Analysis of the Asymmetric Price Transmission in the Ukrainian Wheat Supply Chain

Kateryna Goychuk

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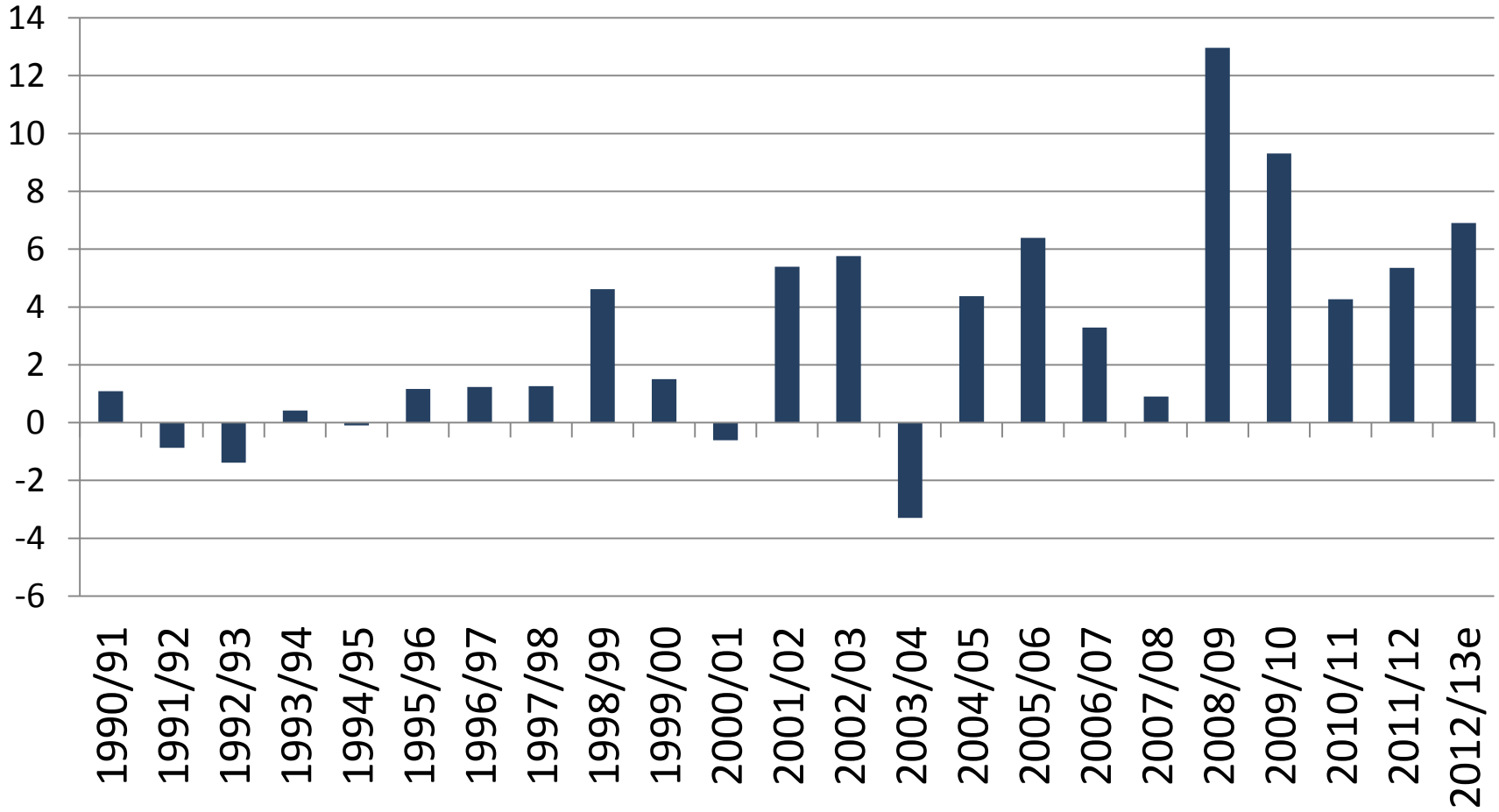
College of Agriculture, Food and Natural Resources

Black Sea Grain Market

Dynamics of the Ukrainian **wheat** net exports, mln tons



Source: USDA, April 2013

Ukrainian Wheat Exports (1000 MT)

	Country	2008/09	2009/10	2010/11	2011/12
1	United States	27,101	24,172	35,977	28,071
2	Australia	13,450	13,764	18,477	23,041
3	Russia	18,393	18,556	3,983	21,627
4	Canada	18,674	18,992	16,768	17,603
5	EU-27	25,351	22,115	22,906	16,439
6	Argentina	8,651	5,255	7,742	11,949
7	Kazakhstan	5,701	7,871	5,519	10,619
8	**Ukraine**	13,037	9,337	4,302	5,436
9	Turkey	2,342	4,363	2,945	3,680

> 50% of total wheat is exported to **North Africa** and **Near East Asia**

Source: USDA, December 2012

Chronology of **officially implemented** grain export restrictions, 1000 MT

Decision date	Period	Wheat	Barley	Corn
10/11/2006	10/17/2006-12/31/2006	400	600	600
12/08/2006	12/14/2006-06/30/2007	3	600	500
02/13/2007	02/15/2007-06/30/2007	3	606	30
02/22/2007	02/26/2007-06/07/2007	3	Quotas cancelled	Quotas cancelled
05/22/2007	05/22/2007	Quotas cancelled	-	-
06/20/2007	07/01/2007-10/31/2007	3	3	3
09/26/2007	01/01/2008-03/31/2008	200	400	600
03/28/2008	04/01/2008 – 04/30/2008	200	400	Automatic licensing
04/23/2008	04/2008-07/01/2008	1,200	900	Automatic licensing
05/21/2008	05/21/2008	Quotas and licenses are cancelled		
10/06/2010	10/20/2010-12/2010	500	200	2,000
12/08/2010	12/2010 – 02/2011	1,000	200	3,000
03/30/2011	04/04/2011 – 07/01/2011	1,000	200	5,000
05/2011	05/2011	Quotas are cancelled		
05/2011	05/2011-01/2012	Tariffs are introduced		
10/2011	10/2011	Tariffs cancelled, except for barley (01/01/2012)		

Source: FAO, 2011; FAO-EBRD, 2010

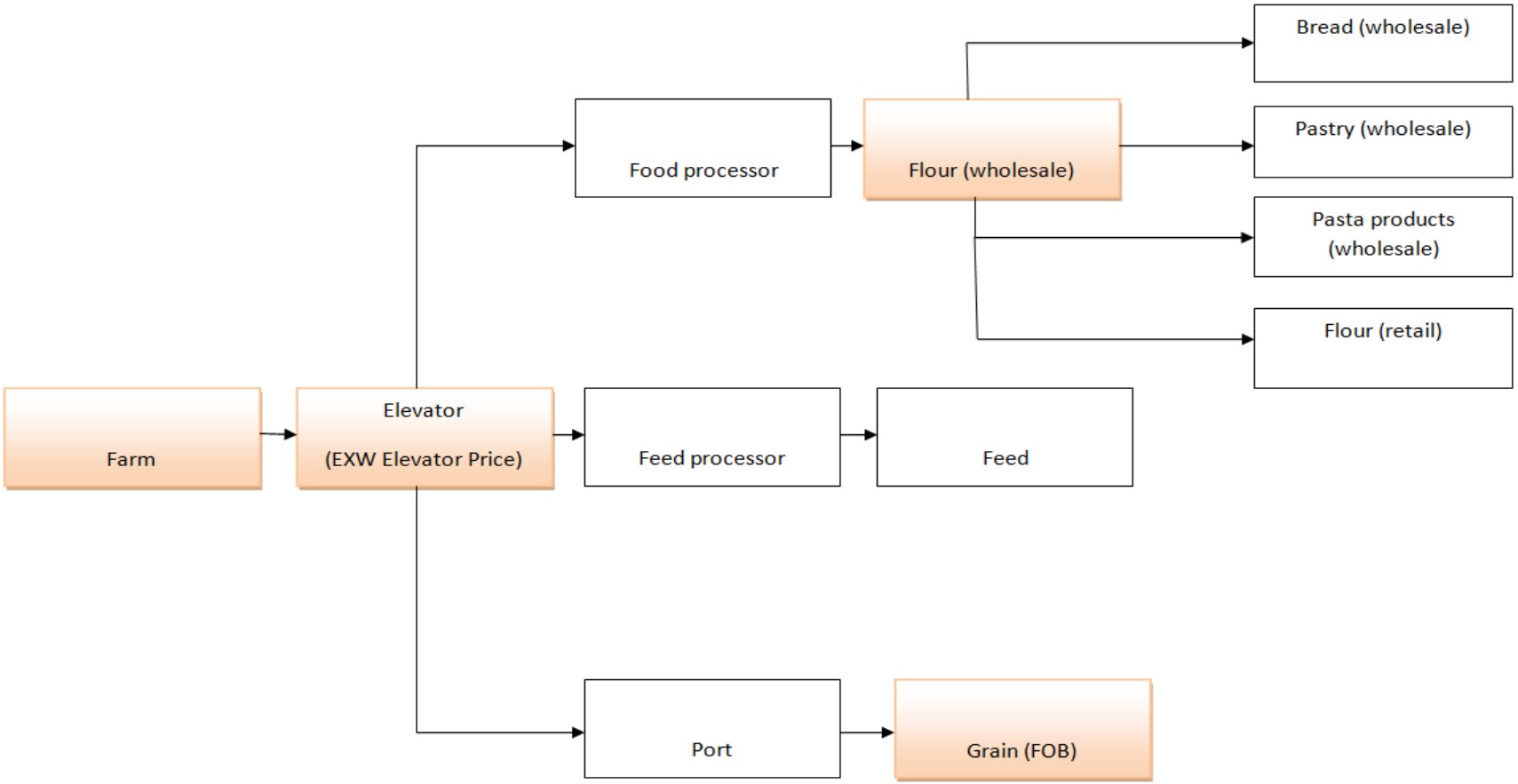
Objective:

- To investigate short- and long-run vertical price transmission behavior in the Ukrainian wheat supply chain

More specifically…

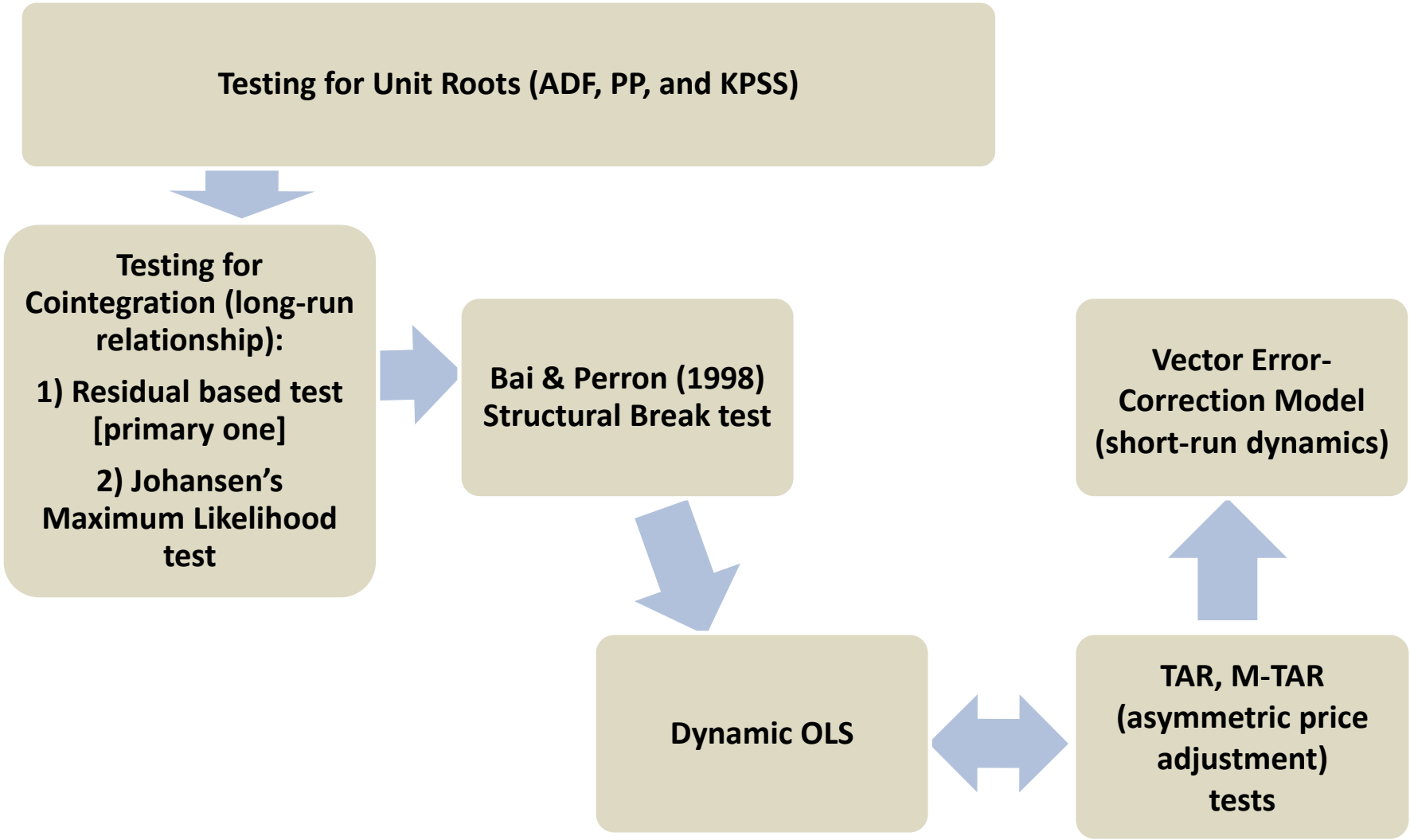
- To analyze the speed and magnitude of price transmission from the world wheat market to the Ukrainian domestic players
- To investigate price transmission between farm and consumer levels
- To check for the presence of the structural changes in such relationships
- To investigate the short run dynamics between cointegrated prices
- To provide the insights into the possible policy solutions

Figure 3. Simplified Ukrainian wheat supply chain (without the retail level, except for flour)



Source: Canadian International Development Agency, 2007

Methods used



Previous studies/Contribution

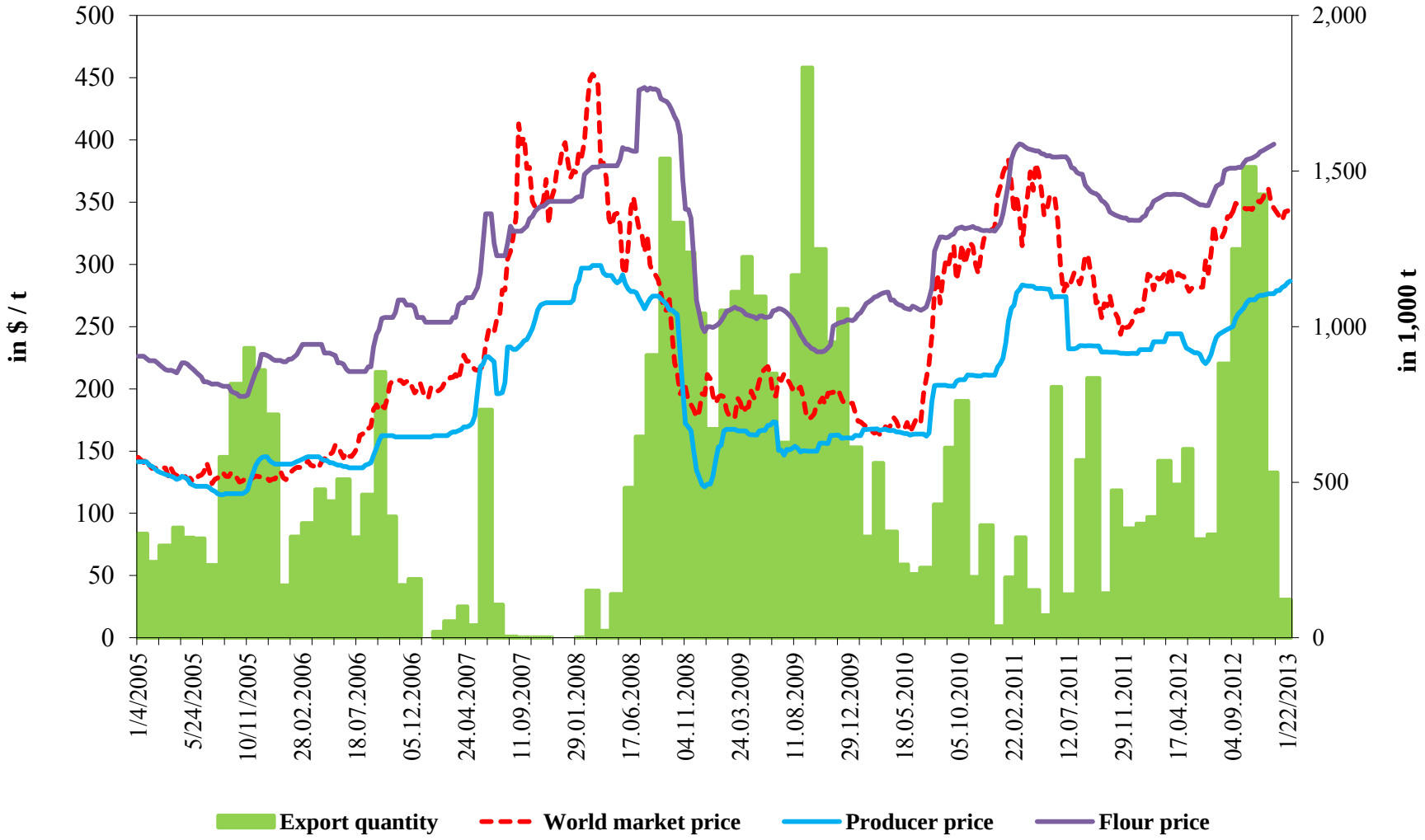
Previous studies:

- Gotz et al. 2010;
- Brummer et al. 2009.

Contribution:

- MECV vs. Threshold error correction
- Farm $\longleftrightarrow$ Consumer price transmission
- Asymmetric adjustment
- Short-run analysis
- Structural break investigation

Data



- Source: APK-Inform

Testing data stationary

- Augmented Dickey-Fuller (ADF)
- Philips-Perron (PP) tests
- Kwiatkowski, Phillips, Schmidt, and Shin (KPSS) test

The results suggested that all series are I(1) stationary

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Co-integration tests

- **Cointegration** presupposes that observable variables exhibiting non-stationary behavior will nonetheless be linked in the long-run

- Two methods:
  - Engel and Granger residual based test
  - Johansen Maximum Likelihood method

- The results suggest that two pairs of prices (France – Farm and Farm –Wheat) are cointegrated

Therefore,

$$P_t^{FL} = \beta_0 + \beta_1 P_t^{FW} + \varepsilon_t$$

Or Dynamic OLS

$$P_t^{FL} = \theta_0 + \theta_1 P_t^{FW} + \sum_{i=-m}^{+m} \Delta P_{t-i}^{FW} + \varepsilon_t$$

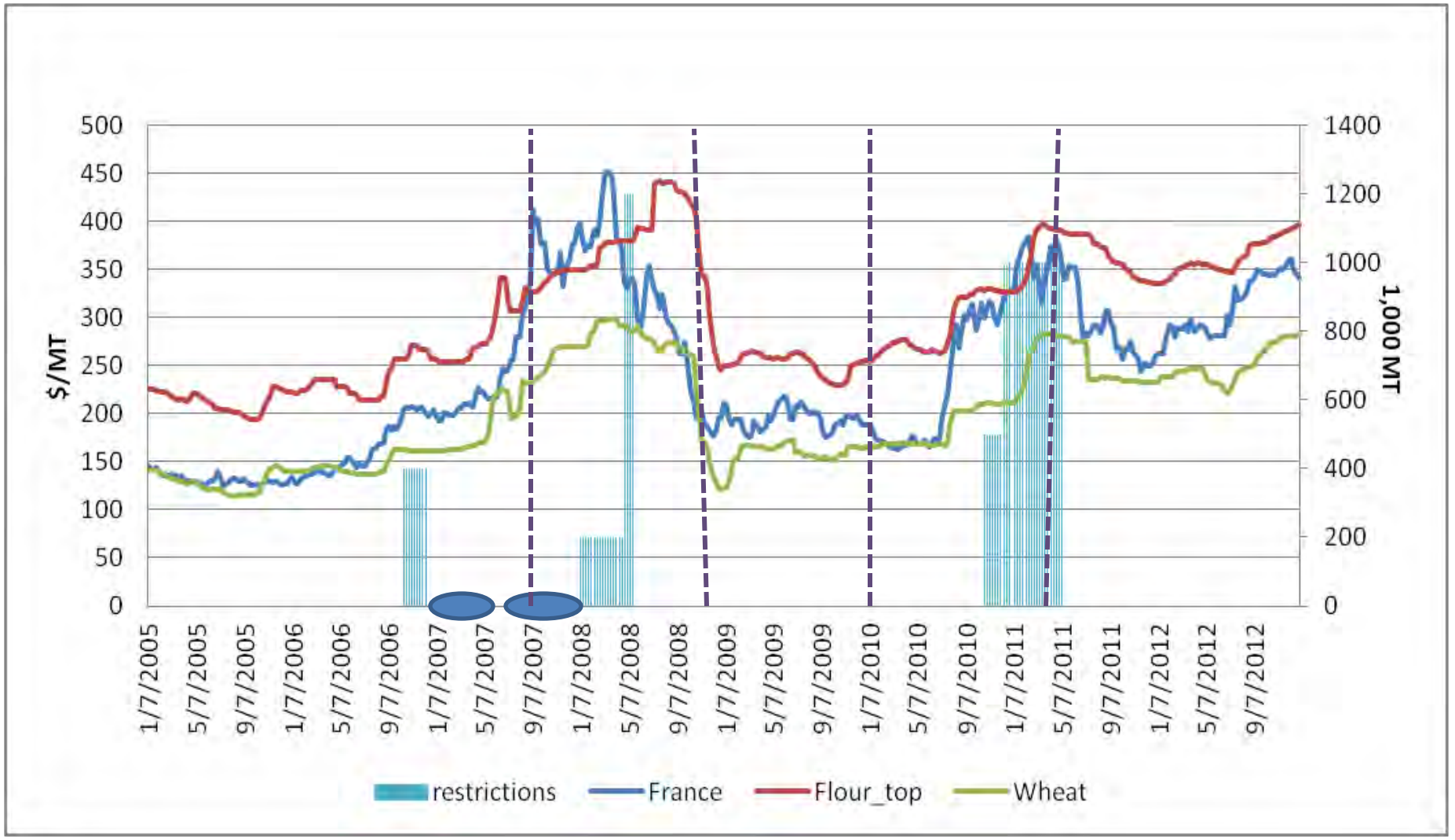
- The long-run elasticities are equal to
  - 0.69 (case of Farm-France)
  - 0.74 (case of Flour-Farm)

Structural breaks

	Break date	Confidence interval	BIC	RSS
Break 1	8/17/2007	07/20/07 – 08/24/07	2.03	-947.44
Break 2	10/24/08	10/17/08 – 10/31/08		
Break 3	01/01/10	12/18/09 – 3/05/11		
Break 4	03/18/11	3/11/11 – 4/1/11		

Period 1 (January 2005 till August 2007)
Period 2 (September 2007 – October 2008)
Period 3 (November 2008 – November 2010)
Period 4 (December 2010 – March 2011)
Period 5 (April 2011 – December 2012)

Chronology of export quotas and structural breaks



Dynamic OLS results for different regime dummies

Variable[6]	Coefficient[e]
Const	2.17 (0.35)***
Trend	0.0005(0.00)***
P_t^{FR}	0.55 (0.06)***
Regime 1	0.01 (0.07)
Regime 2	-0.34 (0.08)***
Regime 3	-0.33 (0.17)*
Regime 4	-0.14 (0.07)**
ΔP_{t-1}^{FR}	-0.43(0.09)***
ΔP_{t-2}^{FR}	-0.31 (0.09)***
ΔP_{t+1}^{FR}	-0.04 (0.09)
ΔP_{t+2}^{FR}	-0.02 (0.08)
AIC	-1033.76

Testing for asymmetries in price transmission

- Asymmetric price transmission - implies that the adjustment towards the equilibrium is of different magnitude regardless of the direction of the change.

$$\Delta\bar{\varepsilon}_t = \gamma_1 \bar{\varepsilon}_{t-1} + \sum_{i=1}^{p} \gamma_{i+1} \Delta \bar{\varepsilon}_{t-i} + \omega_t$$

, where

$$\Delta\bar{\varepsilon}_t = I_t \gamma_1 \bar{\varepsilon}_{t-1} + (1 - I_t)\gamma_2 \bar{\varepsilon}_{t-1} + \varphi_t$$

$$I_t = \begin{cases} 1 \; if \; \Delta\bar{\varepsilon}_{t-1} \geq 0 \\ 0 \; if \; \Delta\bar{\varepsilon}_{t-1} < 0 \end{cases}$$

Step 3: Testing for asymmetric price transmission: M-TAR model

	France-Wheat	Wheat-Flour
Variable	Parameter estimate	Parameter estimate
γ_1	-0.06 (-2.01)**	-0.03 (-0.99)
γ_2	-0.09(-3.44)**	-0.10 (-4.33)**
$H_0: \gamma_1 = \gamma_2 = 0 (\Phi)$	7.72**	9.75**
$H_0: \gamma_1 = \gamma_2 (F)$	0.81[0.37]	4.61 [0.03]**
τ	0	0

Error-Correction Model (short-run dynamics)

- Error Correction Models (ECMs) estimate the speed at which a dependent variable returns to equilibrium after a change in an independent variable

$$\Delta P_t^{FL} = a_0 + a_1 \bar{\varepsilon}_{t-1} + \sum_{i=1}^{p} \delta_i \Delta P_{t-i}^{FL} + \sum_{j=1}^{n} \theta_j \Delta P_{t-j}^{FW} + \mu_t$$

- Threshold Error Correction Models (TECMs)

$$\Delta P_t^{FL} = a_0 + \rho_1 I_t \bar{\varepsilon}_{t-1} + \rho_2 (1 - I_t) \bar{\varepsilon}_{t-1} + \sum_{i=1}^{p} \delta_i \Delta P_{t-i}^{FL} + \sum_{j=1}^{n} \theta_j \Delta P_{t-j}^{FW} + \mu_t$$

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ECM results

Dependent variable	Independent variable	# of lags	Speed of adjustment, ρ_1	Speed of adjustment, ρ_1	Speed of adjustment, ρ_2
FrenchFOB	Wheat	1;1	-0.0240 (-1.33)	-	-
Wheat	FrenchFOB	2;2	-0.0638 (-5.70)**	-	-
Flour	Wheat	1;1	-	-0.02 (-1.23)	-0.11(-6.08)**

Summary (France – Wheat)

- Long-run cointegration results indicate that Ukrainian farm wheat prices are co-integrated with the world wheat export price. Price transmission is symmetric.

- Long-run price transmission is equal to 0.69, however, it is not constant across the analyzed period
  - ⟶ Can we blame the disruptive policies?

- 90 percent of short-run adjustment to the disequilibrium happens within 9 months

- Ukrainian farm price follows world wheat price (not really a surprise!)

- So, what can we conclude about the efficiency of the Ukrainian wheat market?

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Summary (Flour – Wheat)

- Long-run cointegration results indicate that Ukrainian farm wheat prices and Ukrainian flour prices are co-integrated.
- Long-run price transmission is equal to 0.74, however, it is not constant across the analyzed period
- Price transmission is asymmetric.
  - Ukrainian miller industry responds much more quickly to the shocks that squeeze its profit margins than to those that stretch them
- 90 percent of short-run adjustment to the disequilibrium happens within 5 months

THANK YOU!

QUESTIONS?

COMMENTS?

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