# Mustard price dynamics due to ban on blending: time series intervention model with nonlinear function

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**Intervention analysis is used to study structural changes in data resulting from external events. Traditional time series intervention models, viz. autoregressive integrated moving average model with exogenous variables (ARIMA-X) and artificial neural networks with exogenous variables (ANN-X), rely on linear intervention functions such as step or ramp functions, or their combinations. However, when intervention effects are nonlinear, growth models may offer a viable alternative. This study proposed a new algorithm for time series intervention analysis employing ARIMA and ANN models with a nonlinear intervention function. The Hoerl function has been introduced as a nonlinear intervention function. To demonstrate the effectiveness of the proposed model, monthly wholesale price data from three markets in Rajasthan, namely, Tonk, Alwar and Sriganganagar during January 2010 to May 2023 have been used. The analysis encompassed a comprehensive examination across all markets, revealing that the proposed models consistently outperformed the conventional ARIMA-X and ANN-X methodologies in terms of performance and accuracy.**

**Keywords:** Accuracy, blending, Hoerl model, intervention effect, mustard.

vitamins, 2–3% glucosinolate, 14–15% carbohydrates, 25–30% protein and 10–12% fibre. The composition of mustard oil typically includes around 40–60% erucic acid, 4.5–13% linolenic acid and 25–30% oleic acid[3]. In India, during the 1990s, blending of edible oils was permitted for the first time. This move was prompted by the widespread outbreak of dropsy towards the end of the decade, which was attributed to the adulteration of mustard oil. However, researchers argue that the blending of mustard oil had detrimental effects on both the mustard farming community and public health. Consequently, blending of mustard oil was banned in October 2020. This policy intervention has had repercussions on the price of mustard oil and on the economy of both the farming community and consumers[4].

Time series analysis is used to forecast future events based on the past pattern. The auto regressive integrated moving average (ARIMA) is considered the most notable developed in a class of time series forecasting. This model performs well if the data under consideration is linear and forecast needed is for the short term. But if the past data is affected by intervention, the conventional time series model fails to predict the actual picture of the future. Intervention can be defined as any sudden change in