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Nonlinearities in the Slovenian Apple Price Transmission

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Motivations

- I. Food prices in the 2000s decade were characterized by higher instability relative to previous decades (FAO-OECD, 2011; FAO, 2008).
- II. The literature on the Central and Eastern European Countries on vertical price transmission is relatively scarce.
- III. Slovenian apple sector has economic relevance.
 - It is the most relevant fruit sector in Slovenia.
 - It is also one of the few agricultural sectors in Slovenia with trade surplus.

Objective

Assess price linkages and patterns of transmission among producer and consumer markets for apple in Slovenia

Outline

1. Methodology.
2. Data & Results.
3. Concluding remarks & policy implications.

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Methodology

Parametric model

Threshold Vector Error Correction type of Models (TVECM), require assumptions about the nature of price behavior.

If assumptions are incorrect, results are likely to be biased.

Compared

Non-parametric technique

Multivariate Local Linear Regression Estimators (MLLRE), are data driven methods that do not require any assumption. They are thus robust to misspecification issues.

Applying both parametric and non-parametric methods allows exploring many interesting data features that are difficult to identify by only utilizing a single approach (Fan and Gijbels, 1996)

Non-linear TVECM

A TVECM is a nonlinear version of a VECM which allows to uncover potential nonlinearities and asymmetries in the adjustment of individual prices.

(TVECM)

A two-regime TVECM can be expressed as:

$$\Delta P_t = \begin{cases} \alpha^{(1)} + \alpha_p^{(1)} v_{t-1} + \sum_{i=1}^n \alpha_i^{(1)} \Delta P_{t-i} + \varepsilon_t^{(1)} & \text{if } v_{t-d} \leq c \\ \alpha^{(2)} + \alpha_p^{(2)} v_{t-1} + \sum_{i=1}^n \alpha_i^{(2)} \Delta P_{t-i} + \varepsilon_t^{(2)} & \text{if } v_{t-d} > c \end{cases}$$

Where $P_t = (P_{Pr,t} \ P_{Co,t})$ is the vector of prices being analyzed

$\alpha^{(m)}, \alpha_i^{(m)}$ are parameters showing the short-run dynamics

$\alpha_p^{(m)}$ are the speed of adjustment parameters to disequilibriums from long-run parity

Non-linear MLLRE

Non-parametric model (MLLRE)

$$\sum_{t=1}^n (Y_t - \beta_0 - \beta_1'(\mathbf{X}_{t-1} - \mathbf{x}_k))^2 K_{\mathbf{h}}(\mathbf{X}_{t-1} - \mathbf{x}_k)$$

Where: $Y_t = \Delta P_{it}$, $Y_t \in \mathbb{R}$,

$$\mathbf{X}_{t-1} = (\Delta P_{pt-1}, \Delta P_{cot-1}, v_{t-1}), \mathbf{X}_{t-1} \in \mathbb{R}^d$$

$$K_{\mathbf{h}}(\mathbf{X}_{t-1} - \mathbf{x}_k) = \prod_{j=1}^d K\left(\frac{X_{j,t-1} - x_{j,k}}{h_j}\right) h_j^{-1}$$

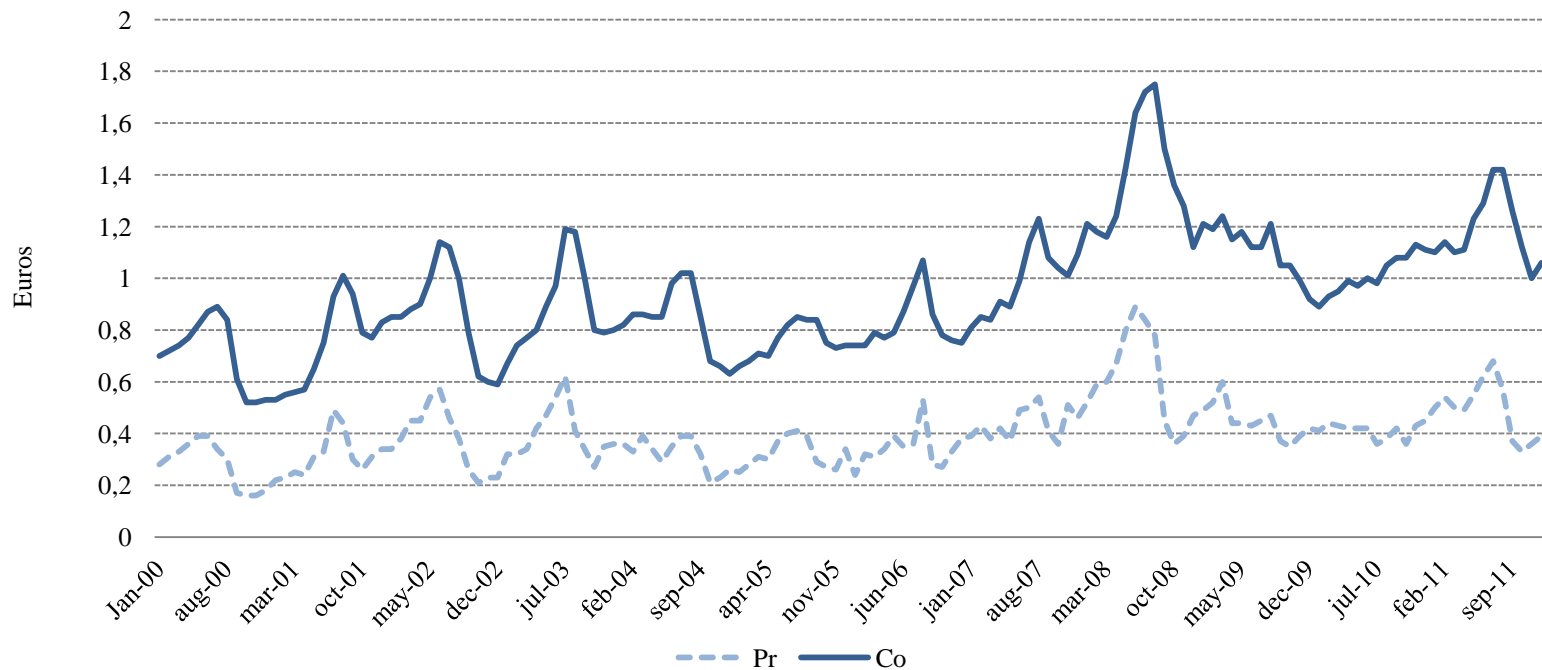
$$h_j = h_{base} s_x n^{-1/5}$$

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Results / Empirical application

Data. Monthly producer and consumer apple prices observed from January 2000 to December 2011 are used.



Result / Unit root tests

Time series properties: unit root tests

Price series	Test type	Test statistic	5% critical value
Producer	ADF	-2.660	-3.447
	KPSS	1.170	0.146
Consumer	ADF	-2.711	-3.447
	KPSS	1.574	0.146

Results / Cointegration

Johansen test for cointegration and cointegration relationship

Ho	Ha	λ_{trace}	P-value
$r = 0$	$r > 0$	42.656	0.000
$r \leq 1$	$r > 1$	7.770	0.101

Cointegration relationship	
$P_{Pr} - 1.046^{**} P_{Co} + 0.887^{**} = Ect$	
(0.061)	(0.015)

Note: r is the cointegration rank.

- Engle and Granger cointegration test is also applied and suggests that the hypothesis of no cointegration can be rejected at the 5% significance level.

Results / TVECM

TVECM: Thresholds and Sup-LR test

Threshold (C)	Sup-LR test (p-value)
0.097	19.050 (0.040)
First regime “low ECT”	$ECT \leq 0.097$
Second regime “high ECT”	$ECT > 0.097$

Results / TVECM

TVEC model: parameter estimates.

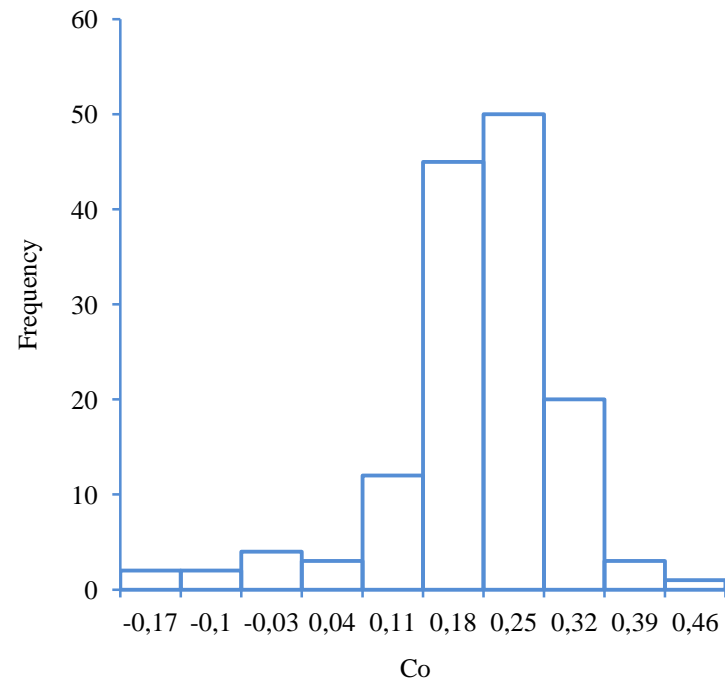
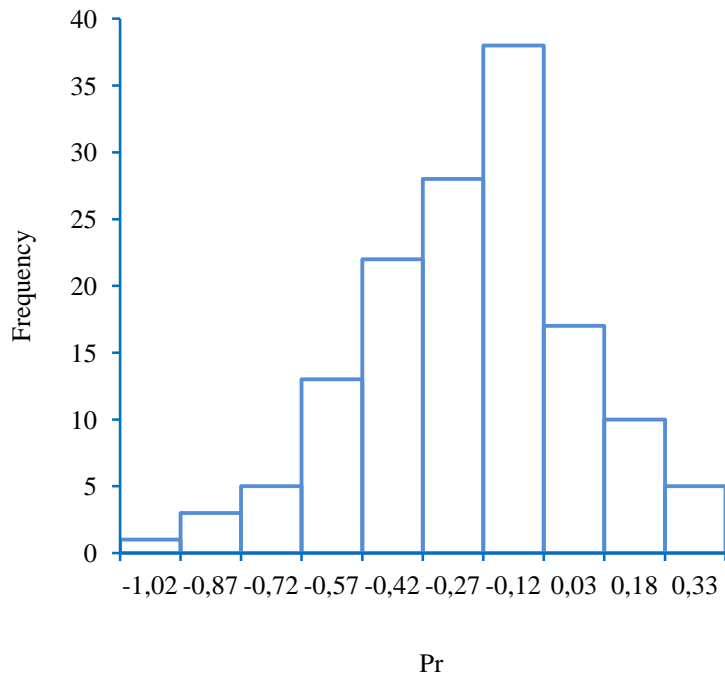
Parameters	Producer price equation		Consumer price equation	
	Regime I	Regime II	Regime I	Regime II
ΔPR_{t-1}	0.403** (0.132)	-0.551** (0.262)	0.110* (0.059)	-0.101 (0.117)
ΔCO_{t-1}	0.239 (0.253)	-0.354 (0.503)	0.200* (0.113)	0.060 (0.224)
ECT_{t-1}	-0.478** (0.187)	0.324 (0.270)	0.127 (0.083)	0.320** (0.120)
Constant	0.006 (0.019)		0.001 (0.009)	
No observations	Obs. in Regime I [99]		Obs. In Regime II [44]	

Notes: Number in parentheses are standard errors.

*(**) denote statistical significance at the 10 (5) per cent level.

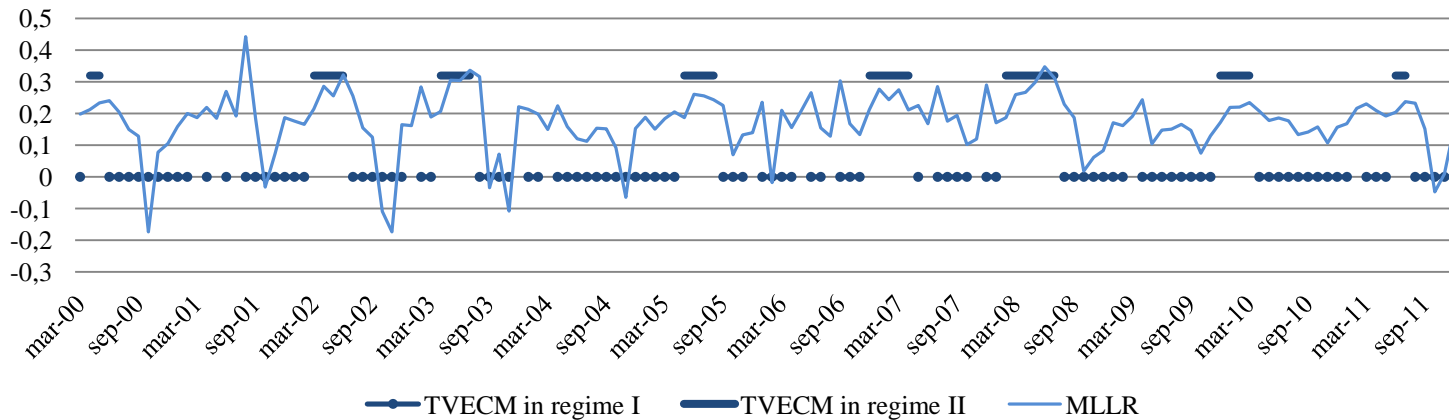
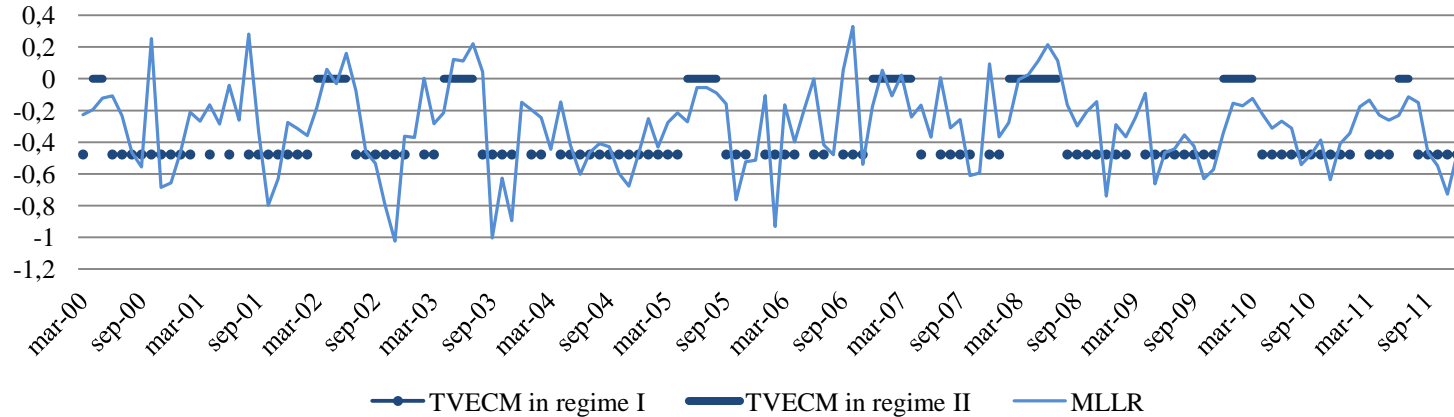
Results / MLLRE

Distribution of localized estimates of the parameters showing the adjustment to disequilibrium



Results / TVECM vs MLLR


Non-parametric and parametric adjustments of producer and consumer prices




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Concluding remarks



It is the first attempt to analyze price linkages and patterns of vertical transmission among producer and consumer markets for apple in Slovenia.



No previous study has applied the MLLR to characterize vertical price transmission along the food marketing chain.

Concluding remarks / Policy implications

- Both parametric and non-parametric approaches suggest that apple prices respond to deviations from long-run equilibrium in a non-linear fashion.
- Results also provide evidence that producer prices tend to increase at a faster speed than consumer prices. Both prices are reluctant to fall, which may harm the Slovenian net exporter position in apple international trade.
- Non-parametric techniques further suggest that threshold models may have difficulties in adequately representing the actual links between the variables.

THANK YOU FOR YOUR ATTENTION