JOURNAL OF COMMUTATIVE ALGEBRA
Volume 1, Number 3, Fall 2009

RELATIONS BETWEEN SEMIDUALIZING COMPLEXES

ANDERS J. FRANKILD, SEAN SATHER-WAGSTAFF, AND AMELIA TAYLOR

ABSTRACT. We study the following question: Given two semidualizing complexes B and C over a commutative noetherian ring R, does the vanishing of $\mathrm{Ext}^n_R(B,C)$ for $n \gg 0$ imply that B is C-reflexive? This question is a natural generalization of one studied by Avramov, Buchweitz, and Şega. We begin by providing conditions equivalent to B being C-reflexive, each of which is slightly stronger than the condition $\mathrm{Ext}^n_R(B,C) = 0$ for all $n \gg 0$. We introduce and investigate an equivalence relation $\approx$ on the set of isomorphism classes of semidualizing complexes. This relation is defined in terms of a natural action of the derived Picard group and is well-suited for the study of semidualizing complexes over nonlocal rings. We identify numerous alternate characterizations of this relation, each of which includes the condition $\mathrm{Ext}^n_R(B,C) = 0$ for all $n \gg 0$. Finally, we answer our original question in some special cases.

1. Introduction.

Given a dualizing complex D for a commutative noetherian ring R, cohomological properties of D often translate to ring-theoretic properties of R. For example, when R is local, if $\mathrm{Ext}^n_R(D,R) = 0$ for $n \gg 0$ and the natural evaluation morphism $D \otimes^{\mathbf{L}}_R \mathbf{R}\mathrm{Hom}_R(D,R) \to R$ is an isomorphism in the derived category $\mathcal{D}(R)$, then R is Gorenstein. Recently, Avramov, Buchweitz, and Şega [**2**] investigated the following potential extensions of this fact.

2000 AMS *Mathematics subject classification.* 13D05, 13D07, 13D25, 13H10.
Keywords and phrases. Auslander classes, Bass classes, complete intersection dimensions, CI-dimensions, Gorenstein dimensions, G-dimensions, semidualizing complexes, tilting complexes.
This work was completed after the untimely passing of Anders J. Frankild on 10 June 2007.
Received by the editors on March 17, 2009, and in revised form on March 20, 2009.
DOI:10.1216/JCA-2009-1-3-393