LocalProjection package for gretl
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Versión 1.0

This package estimates the impulse response functions (IRF) following Jordá (2005) methodology for a multivariate linear local projection, and Auerbach and Gorodnichenko (2012), for a multivariate regime-switching local projection. In this package, the user can find both options (this code was first inspired by the R package “lpirfs” developed by Philipp Adämmer).

Linear local projection:
lin_local_projection(endogenous, exogenous, length, lagselection, nlags, maxlags, infocr, constant, Conflnterv, PositionShock, PositionResponse, exog_lagselection, exog_nlags, exog_maxlags)

Inputs:
endogenous – List including the endogenous variables in the model.
exogenous – List including the exogenous variables, if any. Optional. Default = null.
length – Integer. Number of periods ahead to be estimated in the local projection IRF. Default = 12. Valid values 1 to 60 periods.
lagselection – Boolean. 1.- Lag selection for the endogenous variables, based on an information criterion; 0.- no selection. Default = 0.
nlags – Integer. Number of lags for the endogenous variables to be considered in the estimation. Default = 4. Valid values 1 to 12 periods. (Not needed if lagselection = 1).
maxlags – Integer. Maximum number of lags for the endogenous variables to be tested in the selection of lags, based on the information criterion selected. Default = 12. Valid values 1 to 12 periods. (Not needed if lagselection = 0).
inforc – Integer. The information criterion (1. AIC, 2. BIC, 3. HQC) considered for the optimal lag selection. (Needed if lagselection = 1 or exog_lagselection = 1)
constant – Boolean. 1.- Constant; 0.- no constant. Default = 1.
Conflnterv – Scalar. Confidence interval in the IRF. Default = 0.95. Valid values between 0 and 1.
PositionShock – Integer. Position of the shock variable in the list of endogenous variables.
PositionResponse – Integer. Position of the response variable in the list of endogenous variables.

If exogenous variables are included in the estimation,
exog_lagselection – Boolean. 1.- Lag selection for the endogenous variables, based on an information criterion; 0.- no selection (number of lags predefined). Default = 0.
exognlags – Scalar. Number of lags for the exogenous variables to be considered in the estimation. Default = 1. Valid values 1 to 12 periods. (Not needed if exog_lagselection = 1).
exog_maxlags – Scalar. Maximum number of lags for the exogenous variables to be tested in the selection of lags, based on the information criterion selected. Default = 2. Valid values 1 to 12 periods. (Not needed if exog_lagselection = 0)

The function lin_local_projection returns a bundle, which includes multiple objects described below regarding the characteristics and the results of the linear local projection model:
- **InfoCrit** – String. Information criterion selected
- **EndogVariables** – List. Endogenous variables.
- **OptimalLags** – Matrix. Optimal lags selected for each equation in the VAR.
- **Horizon** – Scalar. Number of periods ahead estimated in the IRF.
- **ExogVariables** – List. Exogenous variables
- **Model** – String. “Linear Local Projection”
- **IRF** – Matrix. Impulse response function values with columns in the order of upper limit, estimation value, lower limit, and periods ahead.
- **ShockVar** – String. Shock Variable
- **ResponseVar** – String. Response Variable

**Regime switching local projection IRFs**

rs_local_projection(endogenous, exogenous, length, lagselection, nlags, maxlags, infocr, constant, ConfInterv, PositionShock, PositionResponse, trigger, dummy, thresh, hpfilter, lambda, gamma, exog_lagselection, exog_nlags, exog_maxlags)

In addition to the parameters of the linear projection previously described, specific parameters of the regime-switching format are needed. The most relevant is a switching or transition variable that can either be decomposed by the Hodrick-Prescott filter, directly plugged in a logistic function or transformed into an indicator variable. The latter allows to determine the periods in which the model is at a high or a low regime.

Inputs:

- **trigger** – List. Switching or trigger variable that will define the high/low regime in the estimation. Default = null. Only one variable is allowed.
- **dummy** – Boolean. 1.- If an indicator variable, or dummy, will determine the periods that belongs to the high/low regime; 0.- the trigger variable will be plugged in a logistic function to determine the periods that belong to the high/low regime.
- **thresh** – Scalar. This parameter indicates the threshold, as a percentile value, that separates the high and the low regime. If the user has previously created an indicator variable, this parameter can be disregarded. Otherwise, thresh will create an indicator variable that takes value of 1 if the trigger variable exceeds the percentile value indicated with this parameter. Default = 0.75. Valid values between 0 and 1.
- **hpfilter** – Boolean. 1.- The switching or trigger variable will be decomposed by the Hodrick-Prescott filter; 0.- the variable will be directly plugged in the logistic function.
- **gamma** – Sensitivity parameter, greater than 0, of the logistic function. (Not needed if dummy = 1).

Similarly, the function rs_local_projection returns a bundle including multiple objects with the characteristics and the results obtained of the nonlinear model:

- **InfoCrit** – String. Information criterion selected
- **Gamma** – Scalar. Logistic function’s gamma parameter.
- **EndogVariables** – List. Endogenous variables.
- **OptimalLags** – Matrix. Optimal lags selected for each equation in the VAR.
- **HPLambda** – Lambda parameter of the HP filter.
- **Horizon** – Scalar. Number of periods ahead estimated in the IRF.
- **ExogVariables** – List. Exogenous variables
- **ExogVariables** – List. Switching variable
- **Model** – String. “Regime Switching Local Projection”
- **TransitionFunction** – Matrix. Transition function values obtained through the logistic function.
- **ShockVar** – String. Shock Variable
- **ResponseVar** – String. Response Variable
- **HighIRF** – Matrix. High-regime impulse response function values with columns in the order of upper limit, estimation value, lower limit and periods ahead.
- **LowIRF** – Matrix. Low-regime impulse response function values with columns in the order of upper limit, estimation value, lower limit and periods ahead.

Any doubts, comments or suggestions are welcome.
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References
### Sample code:

```plaintext
code:]
open AWM18.gdt

REALYER = YER/PCD  # Real Product
REALITR = ITR/PCD  # Real Investment
LREALYER = logs(REALYER)  # Real Product in logs
LREALITR = logs(REALITR)  # Investment in logs
INFL = 100*(PCD/PCD(-4)-1)  # Inflation rate
smpl 1971:1 2017:4

list endogenous = LREALYER INFL STN  # Endogenous variables list
list exogenous = LREALITR  # Exogenous variables list

See Jordà (2005)

# Parameters needed for the local projection
scalar length = 12  # Integer: Horizons to be projected in the IRF. Default = 12 periods ahead. Valid values from 1 to 60.
scalar nlags = 4  # Integer: Lag order for endogenous variables (Disregard if lagselection = 1). Default = 4 lags. Valid values from 1 to 12.
scalar lagselection = 1  # Boolean and optional: Selection of the optimal order according to a selected information criterion (AIC, BIC or HQC). Default = 0 (prior lag order defined). Valid values 0 and 1.
scalar maxlags = 12  # Integer: Maximum number of lags. Needed if endogenous lag selection is activated (lagselection = 1). Default = 12 lags. Valid values from 1 to 12.
string infocr = "AIC"  # String: Information criterion for lag selection ("AIC", "BIC", "HQC") Needed if optimal lag selection is activated (lagselection = 1).

scalar exog_nlags = 0  # Integer: Lag order for exogenous variables (Disregard if exog_lagselection = 1 or none exogenous variables included). Default = 1 lags. Valid values from 1 to 12.
scalar exog_lagselection = 1  # Boolean and optional: Selection of the optimal order according to a selected information criterion (AIC, BIC or HQC). Default = 0 (prior lag order defined). Valid values 0 and 1.
scalar exog_maxlags = 4  # Integer: Maximum number of lags. Needed if optimal exogenous variables lag selection is activated (exog_lagselection = 1). Default = 12 lags. Valid values from 1 to 12.

scalar constant = 1  # Boolean: 1. Constant included; 0. No constant (Default = 1)
scalar ConflInterv = 0.95  # Confidence interval for the IRF. Default = 0.95
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scalar PositionShock = 3  # Shock variable position in the endogenous variable list. Valid values from 1 to the total number of endogenous variables.
scalar PositionResponse = 1  # Response variable position in the endogenous variable list. Valid values from 1 to the total number of endogenous variables.

LinModel = lin_local_projection(endogenous, exogenous, length, lagselection, nlags, maxlags, infocr, constant, ConfInterv, PositionShock, PositionResponse, exog_lagselection, exog_nlags, exog_maxlags)

eval LinModel.OptimalLags
eval LinModel.EndogVariables
eval LinModel.IRF

#See Auerbach and Gorodnichenko (2012)
#Parameters needed for the regime switching local projection
list trigger = INFL  # Trigger or switching variable.
Does not have to be part of the endogenous variables.
scalar dummy = 0  # Boolean: 1.- If switching variable is a dummy (1-0). 0.- If not a dummy
scalar thresh = 0  # Threshold of the trigger or switching variable. Needed if dummy = 0.
scalar hpfilter = 1  # Boolean: 1.- If apply a HP-filter to the original switching variable. 0.- Otherwise.
scalar lambda = 1600  # Lambda parameter for HP-Filter. Ravn and Uhlig (2002): Anuual data = 6.25, Quarterly data = 1600, Monthly data = 129,600
scalar gamma = 6  # Gamma parameter for the logistic transition function.

rsModel = rs_local_projection(endogenous, exogenous, length, lagselection, nlags, maxlags, infocr, constant, ConfInterv, PositionShock, PositionResponse, trigger, dummy, thresh, hpfilter, lambda, gamma, exog_lagselection, exog_nlags, exog_maxlags)

eval rsModel.OptimalLags
eval rsModel.EndogVariables
eval rsModel.HighIRF
eval rsModel.SwitchingTriggerVar