README:
"Double Robustness of Local Projections and Some Unpleasant VARithmetic"

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In this document we describe the replication files for the paper "Double Robustness of Local Projections and Some Unpleasant VARithmetic." The code produces all figures reported in the paper, plus supplementary details on the literature review referenced in Section 5.1. The files are organized into three main folders—one for the various illustrations of our analytical results, one for the simulations, and one for the VAR lag length literature review.

1 Data and code availability statement

In addition to code that we have produced, the replication material draws on the following files that have been wholly or partially produced by other authors:

- We use the datasets of Ramey (2016) and Känzig (2021). Data are obtained from the replication files for those papers, and stored in `_data`.
  - We replicate Ramey's government spending, tax, monetary policy, and TFP shock applications. The corresponding datasets, `homgovdat.xlsx`, `homtaxdat.xlsx`, `Monetarydat.xlsx`, and `Technology_data.xslx` are stored in `_data/ramey`. That folder also contains written permission to reproduce the data. For ease of access we additionally save the relevant data series in `csv` format.[1]

[1] The replication files are available on Valerie Ramey's webpage, `https://econweb.ucsd.edu/~vramey/research.html`. We note that, because it is a handbook chapter, the data (and in particular shock) series used there in turn draw on much prior work, as discussed in detail in Ramey (2016).

  - The relevant files from the replication package of Känzig (2021) are `OilDataM.mat` (for macroeconomic outcomes) and `OilSurprisesMLog.mat` for the shock series, stored in `_data/kaenzig`. That folder also contains the license for re-use. We again additionally save the data series in `csv` format.[2]

- For LP and VAR estimation we use the estimation routines produced for Montiel Olea et al. (2025). The estimation files are stored in the folder `_estim`, which also includes the license for re-use.[3]

- For plotting purposes we use the file `jbfill.m`, available on Mathworks file exchange. The license is reproduced in the folder `analytics/_aux`.

The data file for our VAR lag length literature review, `lit_varlags_raw.csv`, is stored in the folder `lit_lags`. It reports, for a number of recently published papers, the included lag length, the maximal impulse response horizon of interest, the data frequency, the criterion used for lag length selection, and whether additional Bayesian shrinkage was employed. The data was hand-collected by the authors.

2 Computational requirements

All codes have been run and tested on Matlab R2025b on a Macbook Pro 2023 (M3 Pro), and additionally requires the Econometrics, Statistics and Machine Learning, and Parallel Computing Toolboxes. Approximate runtimes for all files are indicated below.

3 Replication instructions

Below we indicate what files need to be run to produce each of the figures in main text and online appendix, as well as supporting information on our VAR lag length literature review.

3.1 Analytics

This folder contains the files necessary to produce all of the figures that illustrate our theoretical results, i.e., Figures 4.1, 4.2, 4.3, A.1, A.2, as well as A.3. The figures are stored in

[2]The replication files are available at `https://github.com/dkaenzig/replicationOilSupplyNews`.
[3]The files are available at `https://github.com/ckwolf92/lp_var_nberma`.

the sub-folder `_figures`, intermediate results in `_results`, and the sub-folder `_aux` contains auxiliary functions. The only file with a non-trivial runtime is `run_ramey_ses.m`, which takes around 3 minutes to run. The end of this section provides some further details on the precise specifications that we run in that file.

- The file `run_ramey_ses.m` replicates several of the headline experiments reported in Ramey (2016, as discussed further below), and stores the results in `res_application.mat`. For convenience that results file is already provided in the replication package.
- The file `plot_worstcase.m` produces Figures 4.1, 4.2, 4.3, A.2, and A.3. It uses as an input the Ramey (2016) replication results, `res_application.mat`.
- The file `plot_arbias.m` produces Figure A.1.

The information in the next paragraph is provided for completeness and not necessary to execute any of our replication codes.

Supplementary details. For the analysis in `run_ramey_ses.m` we consider four applications in which the researcher has access to a direct measure of a macroeconomic shock. We estimate the dynamic causal effects of those four shocks using LPs and the corresponding recursive VAR (Plagborg-Møller & Wolf, 2021), with both specifications including the same set of observables and same number of controls. We then construct bootstrap standard errors with 2,000 bootstrap iterations, assuming homoskedasticity.

The four applications are described below. The data and series mnemonics come from the replication files of Ramey (2016). Our choices of shock measures, observables, samples, data treatment, trends, and lag lengths follow those in the original paper.

1. *Monetary policy:* We use the high-frequency surprises of Gertler & Karadi (2015) (`ff4_tc`) as the observed shock series, and as macro observables we include log industrial production (`lip`), log prices (`lcpi`), the one-year rate (`gs1`), and the excess bond premium (`ebp`). The data are monthly from 1990:1 to 2012:6. We include two lags, and consider impulse responses of all macro variables at horizons of 1–4 years.
2. *Taxes:* The tax shock is the Romer & Romer (2010) series `rrtaxu`. As macro observables we include GDP (`rgdp`), federal tax revenue (`rfedtaxrev`), and government spending (`rgov`), all real, per capita, and in logs. The data are quarterly from 1950:1 to 2007:4. Before estimation, the data are residualized with respect to a quadratic time trend and

a dummy variable for 1975:2. We include four lags, and consider impulse responses of all macro variables at horizons of 1–5 years.

3. *Government purchases:* We use the Ramey (2011) military news series (`rameynews`). The macro observables are GDP (`rgdp`), government spending (`rgov`), and the average tax rate (`taxrate`); the first two series are in real terms, logs, and per capita. The data are quarterly from 1947:2 to 2013:4. Before estimation, the data are residualized with respect to a quadratic time trend. We include two lags, and consider impulse responses of all macro variables at horizons of 1–5 years.

4. *Technology:* We use the unanticipated TFP shock series of Francis et al. (2014) (`ford_tfp`). The macro observables are GDP (`rgdp`), stock prices (`stockp_sh`), and labor productivity (`rgdp/tothours`), all in logs (and in real per capita terms for GDP). The data are quarterly from 1949:2 to 2009:4. Before estimation, the data are residualized with respect to a quadratic time trend. We include two lags, and consider impulse responses of all macro variables at horizons of 1–5 years.

Aggregating across shocks, outcome variables, and horizons, we compute 301 ratios of VAR to LP standard errors. The mean ratio is 0.394, the median is 0.367, the 10th percentile is 0.168, and the 90th percentile is 0.638.

3.2 Simulations

This folder contains the files necessary to produce the simulation results, i.e., Figures 5.1 and D.1. As above figures are stored in `_figures`, intermediate results in `_results`, and the sub-folder `_aux` contains auxiliary functions. Both the DGP set-up and the simulations have non-trivial runtimes, discussed further below.

- The file `gen_varma_oil.m` sets up the oil shock DGP based on Känzig (2021), storing the results in the file `oil_dgps.mat`. It takes around 2 minutes to run. For convenience that file is already stored in the replication package.

- The file `simul_oil.m` runs our main simulations. It uses as an input the `oil_dgps.mat` file. At the top of the file, setting `exp_id = 1` and `boot = true` produces the simulation results for fixed lag length ($p = 12, 15, 18$), while setting `exp_id = 2` and `boot = true` does the same for AIC lag length selection; results are stored as `sim_1.mat` and `sim_2.mat`. The expected run time is about 4500 core-hours (e.g., 180 hours

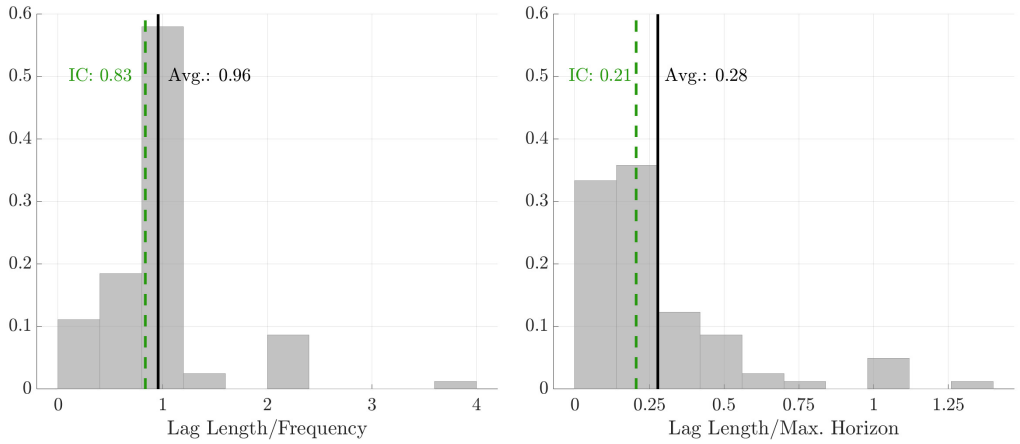

Figure 1: Histogram of VAR lag length relative to data frequency (left panel) and the maximal impulse response horizon (right panel). Black-dashed lines indicate means, and green-dashed lines indicate means for specifications in which the lag length was selected using information criteria.

on a machine with 25 cores). For a faster runtime, we recommend reducing the number of Monte Carlo repetitions (`settings.sim.numrep`) and bootstrap samples (`settings.est.boot_num`), and/or not conducting any bootstrapping (`boot = false`). For convenience the full simulation files are already stored in the replication package, in HDF5 format and thus readable by any HDF5 library.

- The file `plot_oil.m` produces our simulation figures, using as inputs the results files `sim_1.mat` and `sim_2.mat`. With `exp_id = 1` it produces the top panel of Figure 5.1 as well as the top and middle panels of Figure D.1; with `exp_id = 2` it produces the bottom panel of Figure 5.1 as well as the bottom panel of Figure D.1.

3.3 Review of applied lag length selection

We here provide supplementary details on construction of the data referenced in Section 5.1. A list of all included papers in our literature review, together with the recorded information on lags, impulse response horizon, data frequency, and estimation method, is provided at the end of this document. Figure 1 shows histograms of the selected lag length relative to data frequency and to the maximal impulse response horizon reported. Here, "data frequency" refers to the number of observations per year (1 for annual, 4 for quarterly, 12 for monthly, and 365 for daily). The figure is produced by the file `lit_varlags_eval.m` in the folder `lit_lags`, which uses as an input the data file `lit_varlags_raw.csv`.

Journal	Title	Lags	Max. Hor.	Freq.	Lags crit.	Bayes	Comments
AER	A Sufficient Statistics Approach for Macro Policy	4	40	Q	Fixed	1	
AER	Sectoral Media Focus and Aggregate Fluctuations	4	20	Q	Fixed	1	
AER	From Weber to Kafka: Political Instability and the Overproduction of Laws	4	40	Q	Fixed	0	
AER	Feedbacks: Financial Markets and Economic Activity	10	60	M	MDD	1	MDD-based selection is suggested by Table 3.
AER	The Macroeconomic Effects of Oil Supply News: Evidence from OPEC Announcements	12	50	M	Fixed	0	
AER	Lumpy Investment, Business Cycles, and Stimulus Policy	3	20	Q	AIC	0	
AER	Business-Cycle Anatomy	2	32	Q	BIC	1	Identification is about business-cycle frequencies, so we take 32 as the maximal horizon of interest.
AER	Turnover Liquidity and the Transmission of Monetary Policy	10	120	D	AIC	0	
AER	The Dynamic Effects of Personal and Corporate Income Tax Changes in the United States: Comment	4	20	Q	AIC	0	This is the main specification of Mertens-Ravn (2013), which the comment addresses.
AER	Structural Interpretation of Vector Autoregressions with Incomplete Identification: Revisiting the Role of Oil Supply and Demand Shocks	12	17	M	Fixed	1	
AER	Narrative Sign Restrictions for SVARs	24	18	M	Fixed	1	The paper has two main applications. We pick the one (oil) with more lags.
AER	The Market for Used Capital: Endogenous Irreversibility and Reallocation over the Business Cycle	2	10	Q	Fixed	0	
AER	News or Noise? The Missing Link	4	20	Q	Fixed	0	
AER	News Shocks and the Slope of the Term Structure of Interest Rates: Reply	4	40	Q	Fixed	1	
AER	Escaping the Great Recession	2	20	Q	Fixed	1	
AER	Fiscal Volatility Shocks and Economic Activity	4	16	Q	Fixed	0	
ECMA	Uniform Priors for Impulse Responses	4	20	Q	Fixed	1	
ECMA	The U.S. Public Debt Valuation Puzzle	1	14	A	Fixed	0	
ECMA	What Can Time-Series Regressions Tell Us About Policy Counterfactuals?	4	30	Q	Fixed	1	Two specifications are considered in the main text. We picked the one (for monetary shocks) with more lags.

ECMA	Factions in Nondemocracies: Theory and Evidence From the Chinese Communist Party	1	8	A	Fixed	0	Note that the VAR specification is only considered in the appendix.
ECMA	Monetary Policy, Redistribution, and Risk Premia	6	48	M	Fixed	0	
ECMA	Identification at the Zero Lower Bound	4	24	Q	Fixed	0	
ECMA	Local Projections and VARs Estimate the Same Impulse Responses	4	24	M	Fixed	0	The main specification is the one with four lags; the other one is used to illustrate long-lag population equivalence.
ECMA	Inference Based on Structural Vector Autoregressions Identified With Sign and Zero Restrictions: Theory and Applications	4	40	Q	Fixed	1	
ECMA	Uncertainty Shocks in a Model of Effective Demand	4	20	Q	Fixed	1	
ECMA	Unemployment and Business Cycles	2	14	Q	BIC	1	Lag length selection is discussed in the original Christiano-Trabandt-Walentin paper.
ECMA	Sign Restrictions, Structural Vector Autoregressions, and Useful Prior Information	8	20	Q	Fixed	1	
JPE	Heterogeneity and Aggregate Fluctuations	1	40	Q	MDD	1	The bolded specification in Table 4 has one lag; we select this one as the main specification.
JPE	Big G	12	24	M	Fixed	0	
JPE	Mr. Keynes Meets the Classics: Government Spending and the Real Exchange Rate	4	8	Q	Fixed	1	Note that the VAR is only used for shock generation, while LPs are used for IRF analysis.
JPE	Macroeconomic Drivers of Bond and Equity Risks	1	19	Q	Fixed	0	
JPE	Are Negative Supply Shocks Expansionary at the Zero Lower Bound?	24	48	M	Fixed	0	
JPE	Government Spending Multipliers in Good Times and in Bad: Evidence from US Historical Data	4	16	Q	Fixed	0	This is for the TVAR specification. The authors report four-year cumulative multipliers, so the maximal horizon of interest is 16 quarters.
QJE	Financial Market Risk Perceptions and the Macroeconomy	4	10	Q	Fixed	0	Two sets of VAR specifications are reported in the appendix. We picked the one with more lags.
QJE	The Macroeconomic Effects of Government Asset Purchases: Evidence from Postwar U.S. Housing Credit Policy	12	24	M	Fixed	0	
QJE	Marginal Tax Rates and Income: New Time Series Evidence	2	5	A	AIC/BIC	0	The paper has two main specifications, both identical in terms of lag lengths.
QJE	Technological Innovation, Resource Allocation, and Growth	2	5	A	BIC	0	The lag length is reported in the Online Appendix, Table A-15.
QJE	Measuring Economic Policy Uncertainty	6	36	M	Fixed	0	We consider the monthly VAR specification of the main paper; a quarterly specification is considered in the appendix.

	ReStud	Inflation Levels and (In)Attention	3	20	M	AIC/BIC	0	
	ReStud	Sentimental Business Cycles	18	48	M	Max first-stage F-stat	0	
	ReStud	Recoverability and Expectations-Driven Fluctuations	4	20	Q	Fixed	0	
	ReStud	Identifying Shocks via Time-Varying Volatility	4	19	Q	Fixed	0	
	ReStud	U.S. Monetary Policy and the Global Financial Cycle	12	24	M	Fixed	1	
	ReStud	Uncertainty Shocks as Second-Moment News Shocks	4	24	M	AIC	0	The authors also consider daily and quarterly VARs, but the main specification is monthly.
	ReStud	Appropriate Technology and Balanced Growth	2	72	Q	Fixed	1	
	ReStud	The Analytics of SVARs: A Unified Framework to Measure Fiscal Multipliers	4	40	Q	Fixed	1	
	ReStud	Signalling Effects of Monetary Policy	4	20	Q	Max. marg. likelihood	1	
	ReStud	Household Debt and the Dynamic Effects of Income Tax Changes	4	12	Q	Fixed	0	
	ReStud	Self-Fulfilling Credit Cycles	1	18	A	Fixed	0	
	AEJ:M	Terms-of-Trade Shocks Are Not All Alike	1	10	A	Data-selected	0	The main specification has one lag; a two-lag specification is only referenced in a footnote.
	AEJ:M	Severe Weather and the Macroeconomy	12	40	M	Fixed	1	Note that this is a time-varying VAR.
	AEJ:M	Estimating Hysteresis Effects	3	40	Q	AIC	1	
	AEJ:M	Testing the Effectiveness of Unconventional Monetary Policy in Japan and the United States	4	20	Q	AIC	0	The main specification has four lags for the U.S. and two lags for Japan; we picked the longer one.
	AEJ:M	A Congestion Theory of Unemployment Fluctuations	4	20	Q	Fixed	0	
	AEJ:M	The Causal Effects of Lockdown Policies on Health and Macroeconomic Outcomes	14	60	D	Fixed	1	
	AEJ:M	Has the Information Channel of Monetary Policy Disappeared? Revisiting the Empirical Evidence	12	12	M	Fixed	1	Note that the BIC is used in a different part of the paper, but not for the main VAR specification.
	AEJ:M	Earnings-Based Borrowing Constraints and Macroeconomic Fluctuations	4	12	Q	Fixed	0	
	AEJ:M	Measuring Monetary Policy in the Euro Area Using SVARs with Residual Restrictions	12	60	M	Fixed	1	

AEJ:M	Mind the Gap! Stylized Dynamic Facts and Structural Models	4	24	Q	Fixed	0	The authors study the Iacoviello (2005) and Basu-Bundick (2017) specifications; the latter has more lags, so that is what we pick.
AEJ:M	News Shocks under Financial Frictions	5	40	Q	Fixed	1	
AEJ:M	The Decline of the Labor Share: New Empirical Evidence	4	40	Q	Fixed	1	
AEJ:M	Uncertainty and Business Cycles: Exogenous Impulse or Endogenous Response?	6	60	M	Fixed	0	
AEJ:M	The Transmission of Monetary Policy Shocks	12	24	M	Fixed	1	The paper considers several specifications, but they are all essentially identical in terms of lags.
AEJ:M	Monetary Policy and Inequality under Labor Market Frictions and Capital-Skill Complementarity	5	48	M	Fixed	0	
AEJ:M	Sectoral Price Facts in a Sticky-Price Model	4	16	Q	Fixed	0	
AEJ:M	Managing the UK National Debt 1694–2018	4	10	A	Fixed	0	
AEJ:M	Deconstructing Monetary Policy Surprises—The Role of Information Shocks	12	36	M	Fixed	1	
AEJ:M	The Aging of the Baby Boomers: Demographics and Propagation of Tax Shocks	2	4	A	Fixed	0	
AEJ:M	Corporate Cash and Employment	1	20	Q	Fixed	0	
AEJ:M	Fixed-Wage Contracts and Monetary Non-neutrality	4	48	M	Fixed	0	
AEJ:M	Monetary Policy, Real Activity, and Credit Spreads: Evidence from Bayesian Proxy SVARs	12	48	M	Fixed	1	AIC is only considered as an (unshown) robustness check.
AEJ:M	Oil and Macroeconomic (In)stability	2	40	Q	Fixed	1	
AEJ:M	Noisy News in Business Cycles	4	40	Q	Fixed	0	
AEJ:M	Bank Leverage Cycles	2	30	Q	Fixed	0	
AEJ:M	Transfer Payments and the Macroeconomy: The Effects of Social Security Benefit Increases, 1952-1991	12	12	M	Fixed	0	
AEJ:M	The Macroeconomic Effects of Monetary Policy: A New Measure for the United Kingdom	24	36	M	Fixed	0	
AEJ:M	The Exchange Rate Response to Monetary Policy Innovations	6	10	M	AIC	0	
AEJ:M	A New History of Banking Panics in the United States, 1825-1929: Construction and Implications	12	12	M	Fixed	0	We consider the monthly (and not the annual) specification as the main specification, as such specifications are more typical in VAR analyses.
AEJ:M	Monetary Policy Surprises, Credit Costs, and Economic Activity	12	48	M	Fixed	0	

AEJ:M	Understanding the Great Recession	2	12	Q	Fixed	1	
AEJ:M	The Effects of Monetary Policy on Stock Market Bubbles: Some Evidence	4	4	Q	Fixed	1	Note that this is a time-varying VAR.

Table 1: *Column (1) lists the journal. Column (2) gives the title. Column (3) lists the VAR lag length. Column (4) gives the maximal impulse response horizon of interest. Column (5) gives the data frequency, with frequency codes A = annual, Q = quarterly, M = monthly, D = daily. Column (6) shows the lag–length selection criterion, with "Fixed" indicating that the lag length was not selected in any data-driven way. Column (7) is 1 if the paper uses Bayesian estimation, and 0 otherwise. Column (8) gives further comments.*

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