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Efficient Reconciliation of a Hierarchy of Forecasts in Presence of Constraints

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ABSTRACT

Businesses often organize their data in a hierarchical fashion and need forecasts for each level of the hierarchy. The hierarchical structure imposes accounting constraints on the data. It seems natural to want these constraints to be respected by the forecasts as well. Additionally, other constraints on the forecasts might be present. For example, the series might need to be nonnegative, or the analyst might want to override some statistical forecasts with judgmental forecasts.

In most cases, forecasts are generated independently for each node. The resulting forecasts do not usually abide by the required constraints. The after-the-fact process through which the constraints are enforced on the forecasts is called reconciliation.

This paper presents a general framework for reconciliation based on constrained regression that enables efficient reconciliation of a hierarchy of forecasts in the presence of linear constraints. The traditional bottom-up and top-down methods of reconciliation follow as particular cases. The paper shows how these methods have been implemented in the new SAS HPFRECONCILE procedure (in SAS® High-Performance Forecasting software 2.2) and in SAS® Forecast Server 1.4.

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