Skew rotations of residuated lattices

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Abstract: Cignoli and Torrens present a construction which given a finite MV-chain of size n produces a integral commutative and involutive residuated lattice of size $2n$ into which the MV-chain embeds as a residuated lattice. Not every new element is below every old element, so this construction differs from the usual downward rotation, as the latter would produce a chain. We unify the two constructions and extend the result to all MV-algebras, actually to all involutive, integral commutative residuated lattices.

The proof makes use of a recent a result of Galatos and Prenosil about embedding ℓ-bimonoids into commutative, involutive residuated lattices. The unification of the two constructions mentioned above comes from defining an addition operation on the original residuated lattice and which will end up being the restriction of the De-Morgan dual of multiplication in the resulting involutive structure.