

Abstract Submitted
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Paradoxical Behavior of Granger Causality ANNETTE WITT¹,
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Organization, ALEXANDER GAIL³, German Primate Center — Granger causality
is a standard tool for the description of directed interaction of network components
and is popular in many scientific fields including econometrics, neuroscience and
climate science. For time series that can be modeled as bivariate auto-regressive
processes we analytically derive an expression for spectrally decomposed Granger
Causality (SDGC) and show that this quantity depends only on two out of four
groups of model parameters. Then we present examples of such processes whose
SDGC expose paradoxical behavior in the sense that causality is high for frequency
ranges with low spectral power. For avoiding misinterpretations of Granger causal-
ity analysis we propose to complement it by partial spectral analysis. Our findings
are illustrated by an example from brain electrophysiology. Finally, we draw impli-
cations for the conventional definition of Granger causality.

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