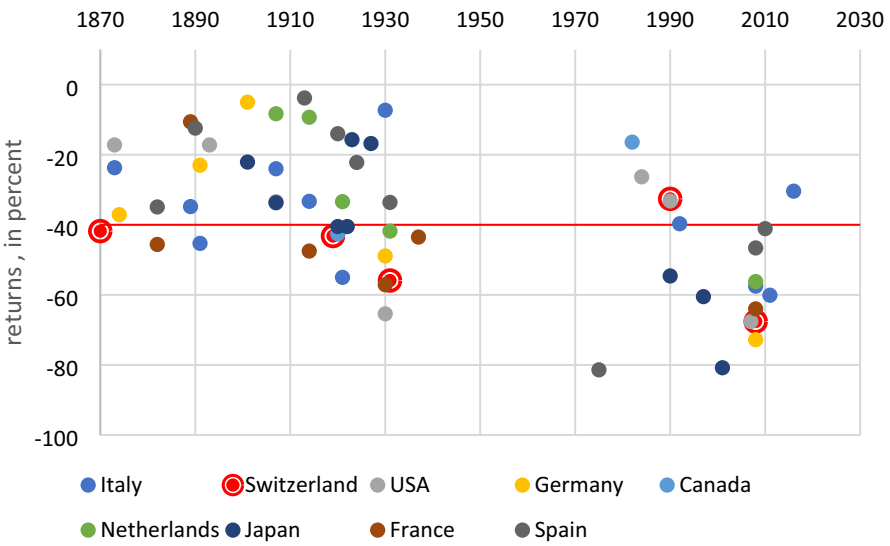

Fig. 4 Banking crisis episodes and equity returns, adapted from Baron et al. (2021). This figure shows banking crisis episodes over the period from 1870 to 2016 and bank equity returns calculated as peak-to-trough real total returns for each episode, in per cent, computed as the maximum cumulative decline (based on annual data) in the bank equity total return index for selected countries

Figure 5 shows the unweighted capital ratios of four major Swiss bank groups, namely large banks, cantonal banks, cooperative banks (Raiffeisen banks) and regional banks (from 1944).

Two key observations emerge. First, although initially higher than all other bank groups, the equity ratio of the large banks fell below that of the other banking groups in the 1990s and remains low to this day. No risk differentiation for systemic risk is evident. Second, while the introduction of unweighted capital requirements (leverage ratio) under Basel III slightly increased the level of equity, it has nonetheless remained well below the 10% level.

Several questions are compelled by these historical observations. How large must the necessary level of bank capital and reserves be to cushion them against illiquidity? Are larger banks intrinsically riskier? Should there be an additional capital requirement for larger, systemically relevant banks? Probability theory, rather than authoritarian solutions and regulation, provides answers to these questions. We follow the extensive statistical literature spurred by Edgeworth (1888) and an illustration from Zimmermann (2017 and 2023a, b) to shed light on these important questions. The model includes basic statistical concepts, such as correlation, volatility and beta for the following problem:

Assume an initial universe of 100 small, independent and unlevered banks which merge into larger units over time. The consolidated banking market then comprises fewer new banking units, each hosting some of the "old" banks although reorganized into new legal (merged) entities. How does this affect risk? Table 1 shows the effects of banks merging into larger units:

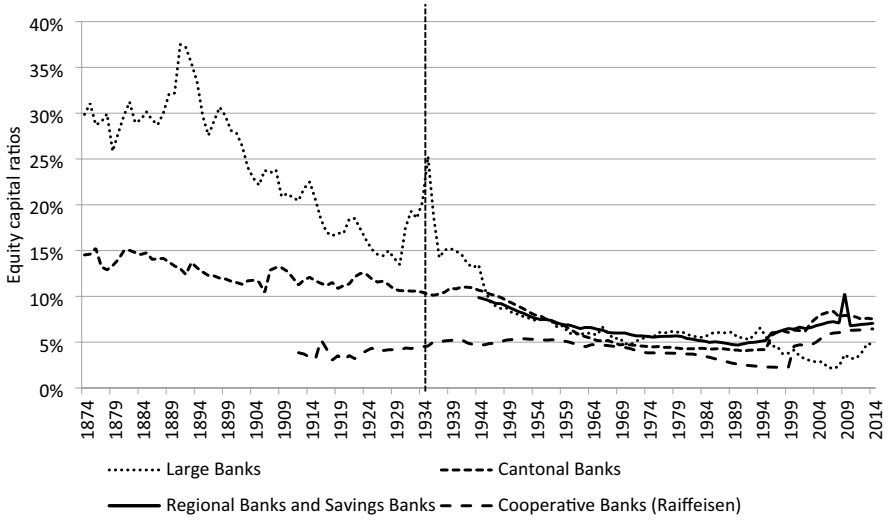

Fig. 5 Bank equity capital ratios for major banking groups, Switzerland, 1874–2014, adapted from Amrein (2017). The figure shows historical unweighted capital ratios of four major Swiss bank groups, namely large banks (lightly dotted), cantonal banks (narrowly dashed), regional banks & savings banks (solid line) as well as cooperative banks, the latter called "Raiffeisenbanken" (dashed). The vertical dotted line represents the year of the adoption of capital adequacy rules in Switzerland in 1935; notice that the peak of the curve is mainly related to the depreciation of assets after the outbreak of the Great Depression in 1929

Consolidating from 100 to 25 banks, for example, importantly affects key statistical parameters (compare column 3 to column 1). We initially look at the universe of 100 small unlevered banks, each exhibiting an asset volatility of 20% and a homogeneous mutual correlation of 0.3. Next, when they merge into larger units, each comprising four small banks, the volatility of each larger banking unit rises to 55% and, less intuitively, the mutual correlation amongst the larger banking entities increases to 0.63. Note that these figures do not neglect the "diversification" effect of the banks which is reflected in a low correlation coefficient. However, the issue in this example is about adding (partially uncorrelated) risks, thereby splitting capital across risks.[15]

How does this affect the systematic risk of the banks? Assuming a market beta of a small bank of 0.27 (based on a correlation with the market of 0.2 and a market volatility of 15%), this leads to four times the beta of the small bank (i.e. 1.08). This implies that a larger bank is riskier simply because of its size, as everything else remains equal. When we further relax the leverage assumption and stipulate that each small bank should have a capital ratio of 10% (ignoring taxes) and a levered equity beta of 2, leaving the capital ratio unchanged, the model beta of a single aggregate bank increases to 10.8. To bring the systematic risk down to the original value of 2 would require an increase in the capital ratio to around 50% ($=1.08*(1/0.5)$)! Of course, the target beta of 2 is arbitrary—in practice, it will be

[15] This distinction has been forcefully emphasized by Samuelson (1963) as "fallacy of large numbers".

Table 1 Numerical example of bank size, concentration, systematic risk, and CoE

		Size of aggregate (#of banks/aggregate)				
		1	2	4	5	10
Aggregates of banks	Correlation among aggregates	0.30	0.46	0.63	0.68	0.81
	Volatility of aggregates	20%	32%	55%	66%	122%
	Correlation with non-bank market segment (NBM)	0.2	0.25	0.29	0.30	0.33
Banking sector	Number of aggregates	100	50	25	20	10
	Volatility of equally weighted bank sector portfolio (BK)	11%	22%	44%	55%	111%
	Correlation of BK with NBM	0.36	0.36	0.36	0.36	0.36
Market portfolio	Volatility of implied market portfolio	13.40%	14.30%	16.40%	17.60%	24.30%
	Risk premium of market portfolio	3.4%	3.6%	4.1%	4.4%	6.1%
Banking sector	Correlation of BK sector with market portfolio	0.47	0.55	0.69	0.74	0.87
	Beta of BK sector	0.38	0.86	1.86	2.32	3.97
	Risk premium of BK sector	1.3%	3.1%	7.6%	10.2%	24.2%
	Total risk of BK sector	11%	22%	44%	55%	111%
	Systematic risk of BK sector	5%	12%	30%	41%	97%

This table is adapted from Zimmermann (2017) and the corrected Table 1 from Zimmermann (2023a, b). Table 1 shows a numerical example of the development of statistical properties under the following assumptions about the market portfolio: market share banking sector = 15%; volatility non-banking sector (NBM) = 15%; Sharpe ratio of market portfolio (market price of risk) = 0.25

generally accepted that larger banks are exposed to or else incur larger systematic risks.

This example serves to illustrate the need for larger capital requirements for systemically relevant banks—vis-à-vis G-SIBs which are more interrelated and constitute a larger systemic risk to society. Despite this, as we have shown in Fig. 5, no risk differentiation for systemic risk is evident. On the contrary, for some periods following the 2008 GFC, the big banks' equity ratio was significantly smaller than that of any other banking group. Our considerations lead to the obvious conclusion that G-SIBs should hold larger equity cushions to absorb shocks.

We are aware that bank industry representatives argue that equity capital increases are not viable, suggesting they are linearly and positively related to capital costs. They advocate that equity capital increases harm consumers, as banks would have to pass on their higher capital costs to them by, for instance, increasing interest rates on lending. However, we argue that this point of view has several flaws. *First*, an increase in equity capital lowers the investment risk of shareholders (i.e. the equity beta), thereby reducing the expected return in holding bank stocks and the cost of equity (CoE) of the bank. *Second*, the well-known Modigliani–Miller (MM) theorem implies that the value of the firm is invariant to its capital structure under a set of assumptions (i.e. no taxes, no bankruptcy or agency costs, independence of borrowing and lending policies, etc.). In other words, as more equity capital is used, the volatility of the return on that equity falls and the safety of the debt rises so that the required rate of return on both sources of funds falls. It does so in such a way that the weighted average cost of capital (WACC) remains unchanged. In short, the WACC should remain constant if equity (E) is substituted for debt (D) and vice versa. Therefore, the standard textbook WACC formula implies that the CoE decreases following an increase in bank equity and reflects just the change in the equity and debt capital ratios necessary to keep the WACC constant. WACC is the standard hurdle rate used in capital budgeting decisions and against which banks gauge the profitability of their investments, for example in terms of loans or mortgages. Based on MM, a decrease in the CoD implied by an equity capital increase may, therefore, partially or entirely outweigh the effect of the CoE component. It thus follows, from basic capital structure theory, that it is misleading to argue that an increase in equity capital increases "the" cost of capital. Rather, an increase in bank equity results in a reduction of the CoE and CoD. The overall effect on WACC depends on the relative size of the increase in the equity capital ratio, $E/(E+D)$, relative to the decrease in CoE and CoD.

This raises the question as to the validity of the MM theorem as our working hypothesis. A detailed post-GFC discussion on the MM theorem for banks, optimal bank capital, and the private vs. social cost of capital can be found in Miles et al. (2013). In line with our consideration, they state that (p. 5) "it is absolutely not self-evident that requiring banks to use more equity and less debt has to substantially increase their costs of funds and mean that they need to charge substantially more on loans to service the providers of their funds". Junge and Kugler (2013) provide further support for our conjecture. In their empirical analysis, they found a positive relation between bank leverage and systematic bank risk (equity beta) and showed that the MM theorem holds remarkably well. Coinciding with MM's capital

structure theory, they showed empirically that a decrease in leverage is associated with a decrease in the CoE, and that the implied effects on the WACC of banks are, under realistic market parameters and when doubling equity capital, only marginal.

It follows that the implicit causal claim made by banks, namely that the CoE is positively associated with an increase in equity, has fundamental flaws. From a financial economics perspective, the converse of the causal interpretation of an increase in bank equity holds true, i.e. that an increase in bank equity decreases risk and the CoE, only marginally affecting the WACC.

We next use Junge and Kugler's (2013) regression estimates to gauge the effects of a substantial increase in UBS's equity on its WACC.[16] According to the half-year 2023 report of UBS, the newly merged bank has a total equity of 87.64 bn Swiss francs. Relative to total liabilities and an equity of 1.68 trillion Swiss francs, this equates to a low 5.2% total equity ratio. Using the Junge and Kugler model, almost doubling the bank's equity to 10% (approximately 168 billion Swiss francs), increases the expected WACC fractionally by 0.13% from 2.13 to 2.26%. In absolute terms, the marginal cost of doubling UBS's equity, as proxied by the change in the WACC, thus amounts to a relatively low approximate of 218 Mio. Swiss francs. These costs must be set against the substantial benefits of preventing a banking crisis and the implicit costs to bank claim holders and taxpayers.

It appears to us that banks should use a more realistic and market-based approach to evaluate the expected effects of increasing their equity capital. We agree with Admati et al. (2013)[17] in the conviction that financial economist's quantitative models should serve as the foundations for the debate pertaining to the adequate level of bank equity. Against this background, it appears reasonable to us to contend that G-SIBs should substantially increase their equity capital to absorb shocks.

[16] See Junge and Kugler (2013) for a detailed description of their model and the associated empirical findings. We assume a CAPM-based cost of equity in the amount of 10%. This is in alignment with Altavilla et al. (2021), who have recently measured the cost of equity of Euro area banks, and with King (2009), who provides estimates of the inflation-adjusted cost of equity for banks over the period from 1990 to 2009. We use a market risk premium of 8.25% and a risk-free rate of 1.75%. Note that Junge and Kugler provide evidence that the irrelevance proposition of MM holds to a large extent. When we use their model, under the assumption that the irrelevance proposition does not hold at all, then the WACC increases from 2.13% by 0.35% to 2.48%. The debate, using this example, can thus be framed assuming an increase in the WACC of between zero (where MM holds perfectly) to a maximum of 0.35% (MM does not hold at all).

[17] On page 18, they state: "The assumptions underlying the Modigliani–Miller analysis are in fact the very same assumptions underlying the quantitative models that banks use to manage their risks, in particular, the risks in their trading books. Anyone who questions the empirical validity and relevance of an analysis that is based on these assumptions is implicitly questioning the reliability of these quantitative models and their adequacy for the uses to which they are put—including that of determining required capital under the model-based approach for market risks".

2.7 Considerations on emergency legislation and the violation of basic principles of monetary order

This bailout was a state-orchestrated exercise based on emergency legislation and is, therefore, questionable from the point of view of the rule of law.[18] It has not only infringed central shareholder rights, but likely resulted in a violation of fundamental principles of monetary order, namely the constitutionally guaranteed independence of the SNB. Article 6 of the Swiss National Bank Act foresees that "[i]n performing the monetary policy tasks […] the National Bank and the members of its bodies may neither seek, nor accept instructions from the FC, the Federal Assembly or other bodies". This principle explicitly prohibits SNB from accepting instructions from the FC. Nevertheless, the emergency legislation enacted to bail out CS[19] provides for the FC to determine the maximum amount of additional liquidity assistance loans that can be disbursed by the SNB (i.e. ELA+).[20] Emergency legislation also allowed SNB to waive collaterals for granting liquidity under ELA+, while the Swiss National Bank Act requires that SNB may only grant loans to a commercial bank against sufficient collateral. Moreover, ELA+ loans were granted in contradiction to the Guidelines of the SNB, which specify that liquidity assistance must be fully covered by sufficient collateral at all times.[21] Instead, the emergency legislation only provided for a bankruptcy privilege in favour of SNB when securing liquidity loans. Despite the absence of any detailed analysis, it appears plausible to us that this privilege can hardly be viewed as sufficient collateral and must therefore be regarded as essentially worthless.[22] While we leave it to legal scholars and practitioners to judge whether the emergency legislation that made this bailout possible violated existing laws or guidelines, it appears to us that the Swiss trinity certainly stretched the legal possibilities to the limit, or beyond, to enable this bailout. This must, under all circumstances, be avoided in the future.

[18] The Neue Zürcher Zeitung referred to it as "grasping into the poison cabinet" (26 April 2023).

[19] Ordinance on Additional Liquidity Assistance Loans and the Granting of Default Guarantees by the Confederation for Liquidity Assistance Loans by the Swiss National Bank to Systemically Important Banks, 16 March 2023 (version as of March 19).

[20] Art. 2, Ziff. 2.

[21] Section 6 in: Guidelines of the Swiss National Bank on Monetary Policy Instruments (Richtlinien der Schweizerischen Nationalbank über das geldpolitische Instrumentarium) of 25 March 2004 (as of 5 May 2023).

[22] Notice that privileged claims fall at the very end of the 2nd bankruptcy class. Other substantial claims are serviced before. A special Swiss feature in the liquidation process of a bankrupt bank is that the secured deposits (excluding pension assets) are to be paid by the liquidator directly from the bank's available liquidity. Such payments must be made before the actual bankruptcy procedure starts. The first bankruptcy class includes salary claims and the employee's pension fund. The second bankruptcy class includes social security contributions and privileged claims representing secured deposits of customers, insofar as they are not covered by Esisuisse's deposit guarantee, bank notes (Kassenobligationen), or Pillar 3a assets and funds on vested benefit accounts (up to 100,000 Swiss francs per person in each case). It is only after all these claims have been settled that the loans from ELA+ would have been serviced. Moreover, the scope and quality of available assets have been eroded by the collateral provided for ordinary ELA.

So why was it even necessary in the first place to stretch or perhaps even exceed legal limits? The answer was offered by FC Keller-Sutter, the Swiss finance minister who, according to her judgement, stated that the Swiss rules for winding up big banks were insufficient.[23] This assessment is both surprising and disappointing. Surprising as FINMA had been mandated in the aftermath of the 2008 GFC, over a decade prior, to implement rules that allow for an orderly bank resolution. Such rules were not in place by March 2023. While the FC announced its intention to introduce a PLB on March 11, 2022,[24] it only adopted the dispatch on the introduction of a PLB for systematically important banks on September 6, 2023,[25] in hindsight of the CS bailout. This was disappointing as a PLB for significant banks was widely adopted by most industrialized countries some years ago (see Grund et al. 2020 for an overview). While FINMA is responsible for the planning and implementation of a system that allows for the resolution of globally active Swiss banks, it has so far not been able to implement an accurate mechanism enabling big banks to be wound up.[26]

2.8 Considerations on solvency, liquidity, and the need to prepare for liquidity shortages

Measures of solvency and liquidity have predictive power for future economic distress within the financial sector (see Adrian et al. 2010, 2015; Adrian and Boyarchenko 2013). Also, the probability of survival for banks facing a crisis is positively related to their extant level of equity (see Berger and Bouwman 2013). Solvency and liquidity measures are, therefore, purposeful prudential safeguards if we are to avoid future financial crises.

However, it appears to us that the doctrinal separation of solvency and liquidity constraints is proving to be of little practical use when it comes to rescuing banks in a crisis.[27] Largely under-researched,[28] we believe it is worthwhile to reconsider how banks may receive access to emergency liquidity. The CS crisis illustrates how central this issue is. Only four days before the unexpected takeover by UBS on March 15, SNB and FINMA announced, in a joint media release,[29] that "[t]he strict capital and liquidity requirements applicable to Swiss financial institutions ensure their

[23] For details, see the article in The Financial Times on March 25, 2023: Rules for winding up big banks do not work, Swiss Finance Minister warns.

[24] See FC's press release of March 11, 2022.

[25] See FC's press release of September 6, 2022.

[26] See Stability Report SNB 2022, p. 28, referring to the FINMA Resolution Report 2022, for more details on the progress of FINMA in this respect.

[27] Parts of the following considerations are based on the proposal of Zimmermann (2023a, b).

[28] The separation of solvency and liquidity regulation is indeed a topic that is not widely studied in the literature. Cecchetti and Kashyap (2018) refer to Goodhart (2011), who notes in his authoritative review on banking regulation since 1974 "that the original intent was to have a liquidity requirement to complement the capital requirement" instead of developing a common coordinated framework. Indeed, the authors' analysis reveals contradictory regulatory effects of the major capital and liquidity rules that are in place since Basel III.

[29] See https://www.snb.ch/en/mmr/reference/pre_20230315/source/pre_20230315.en.pdf

stability". They further explained that "Credit Suisse meets the capital and liquidity requirements imposed on systemically important banks". At the same time, the media release also noted that "[i]f necessary, the SNB will provide CS with liquidity". This need seems to have arisen on the very same day when CS applied for, and SNB granted, an ELA in the amount of 50 bn Swiss francs. So was CS solvent but illiquid?

Solvency and liquidity are interconnected constructs and short-term liquidity is affected by a bank's capital shortfall in situations of general financial distress (Pierret 2015). Yet the distinction between solvency and liquidity matters primarily from a formal legal standpoint of view: Under the Swiss National Bank Act (Art. 9), as stated previously, the SNB may grant loans to a commercial bank only against sufficient collateral. In the case of ELA, there is an additional and explicit requirement that the supported institution is important for the stability of the financial system *and must be solvent* (Guidelines of the SNB on Monetary Policy Instruments, sec. 6), based on an assessment of FINMA. This implies that CS was considered solvent by FINMA only four days before the takeover. But why must a solvent bank be taken over within a state-orchestrated merger applying emergency legislation?

It appears that, in the event of a bank crisis, the distinction between solvency and liquidity has subordinate economic significance. Obviously, CS suffered a liquidity shortfall of a magnitude sufficiently dramatic to make this transaction imperative. While bank regulation makes a—not very informative—distinction between solvency and liquidity, capital markets clearly indicated a very high probability that CS would default (i.e. it needed to be rescued). As we will discuss below, the price for hedging CS's default risk, as proxied by the credit default swap (CDS) premium, amounted to over 1000 bp as of March 15. We learn from this that solvency is difficult to distinguish from liquidity in the event of a crisis, and that dubious solvency can even lead to the SNB not being allowed to grant liquidity assistance.

The solution to this problem is to prepare for liquidity shortages for defaulting banks at an early *ex-ante* stage where solvency is not in question. G-SIBs should be required to buy what we call liquidity options from central banks, which are used to cover short-term liquidity needs in times of crisis. Such options are equivalent to converting bail-in-capital at times when banks are solvent and to compensating lenders for this option by offering a yield premium. *Ex-ante* liquidity options must meet at least four key requirements. First, they must be contractually binding liquidity loans which banks can draw upon in the event of a crisis (i.e. if regulatory liquidity requirements are no longer met). Second, eligible collaterals and applicable haircuts thereto, together with the interest rate on the amount drawn (the exercise rate of the option), must be fixed at origination of the contract. Third, the bank must pay an upfront option premium.[30] Fourth, the pricing of both, the exercise rate on amounts drawn and the option premium, should be based, as closely as possible, on market prices.

[30] See recent literature on the price of loan commitments (for example, Rauf 2023) or on deposit insurance premiums (for example, Kim and Rezende 2023) for insights on the potential pricing of such option premia.

Opponents of this proposal will argue that central banks provide the necessary liquidity in the event of a crisis anyway. However, this argument only applies to solvent banks. As we have discussed above, solvency and liquidity can hardly be distinguished in the event of stress based on common solvency and liquidity constraints. For example, Baker et al. (2017) suggest that liquidity measures are more transparent and easier to understand, while capital ratios are not so easy to interpret. We therefore advocate that liquidity options must be secured where solvency is beyond doubt. Moreover, the pricing of *ex-post* liquidity assistance appears to be subject to political pressures, likely leading to wealth transfers from the taxpayer to the stakeholders of bailed-out banks. Contrary to this, the *ex-ante* pricing of liquidity options outside of acute distress allows for market-based pricing mechanisms, thereby minimizing negative wealth effects for taxpayers. Importantly, the *ex-ante* pricing of liquidity options would be captured by the profit and loss statement of banks, thereby helping to make the cost of potential liquidity shortages more transparent in that their use would help to avoid implicit TBTF guarantees financed by the state (i.e. the taxpayer).

Our proposal for liquidity options may at first glance appear innovative. However, the concept of using contractual liquidity options from the relevant central bank for a fee has already been incorporated within the Basel III framework since 2014.[31] The Liquidity Coverage Ratio (LCR 31) foresees that contractual liquidity options may be used in those jurisdictions that have an insufficient supply of Level 1 high-quality liquid assets (HQLA, or both Level 1 and Level 2 HQLA) within their domestic currency to meet the aggregate demand of banks with significant exposures to this currency. LCR 31 rules thus already apply to a limited number of currencies and jurisdictions. Making the use of liquidity options additionally available to G-SIBs could help to avoid future liquidity-induced bank crises.

It is important to note that our proposal for *ex-ante* priced liquidity options differs in several important dimensions from SNB's ELA+ as granted to CS: *First*, ELA+ was executed *ex-post* and under immense political pressure and time constraints. *Second*, as discussed before, collateral was largely missing and has since been replaced by a bankruptcy privilege. This, however, was of questionable value and perhaps even worthless as a form of collateral. *Third*, given the time pressure, no transparent market-based pricing was established. *Finally*, and of key importance, depositors were unable to assess *ex-ante* whether liquidity constraints could pose a serious threat to CS's survival, further exacerbating the negative spiral and increasing the likelihood of a bank run. Surprisingly, the Swiss Bankers Association (SBA) takes exactly the opposite road to our proposal as, even before the ELA+ loans had been reimbursed, the SBA advocated that ELA+ (i) be open to all banks; (ii) without collateral; and (iii) maintained for an indefinite period, without detailing any *ex-ante* premiums or loan limits.[32]

[31] Basel Committee on Banking Supervision: LCR Liquidity Coverage Ratio LCR31. Alternative Liquidity Approaches. Version December 15, 2019.

[32] Swiss Bankers Association Statement as of June 21, 2023, on the consultation report on: Änderung des Banken-gesetzes. Gewährung von Ausfallgarantien des Bundes für Liquiditätshilfe-Darlehen der Schweizerischen Nationalbank an systemrelevante Banken.

In retrospect of the CS crisis, the FC adopted the dispatch[33] on the introduction of a PLB for systematically important banks on September 6, 2023.[34] This dispatch of the FC is currently subject to the Swiss legislative consultation process in that it will be discussed within the Swiss Parliament. It appears that the current proposal now includes an element that can be somewhat compared to an option premium (see Dispatch on the introduction of a public liquidity backstop for systemically important banks of the FC, dated September 6, 2023, article 32c). Unfortunately, the option premium that is proposed by the FC appears to be very low. While determining the price of such option premiums goes beyond the focus of our work, recent literature related to loan commitments (for example, Rauf 2023) or on deposit insurance premiums (for example, Kim and Rezende 2023) provide helpful insights. This literature makes premiums from 5 to 20 bp per annum relative to total deposits, dependent on various factors, appear reasonable. In sharp contrast, the FC now proposes a premium in the form of a commitment fee in the amount of between 0.005 and 0.015%, equivalent to 0.5 to 1.5 bp or approximately one tenth of the loan commitment fees or deposit insurance premiums observed in prior litarture.[35] While the introduction of an option premium is commendable, the price for it is surprisingly low and cannot be justified by the *ex-post* premium charged after the banks have exercised their option to draw upon emergency liquidity. This low price unlikely avoids moral hazard and provides a free-riding mechanism that may have devastating incentive effects. In other words, it may exacerbate the moral hazard problems associated with TBTF guarantees as discussed above.

2.9 Considerations on *ex-post* CAMEL versus *ex-ante* market-based indicators

Currently, bank regulation is largely defined by the oversight of a given bank's compliance with capital adequacy, asset quality, management quality, earnings, and liquidity (CAMEL) requirements. These typically include ratios related to equity (such as the CET1-ratio), liquidity (e.g. the HQLA, liquidity coverage ratio, LCR, or the net stable funding ratio, NSFR) or by the analysis of risk-weighted assets (RWA) relative to the CET1 ratio, etc. Modelling, or predicting bank distress, is thus, by definition, an *ex-post* accounting exercise. Rather than providing early warning signals, such CAMEL indicators serve only to provide *ex-post* information on solvency or liquidity constraints of the financial industry and/or banks. We suggest that the use of the extant market prices of financial instruments can usefully complement bank regulation as they respond more quickly to changing financial conditions than, for example, the ratings of credit risk agencies. The use of market prices was proposed years ago (e.g. Flannery 1998) although it has since achieved little traction, despite its superiority over CAMEL accounting data and credit ratings in identifying banks' changing financial conditions or fragility (see Bongini et al. 2002). Several arguments support using capital market information as an early warning indicator:

[33] Dispatches that the FC submits to the Federal Assembly to provide an explanation of the bills it drafts.

[34] See FC's press release of September 6, 2022.

[35] See Botschaft zur Änderung des Bankengesetzes, dated September 6, 2023. See also the article of A. Janssen in the Neue Zürcher Zeitung, September 12, 2023, on this subject.

First, capital market data, in particular market prices, are prospective, in that they reflect the expected (future) financial condition of a bank according to a broad spectrum of market participants. *Second*, capital market data represent objective information that is publicly available. This partially eliminates the need to base regulatory interventions exclusively on *ex-post* CAMEL data. Importantly, its use also eliminates the need to justify the timing and triggering of regulatory action. *Third*, capital market prices are very sensitive and thus well suited for use as bank fragility indicators.

Opponents of the idea of using capital market prices will argue that they often overreact to prospective crises. Samuelson, for example, stated in 1966 that "Wall Street indexes predicted nine out of the past five recessions!".[36] His statement provides support for a critical attitude towards the use of capital market data in banking regulation. We argue, however, that using capital market prices, given their overt sensitivity to developments expected by the market is advantageous, rather than problematic. When used judiciously and *in combination* with conventional CAMEL data, they provide valuable additional information and can be used to detect the need for regulatory action *ex-ante*.

Figure 6A, B illustrates the behaviour of two market-based indicators, specifically the 5-year CDS spread[37] and AT1-bond prices. We select a long time horizon to compare the behaviour of CDS spreads and AT1-bond prices from the GFC in 2007/08 to recent events, namely the months preceding the CS bailout and shortly thereafter. In both panels, we show the changes in these key market-based indicators relative to an equally weighted index comprising systemically relevant banks (G-SIBs).

Figure 6A shows that the CDS spread of CS hardly ever exceeded a level of 200 bps during the GFC and that the average spread of G-SIBs during the crisis was only marginally higher. However, the gap widened in the following years, especially during the debt crisis. While the CDS spread of CS never exceeded 200 bp, the spread of G-SIBs increased by up to twice that value. This suggests that spreads above 200 bp can be interpreted as early warnings, while spreads above 400 bp must be interpreted as crisis signals. This is nicely demonstrated by the recent CS turmoil:- By the end of June of 2022, CS's CDS spreads had already surpassed the 200 bp threshold, more than eight months before its bailout. CS's spreads exceeded 400 bp as early as the end of November 2022, indicating escalation and the onset of crisis. Interestingly, these alarmingly high CDS spreads did not contract, even after a new strategy and restructuring measures were released by CS's new top management team. The CDS spreads of an equally weighted basket of large US banks[38] followed a comparable pattern during the run-up to the GFC in 2008. Approximately a

[36] From P.A. Samuelson's *Newsweek* column "Science and stocks", 19 September 1966.

[37] We adopt the widely used terminology CDS "spreads" in the following, although it rather constitutes a price for entering a swap or, more specifically, the fixed part of the swap.

[38] See Yale School of Management and Hutchins Center on Fiscal & Monetary Policy at Brookings, January 2020: Charting the Financial Crisis. U.S. Strategy and Outcomes, p. 19. The equally weighted basket of large US banks consisted of JP Morgan Chase, Citigroup, Wells Fargo, Bank of America, Morgan Stanley, and Goldman Sachs.

year prior to the Lehman Brothers scandal, CDS spreads peaked at 200 bp, providing initial cause for alarm. The CDS spreads subsequently contracted but thereafter jumped to a higher level, peaking at some 450 bp immediately once the Lehman and AIG scandals had broken. This suggests that (in 2008/2009) the CDS spreads already contained (and still contain) valuable information as to the health of the bank sector, but even more so for individual banks in relation to their peers.

Figure 6A also displays the average CDS spread across G-SIBs. As can be seen, CS's idiosyncratic CDS spread component indicates that the observed pattern was not driven by CDS movements in the global banking sector.

Figure 6B shows the price of Additional Tier 1 (AT1)—bonds of CS benchmarked to that of the market, as proxied by the iBoxx AT1—Index in USD. Recent studies on AT1 instruments, which together provide for a comprehensive literature review, include those of Flannery (2017), Avdjiev et al. (2020), and Kind et al. (2022). AT1 instruments are traded in large and established institutional markets (Avdjiev et al. 2020) and are intended to replace state support measures, or bailout capital, in the event of a bank failure (Flannery 2017). They are, in our opinion, a purposeful measure of how the market assesses the necessity of near-term capital injections. Moreover, the pricing factors for AT1 bonds remain stable throughout tranquil and volatile market states (Kind et al. 2022). We suggest that they convey important information on the state of a bank. As can be seen in Fig. 6B, this seems indeed to be the case: The price of CS's AT1 bonds declined monotonically over a time horizon of more than two years, both in absolute terms and also relative to the benchmark. In October 2022, CS's AT1 bonds traded at around 63%, significantly distant from the benchmark, which traded at around 86%. The price even dropped below 60% in December 2022 when the benchmark traded above 90%, indicating a widening price spread between CS's AT1 bonds and their benchmark, indicating that the market expected it was likely that parts of the available AT1 bond capital would be used to safeguard the necessary loss absorption capacity of CS, or, in other words, the market expected that substantial parts of the AT1 bond capital should be required to safeguard the bank's solvency.

However, it was not only CDS spreads and AT-1 bond prices indicated the CS crisis relatively early. We can again turn to the information published by the Volatility and Risk Institute (V-Lab) of New York University. They publish the monthly marginal expected shortfall (MES) of financial institutions, which is the expected loss of a bank's equity conditional on a crisis, the latter being defined as a decline of the relevant stock market index of 40% or more over a period of six months. As we have shown above, such crises are frequent and have also occurred several times in Switzerland.

Table 2 shows the MES of large European banks as of October 2022. The MES of CS exceeded 70% and was larger than the expected shortfall of any other global systemically important bank in Europe. For example, the MES of UBS amounted to a lower 48%, a value which also corresponds to the mean MES of the banks shown. This implies that the model predicted a shortfall of the equity capital of more than two-thirds in the event of a market deterioration. CS's MES, relative to that of other European banks, conveyed important information on the necessity of specific

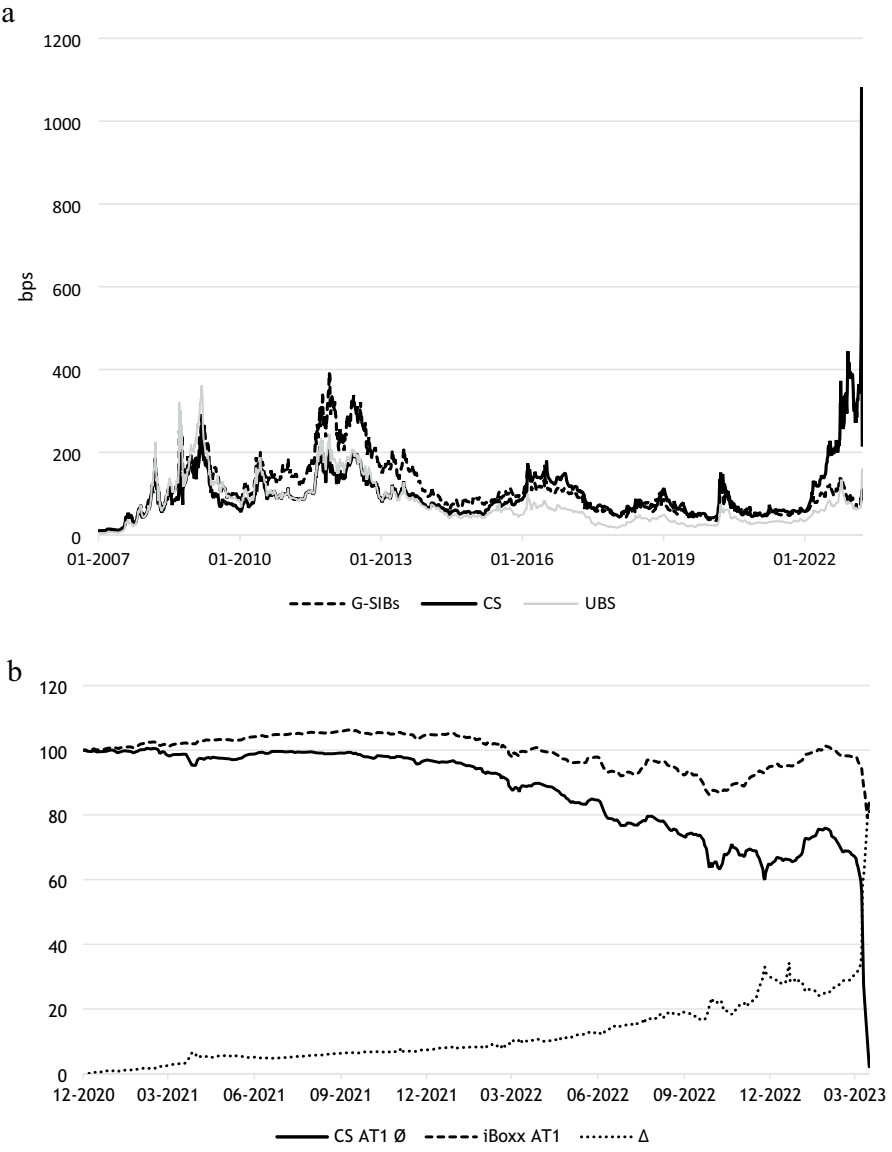

Fig. 6 **A** Market-based indicators of bank solvency: CDS spreads. This figure shows 5-year credit default swap spreads of CS (solid line), in bps, compared to 5-year credit default swap spreads of UBS (grey line), and the average spread of global systemically important banks (G-SIBs; dotted line) from January 2007 until the CS crisis. **B** Market-based indicators of bank solvency: AT1 bond prices. This figure shows the AT1 bond price of CS (solid line), normalized to the starting date (7 December 2020), compared to the benchmark (iBoxx, top dashed line) AT1 bond prices, together with the spread between the two (bottom dotted line)

Table 2 Market risk indicators of large European banks in October 2022

	MES %	Beta	Leverage $(E+D)/E$
Credit Suisse Group AG	74.43	2.67	61.87
Barclays PLC	52.66	1.46	69.81
Deutsche Bank AG	52.21	1.45	71.88
Banco Santander SA	50.6	1.38	39.65
Natwest Group PLC	50.14	1.36	33.87
Lloyds Banking Group PLC	49.42	1.33	32.56
Banco Bilbao Vizcaya Argentaria SA	49.15	1.32	22.74
Societe Generale SA	49.13	1.32	79.91
Standard Chartered PLC	48.46	1.3	46.52
UBS Group AG	48.14	1.29	19.87
ING Groep NV	48	1.28	25.01
Commerzbank AG	47.91	1.28	50.75
BNP Paribas SA	46.81	1.24	51.12
Credit Agricole SA*	46.06	1.21	79.8
Danske Bank A/S	43.22	1.11	40.04
Intesa Sanpaolo SpA	43.19	1.11	26.99
London Stock Exchange Group PLC	40.28	1.01	24.91
HSBC Holdings PLC	39.88	1.00	28.22
UniCredit SpA	39.8	0.99	35.37

This table shows the marginal expected shortfall (MES of large European banks. MES is the mean expected shortfall of bank equity conditional on a crisis, "Beta" refers to the estimate of the systematic risk of bank equity with respect to the market, and "Lev" denotes the leverage factor of the bank. The definitions and interpretations are given in the text, respectively, on the Website of V-Lab. Data are from V-Lab, Volatility and Risk Institute, Stern School, New York University

supervisory intervention. CS's beta coefficient and, to a lesser extent, its leverage factor, also indicated excessive risk for the bank compared to its peers.[39]

Thus, market-based indicators evidently provided clear signals for a looming CS crisis well in advance of March 2023. Unfortunately, market-based indicators still do not trigger any supervisory intervention. Although they provide supervisory authorities with valuable information, allowing them to prepare or even roll out necessary and prescient interventions, these indicators are, to this day, largely ignored. As a result, publicly available information and easy-to-communicate intervention levels remain unconsidered. In the case of CS, the situation went beyond the point of control in March of 2023, whereupon CS's CDS spreads reached a level of 1000 bp on March 15 on the same day as SNB and FINMA jointly released a statement that,

[39] Beta is computed relative to the MSCI World Index, using Engle's dynamic conditional beta model. The leverage factor is the sum of the book value of liabilities plus the market value of equity in relation to the market value of equity. More information is available on V-Lab's website.

despite the US banking crisis, CS would meet the strong regulatory capital and liquidity requirements of Swiss banks. This statement points out that, the monitoring of regulatory capital and liquidity requirements are, especially in the event of market turmoil or for banks facing idiosyncratic difficulties, insufficient instruments through which to supervise banks. The market view clearly indicated a very high likelihood for a CS default on its senior debt. The estimation of the implied probability of default (PD) of CS's senior debt illustrates this impressively.[40] The implied PD, indicated by a CDS spread of 200 bp, 350 bp, 400 bp and 1000 bp amounted to approximately 5%, 8.75%, 10.0% and 25% PD, respectively, in the summer of 2022, the autumn of 2022, and in February and March of 2023. This equates to low-grade *implicit* S&P bond ratings of BBB, BB—BB-, BB-, and NR,[41] indicating that CS's bonds would have been classified as junk bonds as of autumn 2022.

These observations provide a strong case for banking regulation to be more closely aligned with market-based indicators. The use of capital market data in financial market regulation has its critics (see Birchler and Facchinetti 2007, for an overview), and we acknowledge that (i) the signal-to-noise ratio of capital market prices may sometimes poor; (ii) that markets may not be complete or liquid, thereby leading to lower informativeness of the data; (iii) that there is an endogeneity problem arising from market participants expecting the government to support banks in a turmoil[42]; and (iv) that supervisors may have a bias for action even if they view market-based indicators as being non-informative based on their private information (see Morris and Shin 2002; or Birchler and Facchinetti 2007, who argue in this vein). However, such justified punctual criticism does not invalidate our general claim that evidence from market-based indicators should complement existing bank regulation indicators. Charting the financial crisis in 2008/2009 (see footnote 40) and the CS crisis in 2023 leads to an unambiguous conclusion, i.e. that market-based indicators provide valuable *ex-ante* information over and above *ex-post* solvency and liquidity indicators. Also, prices pertaining to credit default swaps (CDS) and AT1 bonds derive from relatively liquid markets in which professional and institutional investors trade, largely offsetting the arguments of critics. Moreover, we argue that the accuracy of private information available to regulators (i.e. CAMEL indicators) suffers various deficiencies, primarily the backward orientation and *ex-post* nature of CAMEL indicators.

Such indicators are of limited utility in anticipating the near to medium-term states of a bank. Moreover, as Flannery (2014) shows, bank supervisors often fail to distinguish between the minimum required capital and the amount of loss absorption available to large, regulated firms. According to his study, this partially reflects the fact that regulations and statutes focus on book equity measures, which may be distorted—such distortions becoming substantial when a bank encounters difficulties, thereby affecting their informativeness most when capital value is most relevant to

[40] We calculate the implied probability of default (PD) using PD = CDS/(1 − RR), whereas CDS is the CDS spread, and RR is the recovery rate for senior debt, using a RR of 60%.

[41] Source: Federal Reserve, St. Louis, Bloomberg, and Damodaran's 2023 equity risk premiums available at https://pages.stern.nyu.edu/~adamodar/New_Home_Page/datafile/ctryprem.html

[42] i.e. that it provides TBTF-support (see Allenspach et al. 2021, who provide evidence for TBTF subsidies for banks)

a firm's viability. We, therefore, suggest that bank supervision mechanisms should be expanded by *ex-ante* market-based indicators, in parallel to considering *ex-post* CAMEL indicators.

3 A holistic financial economist's perspective and proposals for reform

Switzerland, like other countries, needs reforms that remove the destabilising moral hazard consequences of implicit government protection in the banking industry (TBTF guarantees). We outline the proposed cornerstones of such reforms from the perspective of economic desirability and hope to spur a timely discussion about their political feasibility.

3.1 A binding role for *ex-ante* market-based indicators and market discipline

First and foremost, we propose an expanded regulatory mandate for systemically important banks (G-SIBs), one that obligates FINMA to intervene when certain thresholds with respect to individual, or a set of *ex-ante* market-based fragility indicators, are reached. This should not be confused with the general and unspecified claim made by several political parties or by the expert report presented to the Federal Department of Finance that the competencies of the supervisory authority must be expanded in response to the CS crisis—quite the opposite—the regulator should be limited in its discretionary decisions which, today, are largely based on a bank's compliance with *ex-post* CAMEL requirements. Our recommendation follows Calomiris (1999), who advocates a "market discipline" approach to banking regulation. The main advantage of this approach is that "it relies on the marketplace more than on bank regulators to measure bank risk" (p. 1510) and that "market participants […] have the incentive to measure risk honestly, since they bear the costs of their mistakes" (p. 1510f.). A more market-based, rather than a solely accounting-based approach to bank regulation provides an incentive for banks and their capital providers to limit risks and also to communicate this credibly to the capital market so as to minimize the likelihood of intervention by the supervisory authority. As discussed, there are various *ex-ante* market-based market fragility indicators, including CDS spreads and AT1 bond prices, which can be used as early warning devices. These provide timely information on the current or expected future state of a bank and offer opportunities to roll out mandatory supervisory interventions at a time when they are still effective. This avoids hasty, partially uninformed, and politically driven decisions with all the associated legal repercussions and costs. We acknowledge that it is not trivial to make *ex-ante* market-based indicators part of a new regulatory framework or to avoid premature, and perhaps unnecessary intervention, as well as risking the violation of the principles of bank responsibility in a free market economy. However, we believe that the benefits of using *ex-ante* market-based fragility indictors to allow for early and mandatory intervention outweigh the costs of late or even omitted supervisory intervention, especially in the case of a systemically important bank.

3.2 Adequate bank capital base for G-SIBs

The controversy on capital adequacy of G-SIBs has persisted for decades and received fresh impetus in the wake of the GFC. Bank capital provides a cushion that protects banks from insolvency when asset values fall while ensuring "the confidence of creditors to continue to provide funding to the banks in a crisis" (Pierret 2015, p. 193). As we have shown, the equity capitalization of Swiss banks was substantially larger before the introduction of regulatory standards, although it decreased monotonically thereafter. This trend could and should be reversed. The banks' favoured argument, namely that higher capital requirements increase banks' cost of capital, leading to a competitive disadvantage against other banks, has been sufficiently discussed and since debunked by Admati et al. (2013) or Admati and Hellwig (2014). As we illustrate, high CoE capital is likely not the cause, but rather the consequence of large banks' low capital ratios or, in other words, the risk associated with holding minimum capital cushions. Banks tend to neglect the importance of considering the WACC, which is relevant for most banks' financial decisions when arguing against an increase in the equity capital cushion. As Junge and Kugler (2013) show for the Swiss banking sector, the marginal economic costs for larger capital ratios are close to zero, while the economic benefits from preventing a banking crisis are considerable.

As we have shown above, capital requirements are *not* independent of bank sector concentration. Considering the much greater concentration of the Swiss banking sector resulting from the CS-UBS takeover and the implicitly associated increased systemic risk of the merged entity, our reform proposal regarding capital considerations deserves even greater attention. We regard it, therefore, as a necessary, albeit insufficient condition to raise G-SIB's capital to substantially higher levels, perhaps even to levels which prevailed before the introduction of capital adequacy standards. These reflect the level of risk perceived by large banks as unbiased by an implicit public TBTF guarantee, which creates agency problems and moral hazards for the banking sector.

Swiss legislation does provide for progressive equity components for SIBs.[43] However, they appear to be very low and thus insufficient when considering the arguments set out in section 2.6: At the end of 2020, the surcharges for the RWA ratio and the leverage ratio amounted to 1.44% and 0.5% for CS, and to 1.08% and 0.375% for UBS, respectively. The equity components required by Swiss legislation thus amounted to a low required RWA ratio of 14.3% (12.86% plus 1.44%) and 13.94% (12.86% plus 1.08%) for CS and UBS. Likewise, the required leverage ratio for UBS and CS amounted to 5% (4.5% plus 0.5%) and 4.875% (4.5% plus 0.375%). Despite their size and SIB-status, the equity components of CS and UBS only deviate marginally from the base requirements applicable to other banks. Interestingly, a parliamentary motion submitted in 2021 that is still pending is requiring

[43] See Ordinance concerning capital adequacy ERV (Eigenmittelverordnung), Art. 129 and Annex 9, effective January 2020. Apart from a base requirement of 12.86% (RWA ratio) and 4.5% (leverage ratio), a surcharge is applied for the market share in the domestic lending and deposit business and for the size of the bank calculated as a proportion of total exposure.

an unweighted capital ratio of at least 15 percent for G-SIBs and a tightening of the progressive equity components.[44]

3.3 *Ex-ante* priced and paid liquidity options

Banking crises, whether they involve individual banks, contagion effects, or the entire financial system, are inevitably associated with liquidity squeezes. This was recognized by early notable economists, including Cantillon, Hume, Adam Smith, and Ricardo. However, it was Bagehot (1873), who popularized the notion of liquidity risk in the context of financial panics and who set out the basic principles for liquidity provision of central banks in times of crisis.[45] It seems to us only a natural extension of these principles to introduce binding and priced *ex-ante* facilities between systemically important banks and central banks on a contractual basis to hedge against liquidity shortages in stressed situations. As argued earlier, these *ex-ante*-priced liquidity options must be installed at an early stage where solvency is not an issue, at pre-defined conditions and against a premium. The specification of collateral and applicable haircuts is key for implementing such priced *ex-ante* liquidity options. Since eligible collateral shall typically be inferior to HQLA in terms of its solvency and liquidity, the distorting effects of incorrectly specified arrangements, as discussed in Nyborg (2016), deserve particular attention. We expect that diligent *ex-ante* contract specification provides considerable gains in security and transparency and is clearly superior to the support plan including extraordinary ELA+ and the PLB observed in the CS bailout. The unwinding of the CS crisis, and the discussions and recommendations it provoked, make it unmistakably clear that the merged bank is TBTF (i.e. the state-orchestrated merger has given birth to a banking entity with a large and implicit government guarantee).[46] However: no guarantees without pay! The PLB, which is currently undergoing legislative consultation, must be subject to an option premium in exchange for the explicit liquidity option granted to UBS. While such a premium would satisfy a self-evident financial principle, it has not been incorporated in any legislative proposal, at least thus far.

3.4 Taxpayers' limits and the internalization of the value of TBTB guarantees

The SRISK figures discussed above may be indicative of gauging the expected size of a public recapitalization and the costs associated with such a public guarantee. It appears accurate and, moreover, important to us that bank stakeholders profit equally from, but also pay for explicit bailout guarantees. Internalising the associated costs

[44] Motion 21.3910 (Birrer-Heimo), the FC proposes rejection of the motion, on May 2, 2023, the National Council decides on its adoption.

[45] Baltensperger (2023) provides a brief summary and discussion of Bagehot's principles which relate to the amount and speed of liquidity provision, determination of interest rate, and the quality and valuation of collateral.

[46] The report commissioned by the Federal Government of Ammann et al. (2023) considers the nationalisation of G-SIBs, at least as an interim solution, as a necessary second line of defense in the face of the failure of the third pillar of TBTF regulation, *vis-à-vis* the successful resolution of the bank.

with the banking system and rebalancing risk-taking incentives for managers and shareholders would seem an appropriate response to the recurring banking crises.

Moreover, the SRISK figures shown above call for a public debate on the willingness of taxpayers to implicitly finance the TBTF costs of large banks. This debate is, by construction, a political one. How much, in billions of Swiss francs, may a bailout of a Swiss G-SIB cost? How large may a reasonable and politically acceptable support plan be, relative to the economic strength of Switzerland, posited as a percentage of GNP? At this point, we leave this discussion to the taxpayer and all involved stakeholders.

4 Conclusions

Policymakers, practitioners, and researchers do not hesitate to trumpet economies of scope from large financial institutions. While we acknowledge economies of scope, in principle, we argue that their advantages are paired with intensified agency problems and moral hazards associated with monitoring complex financial conglomerates, as well as implicit government TBTF guarantees. These may outweigh economies of scope in the long run. We provide a set of key considerations related to the CS bailout, in that we argue (1) it was driven by a series of idiosyncratic negative events due to bad governance; (2) led to substantial wealth transfers to the benefit of CS bondholders and UBS shareholders, most likely at the expense of taxpayers; (3) created a bank that is "too-big-to-bail" for Switzerland; and (4) is, under certain moral hazard conditions, likely a precursor to a future UBS bailout. We also consider this bailout calls for rethinking: (5) The optimal level of bank equity in a consolidating banking industry; (6) the doctrinal separation of capital and liquidity constraints within the banking sector; and (7) the current banking supervisory framework based on *ex-post* accounting, rather than *ex-ante* market-based bank fragility indicators. We provide a simple holistic financial economist's perspective, in which (i) supervision is expanded by *ex-ante* market-based risk indicators; (ii) unweighted capital ratios are substantially increased to adequately reflect large bank risks; and, (iii) *ex-ante* paid liquidity options are introduced. Finally, we call for a public debate on the willingness of taxpayers to implicitly finance the implicit TBTF risk of large banks.

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