Estimating effect of trade openness on uncovered interest rate parity deviations using double selection by LASSO

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Intro

- UIP deviation puzzle is a phenomenon whereby high interest rate currencies do not depreciate as UIP predicts:

$$F_{t,k}(1 + i^*_{t,k}) = S_t\,(1 + i_{t,k}),$$

  S_t is a nominal exchange rate, $F_{t,k}$ – forward rate at t for k periods; $i_{t,k}$, and $i^*_{t,k}$ – domestic and foreign interest rates
- Empirically, UIP deviations are measured as the slope coefficient β_F in a regression of a realized log-difference of exchange rates $\Delta s_{t+1} = s_{t+1} - s_t$ on a difference between domestic and foreign interest rates $\Delta i_t = i_t - i^*_t$ being not close to 1, and even turning negative for most countries and time periods

- Fama regression:

$$s_{t+1} - s_t = \alpha + \beta_F(i_t - i^*_t) + u_{t+1}$$

A hypothesis for a mechanism of UIP deviations by Itskhoki, Mukhin (2017)

- Financial shocks and changes to the interest rate cause exchange rate to move to offset the changes in a flow of foreign currency in financial markets by changing net export. Responses of exchange rates to shocks are characterised by overshooting the stationary levels – in the spirit of Dornbush (1976)
- The adjustment direction of exchange rates after the shocks coincides with the interest rate differential, thus all expected movements of exchange rates proceed in accordance with the UIP
- Exchange rate reaction to shocks is weaker for more open economies, as the required amount of foreign currency inflow/outflow can be acquired with a smaller change in terms of trade. As a result, we expect in this model to be negative and go to zero as the trade openness increases

A simplified mechanism for a negative β_F formation, proposed in Itskhoki, Mukhin (2017)

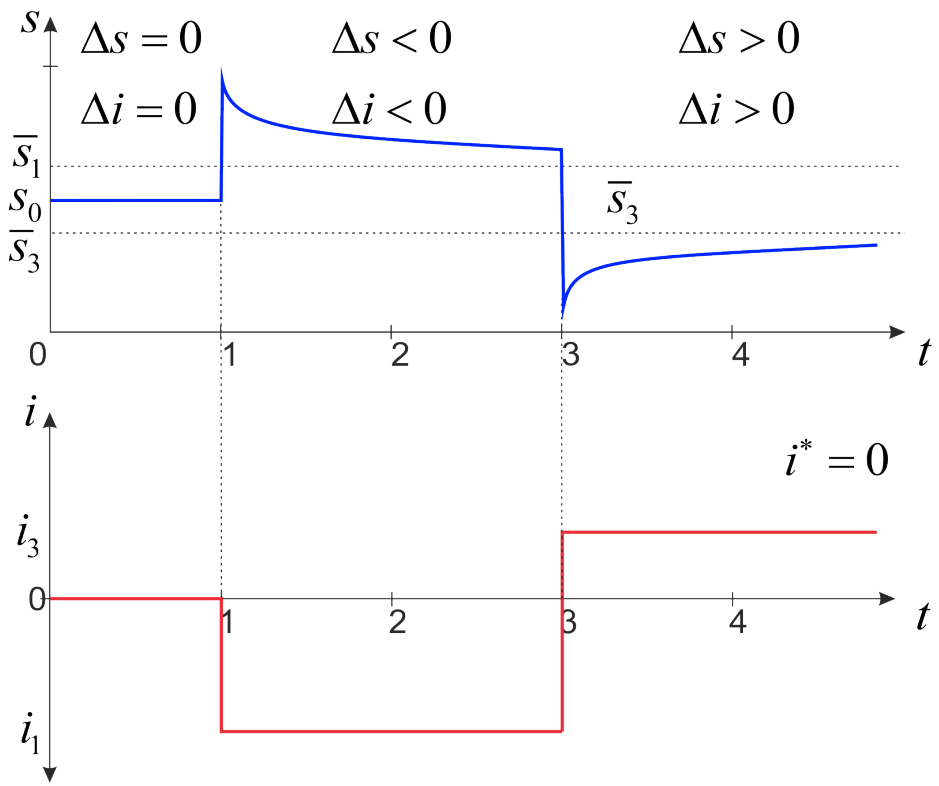

Figure: Dynamics of a nominal exchange rate (blue) in response to changes in interest rate (red). $\bar{s}_1$, $\bar{s}_3$ are stationary levels of exchange rate, corresponding to the current level of interest rate. For simplicity of exposition, the foreign interest rate is set to zero.

Double Selection

- The described mechanism produces a positive correlation between trade openness and a degree of deviations from UIP, although the dependence can be complex, and a naive estimation procedure is likely to be inconsistent due to the presence of omitted variables
- We have to account for a large set of controls, which is infeasible under standard regression framework due to the limited sample size
- To solve this problem, we apply double-selection procedure, proposed by Belloni, Chernozhukov, Hansen (2014)
- It guarantees that the distribution of the estimator for our parameter of interest converges uniformly, which produces reliable statistical tests and confidence intervals in samples of small and moderate size, even when the number of potential control variables heavily exceeds sample size

Data and model

$$Y_{i,t} = \beta X_{i,t} + \sum_{j=1}^{k} \gamma_j Z^j_{i,t} + \varepsilon_{i,t}$$

- $Y_{i,t}$ – Fama regression coefficient estimates for 33 countries, given in Frankel, Poonawala (2010) – a measure of UIP deviations
- $Z^j_{i,t}$ – a control variable set, consisting of Worldbank WDI, IFS Balance of Payments, Penn World Tables 9.1, ATLAS economic development classifiers, and some other indicators
- $X_{i,t}$ – different for two specifications of the model: the first one uses nominal import to consumption ratio as a measure of trade openness, and the second one uses a ratio of real import to GDP
- Estimation by OLS without controls; with controls for the dependent variable selected by LASSO; and with controls for both dependent and explanatory variables selected by LASSO in a double selection procedure

Empirical Results

- Missing data handling: estimate removing rows with missing data, or fill by average values and add a control dummy for modified cells?
- Dependent variable – a measure of UIP deviation magnitude

Missing data	Explanatory variable	(1)	(2)	(3)
entries removed, I	$\frac{\text{nominal import}}{\text{nominal consumption}}$, (a)	0.296	0.108	0.911
		(1.59)	(1.01)	(4.36)
	$\frac{\text{real import}}{\text{real GDP}}$, (b)	-0.660	-0.223	0.090
		(-4.05)	(-2.19)	(0.71)
entries filled, II	$\frac{\text{nominal import}}{\text{nominal consumption}}$, (a)	0.494	0.031	0.141
		(7.03)	(0.59)	(1.67)
	$\frac{\text{real import}}{\text{real GDP}}$, (b)	-0.0777	-0.0619	-0.106
		(-0.649)	(-0.915)	(-1.26)

Table: Coefficients and t-stats in parentheses; (1) – Simple OLS, (2) – Post-LASSO, (3) – Double selection by LASSO.

Results discussion

- Nominal trade openness better reflects magnitude of foreign currency inflows/outflows in response to interest rate shocks
- Inclusion of control variables, selected to explain UIP deviations and trade openness, leads to positive and statistically significant estimate of the slope coefficient in the specification I(a). Likewise, in the specification II(a) this estimate changes from being insignificant for a Post-LASSO model to being positive and significant in the model with double-selected controls
- Our results point out a positive dependence between UIP deviations and trade openness, which agrees with the predictions of Itskhoki, Mukhin, 2017 - unlike the previous empirical research
- Further research needs to utilise the panel structure of our data; in particular, cluster standard errors need to be used in both estimation and inference to account for possible dependence of errors across countries and time periods