# Balance sheet dynamics and Credit Suisse

On March 19 of 2023, Credit Suisse (CS) was forced to be acquired by its rival UBS. This was mediated by its regulator -- Swiss Financial Market Supervisory Authority (SFMSA). Here is a Wikipedia [entry](https://ca.investing.com/equities/credit-suisse-group-balance-sheet) describing the event in some detail.

To shore up CS’s balance sheet prior to the acquisition, the SFMSA forced the liquidation of a certain class of liability. In particular, CS had so-called AT1 bonds, which by design could be written down to zero value at the discretion of the SFMSA. Here is a [discussion](https://en.wikipedia.org/wiki/Contingent_convertible_bond) of AT1 bonds. The creation of such financial instruments was one of the regulatory responses to the global financial crisis. (They are also called “bail-in” bonds to distinguish them from what would otherwise be a publicly funded “bail-out”, which was politically toxic. In this instance it is bondholders who are on the hook rather than taxpayers.)

The Swiss jurisdiction is unique in that it allowed for them to be literally set to zero. All other jurisdictions in the world rather have the feature that they turn into equity – bond holders become equity holders. In this way, the bond holders fare no worse than equity holders in a bank crisis. Which is a pretty standard feature of default --- equity holders should suffer the most since in good times they have the most to gain. The fact that bond holders fared worse generate a lot of controversy. But it is exactly what the AT1 documents said would happen.

Here is a snapshot of CS’s balance sheet after the conversion (use the column for March 31, 2023). All numbers are in millions of Swiss francs (CHF). This is after the AT1 liquidation and so already reflects the impact of that liquidation: <https://ca.investing.com/equities/credit-suisse-group-balance-sheet>

The total amount of AT1 debt (liability) that had been liquidated was 16Bn CHF.

**Q1. Provide the value of assets, liabilities and equity (A, L, E) and the E/A ratio for each of these three balance sheets:**

1. **before the AT1 conversion (assume that other than the conversion, the balance sheet was unchanged between March 19 to March 31… a reasonable approximation.)**
2. **after the AT1 conversion**
3. **after the AT1 conversion if instead of being set to zero, it had been converted to equity**

**Q2. In comparing cases #2 and #3, explain qualitatively (a sentence or two) in which scenario it is better to have been an AT1 holder and in which scenario it is better to have been an equity holder.**

**Q3. Given the prospect of being written down to zero or being converted to equity, why would an investor ever purchase an AT1 bond? How do you think investors are being compensated for that risk? (A very short paragraph.)**

# RWA using OSFI scenario parameters

In this [document](https://www.osfi-bsif.gc.ca/Eng/fi-if/in-ai/Pages/scse-easc.aspx) OSFI documents how they want banks to model PD and LGD parameters in the climate scenario exercise they are planning. We shall map out in this problem how use of the climate adjusted parameters would affect RWA for a particular loan.

Looking at section 3.4.3, there are discussions regarding how to adjust the PD and the LGD to reflect climate effects. In fact, OSFI intends that they be used for provisioning (also known as ECL) which we did not discuss in much detail at all. So for the purpose of this exercise, we will assume that the same adjustments apply to the PD and LGD parameters used for RWA. I will refer to climateRWA to mean the RWA calculated from the formula I presented in the previous lecture, but using climatePD and climateLGD as inputs.

To keep things simple, assume M=1 and R=0.15 in the RWA formula I presented in the first lecture (i.e. ignore the PD dependence of R, which is important in general but is just a distraction in this context.)

As you see, the impact of climate change is all mediated by a single parameter which OSFI calls **climateAdd-oni** which I will shorten to the variable name **c**, for brevity. (I am not a fan of using words as variables when doing math, but that is how things are in this world.) OSFI points to a placeholder table which they haven’t yet filled in for hypothetical c values.

**Q4. Show that when c=0, both PD and LGD are unaffected: that climatePD = PD and climateLGD = LGD.**

**Q5. Consider a hypothetical loan with PD=1%, LGD=40% and EAD=$1 million. Calculate its base RWA using the formula I presented in the first lecture but as modified per my instruction above. Next plot the ratio of climateRWA to base RWA as a function of c for c in the range from 0 to 2.**

**Provide some commentary regarding the ability of OSFI’s parameterisation to affect RWA.**