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Revisiting the statistical analysis of the Israeli–Palestinian conflict

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Haushofer et al. (1) set out to study the causal factors that perpetuate violence in the Israeli–Palestinian conflict. They attribute 10% and 4% of casualties to Palestinian and Israeli retaliation, respectively; these percentages are immaterial and statistically insignificant, thus failing to show the cycle of violence. Reanalyzing the same data while addressing the shortcomings in statistical analysis as detailed below, we find that the nature of the conflict varies over time (Table 1). Some periods display a cycle of violence regimen, whereas in most periods, retaliation explains a minuscule portion of events, suggesting that the parties display no statistical regularity in their actions. The results also show the shift in retaliation strategies on the Palestinian side from killings to Qassam attacks, which are typically smaller than the Israeli retaliation effect.

Table 1.

Observed and expected number of Israeli fatalities (IS), Palestinian fatalities (PA), and Qassam firings (QS) at each epoch using a three-variable VAR model with variance-stabilizing transformation

Epoch	Date	Lag	Observed PA	Expected PA	Observed IS	Expected IS	Observed QS	Expec QS
Start of Qassam data - Operation Defensive Shield	1/01/2001 to 3/29/2002	9	796	71.6 (9.0%)	342	17.3 (5.0%)	17	1.1 (6.0
… -Abbas's nomination	3/30/2002 to 3/19/2003	1	888	11 (1.2%)	320	0.52 (0.1%)	57	0.2 (0.4
… -Arafat's death	3/20/2003 to 11/11/2004	2	1,145	9.5 (0.8%)	232	0.96 (0.4%)	397	13. (3.4
… -Israeli withdrawal from Gaza	11/12/2004 to 8/15/2005	4	183	20 (10.9%)	39	0.18 (0.5%)	156	26. (16.9
… - Hammas coup in Gaza	8/16/2005 to 6/14/2007	3	863	45 (5.2%)	48	0.1 (0.2%)	1,576	32. (2.0
… -End of Qassam data	6/15/2007 to 4/16/2008	2	581	53.8 (9.3%)	28	0.16 (0.6%)	1,440	73. (5.1

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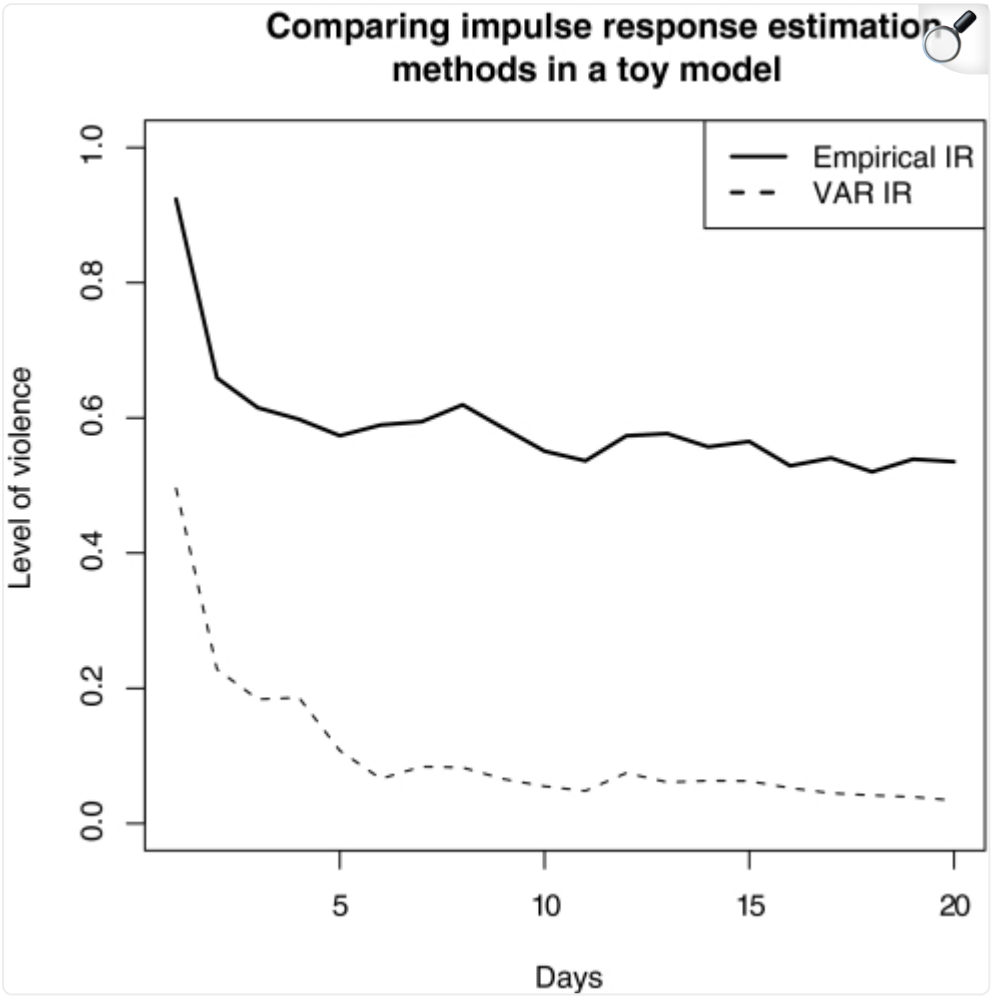
Although statistical analysis of any conflict is controversial, we adopt the data-driven approach by Haushofer et al. (1) and address several statistical shortcomings. (*i*) Years 2001–2008 included

several epochs in the conflict, rendering the single impulse-response assumption implausible. The stationarity hypothesis is rejected using the maximum of a moving average of the ordinary least squares (OLS) residuals in a sliding window of 5% of all observations (P value ≤ 0.014 for all series). (*ii*) Analysis followed the method suggested by Jaeger and Paserman (2) for estimating the response functions. Fig. 1 shows this method to be very misleading. (*iii*) The usual assumptions needed for inference based on F tests are unreasonable. We use a square root variance-stabilizing transformation to alleviate this issue. (*iv*) Although the novelty of the paper is the addition of the Qassam firing data, the impulse response and vector auto-regression (VAR) estimation were carried out using only two of three series at a time. An appropriate model should include three equations with three endogenous predictors. (*v*) Granger tests are surprisingly sensitive to lag selection and are usually carried with the same number of lags for both series (3). When optimizing the lag selection of all three time series simultaneously rather than separately (as performed by Haushofer et al.; ref. 1), some results are reversed; for example, Qassams do Granger-cause an Israeli reaction. It is preferable to fit a simultaneous model with the same lag number for all time series. (*vi*) The proportion of events attributed to retaliation was calculated based on the first day of the empirical response function. Because no side retaliates within a single day, this biases downward the proportion of retaliation-attributed events. We suggest redefining "“the proportion of events attributed to retaliation” as the proportion of events caused by the opposing party's actions as predicted by the VAR estimates. This approach implicitly considers Qassams and killings as provocations interchangeably rather then separately as in ref. 1.

Fig. 1.



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Comparison of impulse-response estimation methods. We define a toy model where the real Qassam firings are used, but Israeli impulse response is generated by a simple rule. For each Qassam fired, there is a 0.5 probability of a Palestinian casualty on the following day. We use the generated data to fit a VAR model and the empirical impulse response as in Haushofer et al. (1), which is clearly biased.

In conclusion, we would like to comment that, although our analysis corrects some of the flaws in the statistical approach of Haushofer et al. (1), we are not claiming that it addresses all possible biases, omissions, and misrepresentations. Our position is that the data used capture only few aspects of this multifaceted conflict. For a proper quantitative analysis, more effort should have been put into data gathering.

Footnotes

The authors declare no conflict of interest.

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