



Monitoring the Global Carbon Budget: Real-time verification of CO₂ emissions

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We show that the residual of the global carbon budget (the so-called budget imbalance) is historically well-described by a zero-mean stationary process. Further, we show that if reported CO₂ emissions become different from actual emissions, this will introduce a structural break in the stationary process driving the budget imbalance. Using the theory of sequential testing, we propose a monitoring scheme, which will detect any misreporting of CO₂ emissions with probability one as time goes, while having controlled size. We perform a number of numerical experiments to illustrate the methods and uncover their finite sample performance. By constructing the monitoring scheme appropriately, detection time can be made sufficiently fast to help inform the 5 yearly global “stocktake” of the Paris agreement. Finally, we give a concrete stopping rule: when the criterion of this simple rule is met, there is statistical evidence of misreporting in global CO₂ emissions.