Title: Panel Forecasts of Country-Level Covid-19 Infections

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Abstract: We use dynamic panel data models to generate density forecasts for daily Covid-19 infections for a panel of countries/regions. At the core of our model is a specification that assumes that the growth rate of active infections can be represented by autoregressive fluctuations around a downward sloping deterministic trend function with a break. Our fully Bayesian approach allows us to flexibly estimate the cross-sectional distribution of heterogeneous coefficients and then implicitly use this distribution as prior to construct Bayes forecasts for the individual time series. According to our model, there is a lot of
uncertainty about the evolution of infection rates, due to parameter uncertainty and the realization of future shocks. We find that over a one-week horizon the empirical coverage frequency of our interval forecasts is close to the nominal credible level. Weekly forecasts from our model are published at https://laurayuliu.com/covid19-panel-forecast/.

**JEL Classification:** C11, C23, C53

**Key words:** Bayesian inference, Covid-19, density forecasts, interval forecasts, panel data models, random effects, SIR model.

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**Dataset:** The data set is obtained from CSSE at Johns Hopkins University (https://github.com/CSSEGISandData/COVID-19). We define the total number of active infections in location \( i \) and period \( t \) as the number of confirmed cases minus the number of recovered cases and deaths. We understand that infections are measured with error because there is evidence that a significant number of infected individuals are asymptomatic and hence not captured in the official statistics. Moreover, determining the precise number of Covid-19 related deaths is non-trivial (dying with versus dying of Covid-19). The goal of our modeling effort is to predict the number of active infections as recorded in the CSSE data set.

**URL:** a working paper and updated forecasts are available at: https://laurayuliu.com/covid19-panel-forecast/index.html