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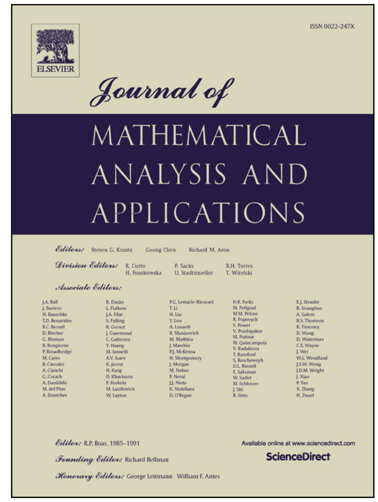

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WEAK HAMBURGER-TYPE WEIGHTED SHIFTS AND THEIR EXAMPLES

George R. Exner, Joo Young Jin, Il Bong Jung, Ji Eun Lee *†

Abstract

Let W_α be a bounded weighted shift with weight sequence $\alpha = \{\alpha_n\}_{n=0}^{\infty}$ and let $\gamma_n = \alpha_0^2 \cdots \alpha_{n-1}^2$ $(n \geq 1)$ with $\gamma_0 = 1$. The positivity of both of the infinite matrices $(\gamma_{i+j})_{0\leq i,j<\infty}$ and $(\gamma_{i+j+1})_{0\leq i,j<\infty}$ is a condition equivalent to subnormality of W_α. For a positive integer n, the positivity of $(\gamma_{i+j})_{0\leq i,j<n}$ defines property $H(n)$ for W_α which is closely related to the flatness of α. As a study of the flatness property, the problem "describe weighted shifts W_α with property $H(n)$ such that $\alpha_1 = \alpha_2$" is considered. We solve this problem in the case of weighted shifts whose weight sequence has Bergman tail, and also in the case of shifts whose weight sequence is the backward extension of a Hamburger completion $(\alpha_0, \alpha_1, \alpha_2)^H$. In addition, we discuss some examples to show the properties $H(n)$, $\widetilde{H}(n)$, and n-hyponormality are distinct.

1. Introduction and Preliminaries

Let $\mathcal{H}$ be an infinite dimensional complex Hilbert space and let $\mathcal{L}(\mathcal{H})$ be the algebra of all bounded linear operators on $\mathcal{H}$. We denote by $[A, B] := AB - BA$ the *commutator* of A and B in $\mathcal{L}(\mathcal{H})$. Let $\mathbb{N}$ [resp., $\mathbb{Z}_+$] be the set of positive integers [resp., nonnegative integers]. We write $\mathbb{R}$ [resp., $\mathbb{R}_+, \mathbb{C}$] for the set of real [resp. nonnegative real, complex] numbers and let $\mathbb{R}_+^0 := \mathbb{R}_+ \backslash \{0\}$.

An operator T in $\mathcal{L}(\mathcal{H})$ is *subnormal* if it is (unitarily equivalent to) the restriction of a normal operator to an invariant subspace, and *hyponormal* if $[T^*, T] \geq 0$. There are several properties between subnormality and hyponormality, which have been considered for about two decades, such as (strongly) n-hyponormal and weakly n-hyponormal operators for $n \in \mathbb{N}$, etc. (cf. [1],[5],[6],[8],[9]). In the study of these classes, the weighted shifts W_α with weight sequence $\alpha = \{\alpha_i\}_{i=0}^{\infty}$ in $\mathbb{R}_+^0$ have played an important role. As a similar study, in [13, Th. 4.4] Hamburger-type weighted shifts which are related to Hamburger moment sequences were introduced. For the readers' convenience we discuss them briefly below.

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