

Due to outlying swings that may result from confusion surrounding technical definitions when submitting data, QS opted in 2010 to adopt a damping mechanism to help minimize the occurrence of errors by spreading big swings over several editions. It was applied to eliminate swings beyond certain thresholds and it is automatically triggered whenever annual changes exceed certain thresholds. A more detailed technical explanation of how it was applied can be found here:

Regarding the damping mechanism, this is a statistical technique we use to spread big inter-annual changes over a number of years to minimize the occurrence of errors.

The damping mechanism was first introduced in 2010. And in 2012, we further optimized the mechanism to ensure faster recognition of genuine changes in performance – particularly in outlying instances.

To illustrate how and when the damping mechanism is applied, the following concepts are crucial to understand:

Maximum Accepted Variation: the maximum increase or decrease in a score or ratio we will accept without adjustments. It is the scores that are damped in Academic Reputation and Employer Reputation as we use normalized scores to calculate [Academic and Employer reputation](#) results in the rankings analysis, whereas for other indicators we use percentages due to the nature of those indicators;

Damping Threshold: the damping mechanism is only applied when the scores or ratios are above this value. Any score or ratio below will not be affected;

Recovery Increment: the rate QS accepts when the value exceeds the maximum accepted variation.

To be more specific, for the Academic Reputation, we accepted in full a maximum year to year increase of 10 points in the university scores after normalization. In this case, the recovery increment is 20%, which means we will accept 20% of the excess over the maximum accepted variation. However, if the score has not exceeded the damping threshold of 15, no damping would be applied (even if the year to year change exceeds 10 points). A similar approach is used for Employer Reputation, however, the maximum accepted variation will be 3 points, the damping threshold 4 and the recovery increment 20%.

With regard to the International Faculty Ratio and International Student Ratios, if the variation of the ratio against last year is over 3% while the ratios of both years exceed 5% then the damping mechanism will be applied. In this case any variation exceeding 3% will be accepted at a recovery rate of 33%. For example, if the International Faculty Ratio of an institution increased from 5% to 9% this year, the variation would be $9\% - 5\% = 4\%$, which is higher than 3%. What we use will be $5\% + 3\% + 0.33 * (4\% - 3\%) = 8.33\%$. However, if the International Faculty Ratio is below 5% then we will accept the original value. It should be noted that the International Faculty Ratio is capped at 50%. Having said that, the maximum ratio increase we could accept will be 50% (Cap) so any values beyond that will be discarded.

Damping of the Faculty Student Ratio and the Citations per Faculty Ratio is similar to the damping of International Faculty Ratio and International Student Ratio. The main difference is in the way we calculate the variations in ratios. For International Faculty and International Students Ratios, this is calculated by a simple subtraction between the current and previous years' ratios. While the

variation of Faculty Student Ratio and Citations per Faculty Ratio is calculated from the percentage growth/decay from last year.

Take Faculty Student Ratio for example, if the increased percentage against the previous year is over 10% while the ratio exceeds 4% then the damping mechanism will be applied. In this case any variation exceeding 10% will be accepted at a recovery rate of 20%. However, if the Faculty Student Ratio is below 4% then we will accept the original value. It should be noted that the Faculty Student Ratio is capped at 30%. Having said that, the maximum ratio increase we could accept will be 30% (Cap) so any values beyond that will be discarded.

In the case of the Citations per Faculty Ratio, we allow a maximum year to year change of 20% (plus a reference value depending on the average change level year on year). For any excess, we only consider 33%. For example, let's assume reference value equals to 0. If a ratio changes from 1.0 to 1.3 in a given year, we would only accept the full change to 1.2 and 33% of the remaining 0.1. So, the hypothetical ratio used in a case like this would be 1.233 (and not the original 1.3).

The following table provides a summary of the damping parameters we used in the QS World University Rankings 2020:

ID	Indicator	Weight	Cap	Maximum Accepted Variation	Damping Threshold	Recovery Increment
ar	Academic Reputation	40.0%		10.0	15	20%
er	Employer Reputation	10.0%		3.0	4	20%
fsr	Faculty Student Ratio	20.0%	30%	10%	4.0%	20%
cpf	Citations per Faculty	20.0%		20%	2	33%
ifr	International Faculty Ratio	5.0%	50%	3%	5%	33%
isr	International Students Ratio	5.0%	50%	3%	5%	33%