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Corrigenda to: "Generalizations of theorems of Fejér and Zygmund on convergence and boundedness of conjugate series"

(Studia Math. 57 (1976), 241–249)

by

G. GOES (Stuttgart)

Abstract. Proposition 4.1(i) of [1] is incorrect, i.e. the sequence of Cesàro-sections $\{\sigma_n x\}$ of a sequence x in a translation invariant BK-space is not necessarily bounded. Theorem 4.2(ii) of [1] and the proof of Proposition 4.3 of [1] are corrected. All other statements of [1], including Proposition 4.3 itself, are correct.

1. Notations and definitions. We use the notations and definitions of [1]. Two more definitions:

$$\widehat{L}^2 := \Big\{x \in \Omega : \|x\|_2 := \Big(\sum_{k=-\infty}^{\infty} |x_k|^2\Big)^{1/2} < \infty\Big\},$$

$$\widehat{M}^{\mathrm{d}} := \{x \in \widehat{M} : x = \widehat{\mu},\ \mu \in M_{2\pi} \text{ is discrete}\}.$$

2. The error in Proposition 4.1(i) of [1]. The error in the proof of this proposition consists in the assumption of the existence of the E-valued Riemann integral $\int_0^{2\pi} K_n(t)x \cdot e(-t)\,dt$, where $x \in E$ and K_n is the nth Fejér-kernel. This is pointed out in detail in [2].

A counterexample to 4.1(i) of [1] is $E = \widehat{M}^{\mathrm{d}}$. In fact, since $\Phi \cap \widehat{M}^{\mathrm{d}} = \{0\}$, evidently $\widehat{M}^{\mathrm{d}} \not\subset (\widehat{M}^{\mathrm{d}})_{\sigma\mathrm{B}} = \{0\}$.

A less trivial counterexample is $E = \widehat{M}^{\mathrm{d}} + \widehat{L}^2 = \{x \in \Omega : x = a + b,\ a \in \widehat{M}^{\mathrm{d}},\ b \in \widehat{L}^2\}$ with $\|x\|_E := \|a\|_{\widehat{M}} + \|b\|_{\widehat{L}^2}$. Through this example Ulf Boettcher brought the incorrectness of 4.1(i) in [1] to our attention. Evidently E is a translation invariant BK-space. If $x \in \widehat{M}^{\mathrm{d}} + \widehat{L}^2$ then $\sigma_n x \in \widehat{L}^2$ for all $n = 0, 1, 2, \ldots$ Hence $E \not\subset E_{\sigma\mathrm{B}} = \widehat{L}^2$, since $\widehat{M}^{\mathrm{d}} \not\subset \widehat{L}^2$.

3. Corrected version of Theorem 4.2(ii) of [1]. *If E is a translation invariant BK-space with $E \subset E_{\sigma\mathrm{B}}$, then $E_{\mathrm{AB}} \cap \widetilde{E} \subset \widetilde{E}_{\mathrm{AB}}$.*

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4. Corrected proof of Proposition 4.3 of [1]. First we state the unchanged Proposition 4.3:

Let E be a translation invariant BK*-space. Then $x \in E$ has weakly continuous translation if and only if x has* σK.

Proof. The translation invariance of E implies that the family $\{T_t : t \geq 0\}$ of bounded linear operators from E into E, with $T_t x := e(t) \cdot x$ $(x \in E)$, is a semi-group which fulfills $T_t \circ T_s = T_{t+s}$ for all $t, s \geq 0$. Hence on E weak continuity of translation is equivalent to continuity of translation by the Theorem on p. 233 of [3]. Thus the statement follows from 4.1(ii) of [1] by the definition of a homogeneous BK-space.

REMARKS. (i) I thank Ulf Boettcher for this proof. Later Andreas Pechtl found independently a different proof [2; p. 14, Theorem 3.6].

(ii) Corollary 4.4 in [1] is a special case of the Theorem of [3] just cited.

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