

# Stability regions for fractional difference equations

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In this paper we discuss basic stability properties of a linear two-term fractional difference equation

$$\nabla_h^\alpha y(t_n) = \lambda y(t_n),$$

where  $\alpha \in (0, 1)$ ,  $\lambda \in \mathbb{C}$  and  $\nabla_h^\alpha$  is the Riemann-Liouville fractional difference of order  $\alpha$ . We derive the stability region of this fractional equation including a precise description of its asymptotics. Our analysis particularly shows that the fractional difference equation can retain the key qualitative properties of its continuous counterpart, i.e. corresponding fractional differential equation. In addition, we introduce the backward discrete Laplace transform and employ some of its properties as the main tool in the proof.

## References

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