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AN EIGENVALUE APPROACH TO THE LIMITING BEHAVIOR OF TIME SERIES AGGREGATES

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Abstract. Many time series variables such as rainfall, industrial production, and sales exist only in some aggregated forms. To see the implication of time series aggregation it is important to know the limiting behavior of the time series aggregates. From the relationship of autocovariances between the underlying time series variable and its aggregates, we show that the limiting behavior of time series aggregates is closely related to the eigenvalues and the eigenvectors of the aggregation operator. Specifically, the vector of admissible autocorrelations of the limiting model for the time series aggregates is the eigenvector associated with the largest eigenvalue of the aggregation transformation. This provides an interesting and simple method for deriving the limiting model for time series aggregates. Systematic sampling of time series can be treated similarly. The method is illustrated with an empirical example.

Key words and phrases: Time series, aggregation, systematic sampling, ARIMA process, autocovariance, limiting model.