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Restricted weak type Rubio de Francia extrapolation

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ABSTRACT: The classical Rubio de Francia extrapolation result asserts that if an operator $T : L^{p_0}(u) \rightarrow L^{p_0, \infty}(u)$ is bounded for some $p_0 > 1$ and every $u \in A_{p_0}$, then, for every $1 < p < \infty$ and every $u \in A_p$, $T : L^p(u) \rightarrow L^{p, \infty}(u)$ is bounded. However, there are examples showing that it is not possible to extrapolate to the end-point $p = 1$. In this paper we shall prove that there exists a class of weights, slightly larger than A_p , with the following property: If an operator $T : L^{p_0, 1}(u) \rightarrow L^{p_0, \infty}(u)$ is bounded, for some $p_0 > 1$ and every u in this class then, for every $u \in A_1$,

1. T is of restricted weak-type $(1, 1)$;
2. for every $\varepsilon > 0$,

$$T : L(\log L)^\varepsilon(u) \longrightarrow L_{loc}^{1, \infty}(u).$$

Moreover, for a big class of operators, including Calderón-Zygmund maximal operators, g -functions, the intrinsic square function, and the Haar shift operators, we obtain a weak-type $(1, 1)$ estimate with respect to every $u \in A_1$.