

# Estimating Missing/Counterfactual Figures in Japan's Construction Order Statistics via Multi-output Gaussian Processes

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## Abstract

Japan's construction order statistics have been overstated since 2013. The Ministry of Land, Infrastructure, Transport and Tourism was found to have instructed local authorities to rewrite data received from companies and to have published swollen figures. There is an urgent need to correct the erroneous figures, because, as well as being important in their own right, they are used for other major official statistics including gross domestic product. However, it is impossible to restore monthly figures as the original survey forms from before 2019 have been discarded. This study estimates the missing/counterfactual figures of monthly construction orders in Japan using a number of other related statistics and a Bayesian semiparametric model based on multi-output Gaussian processes. Our modeling strategy can capture complex time-series and inter-series features. We conduct a series of Monte Carlo experiments calibrated to macroeconomic indicators and show that our method outperforms alternatives in terms of imputing accuracy.

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