Oligopoly and Price Transmission in Turkey's fluid milk market

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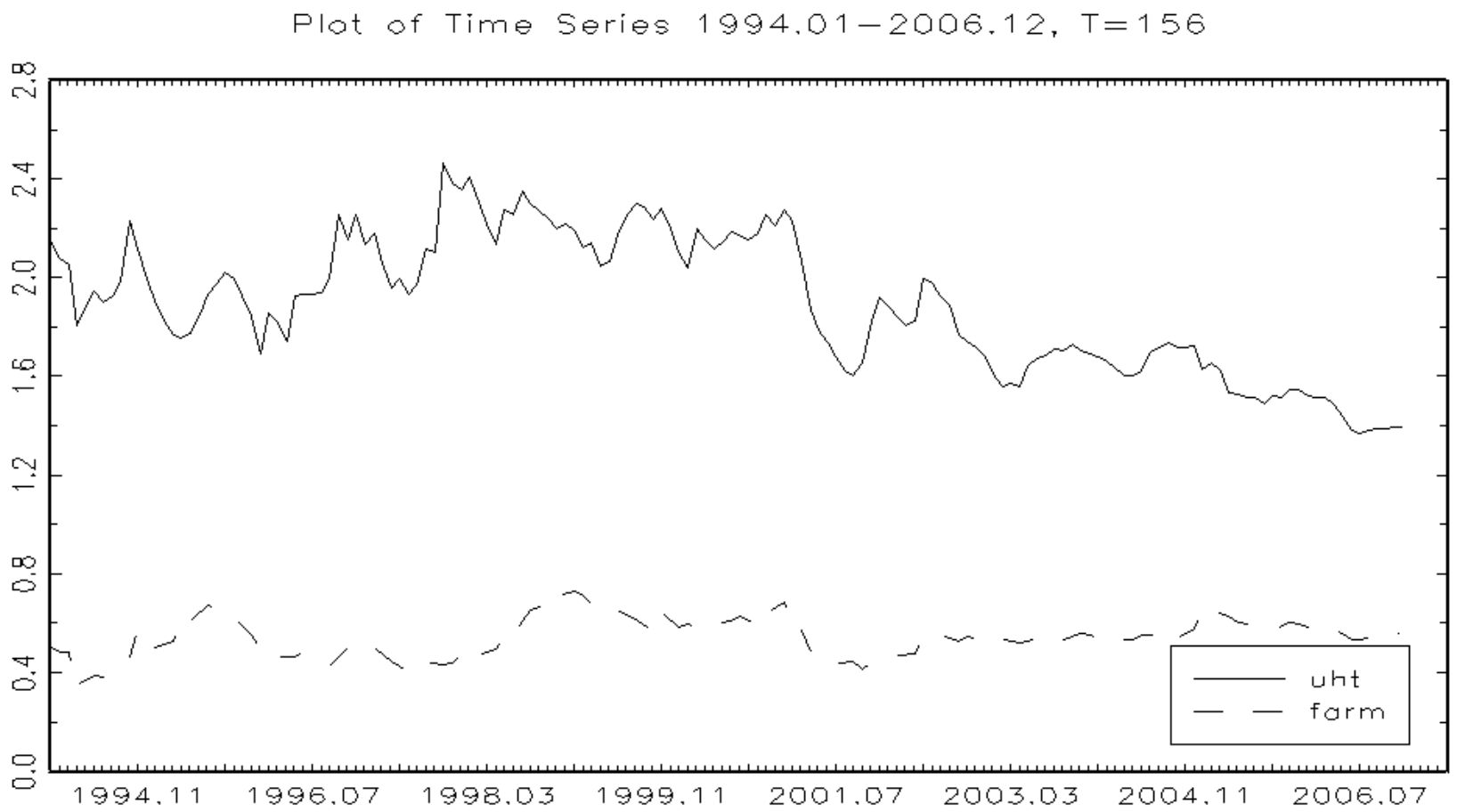
Introduction: two sides of debate

- Dairy farmers: ‘Producers [dairy farmers] face the prices dictated by Industrialists’
  - Raw milk price lower than EU average
  - Dairy products higher than EU average
- Milk processors:
  - Milk quality is low (very high bacteria count)
  - b/c of dispersion of farms collection costs are high

Inflation-adjusted milk price



Our contribution

- propose an alternative scenario that weaves together all the seemingly competing facts.

McCorriston et al., (ERAE 2001)

- Specifically, whereas market power will reduce the level of price transmission (relative to perfectly competitive case), if the industry is characterized by increasing returns to scale, the level of price transmission will increase. Under reasonable conditions, the degree of price transmission may be greater than in the constant returns, perfectly competitive case. (p. 146)

Increasing returns to scale

- We suspect that the growing market size for the formal sector and new investments can herald increasing returns to scale in the dairy processing, and that this can explain the long-run decline in UHT milk prices

Increasing Market Share of Formal Sector

Table 4.2: Source of fluid milk consumed 1994 and 2003

	Rural			Urban			Total		
Years	Open	Packed	Pc daily, lt	Open	Packed	Pc daily, lt	Open	Packed	Pc daily, lt
1994	99 %	1 %	0.085	90%	10 %	0.081	93%	7%	0.082
2003	96 %	4 %	0.113	74 %	26 %	0.086	82 %	18 %	0.094

Our calculations are based on the SIS 1994 and 2003 Household Budget Surveys.

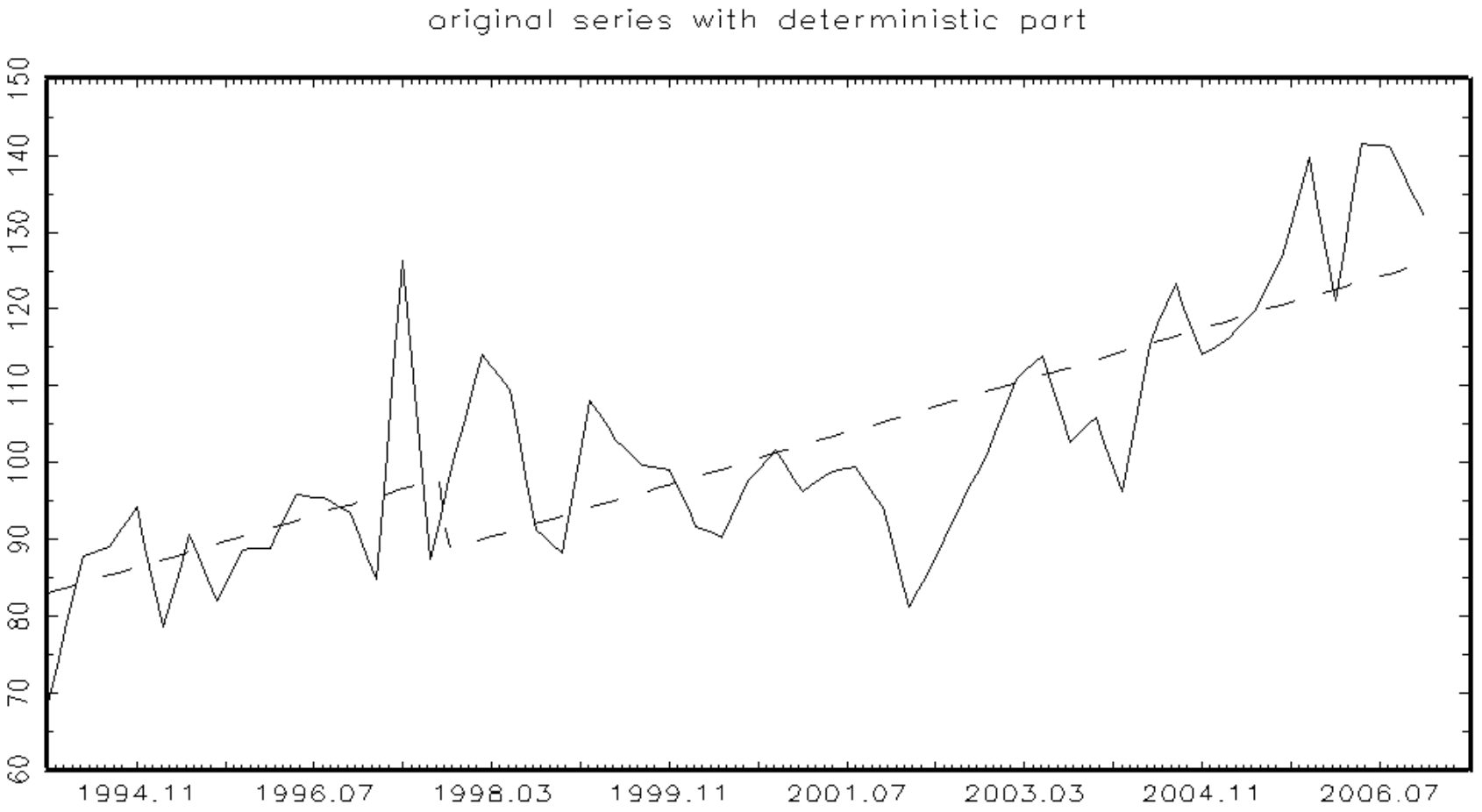
Variables, period 1994-2006

- Inflation adjusted UHT milk price (monthly)
- Inflation adjusted farm-gate milk price (monthly)
- hourly labour productivity index in the dairy sector (originally quarterly) – proxy for increasing returns to scale

Unit root, co-integration

- Unit root tests reveal that inflation-adjusted farm-gate and UHT milk prices are non-stationary
- Farm-gate and UHT milk prices are not co-integrated, as visual inspection suggest – spurious relation

Dairy industry labor productivity included – three series together are cointegrated



Structural break in dairy industry

- Upward trend in labor productivity and downward trend in UHT milk prices coincides with major entries [Danone, Ülker] to dairy industry.
- Break for farm-gate prices coincides with 2001 recession. No structural change

A battery of cointegration tests for three variables

- Johansen trace: cointegrated
- Threshold auto-regressive: cointegrated (symmetric)
- Moment TAR: cointegrated (asymmetric)
  - $c > 0$; $\rho 1 > \rho 2 \rightarrow$ faster convergence when prices are above long run equilibrium.

Conclusion

- We employ TAR and M-TAR models to study whether manipulation by dairy processors in the form of asymmetric price transmission is taking place. We find evidence of asymmetry, but its direction is contrary to our initial expectations.
- **The dairy processing firms are quicker to pass price reductions in farm-gate prices to their customers than price increases.**

Speculation – Future Research

- Missing Milk
- Why negative APT? Why not simply symmetric price transmission?

Speculation - Missing Milk

- Despite a dynamic processing sector, the supply response from the dairy farmers has been disappointing both for policymakers and for processing firms themselves.
- The level and volatility of milk prices formed at these auctions apparently does not instill enough confidence in dairy farmers to invest in expensive machinery and to enlarge their herds in order to meet the demand of dairy processors.

Speculation - Retailers

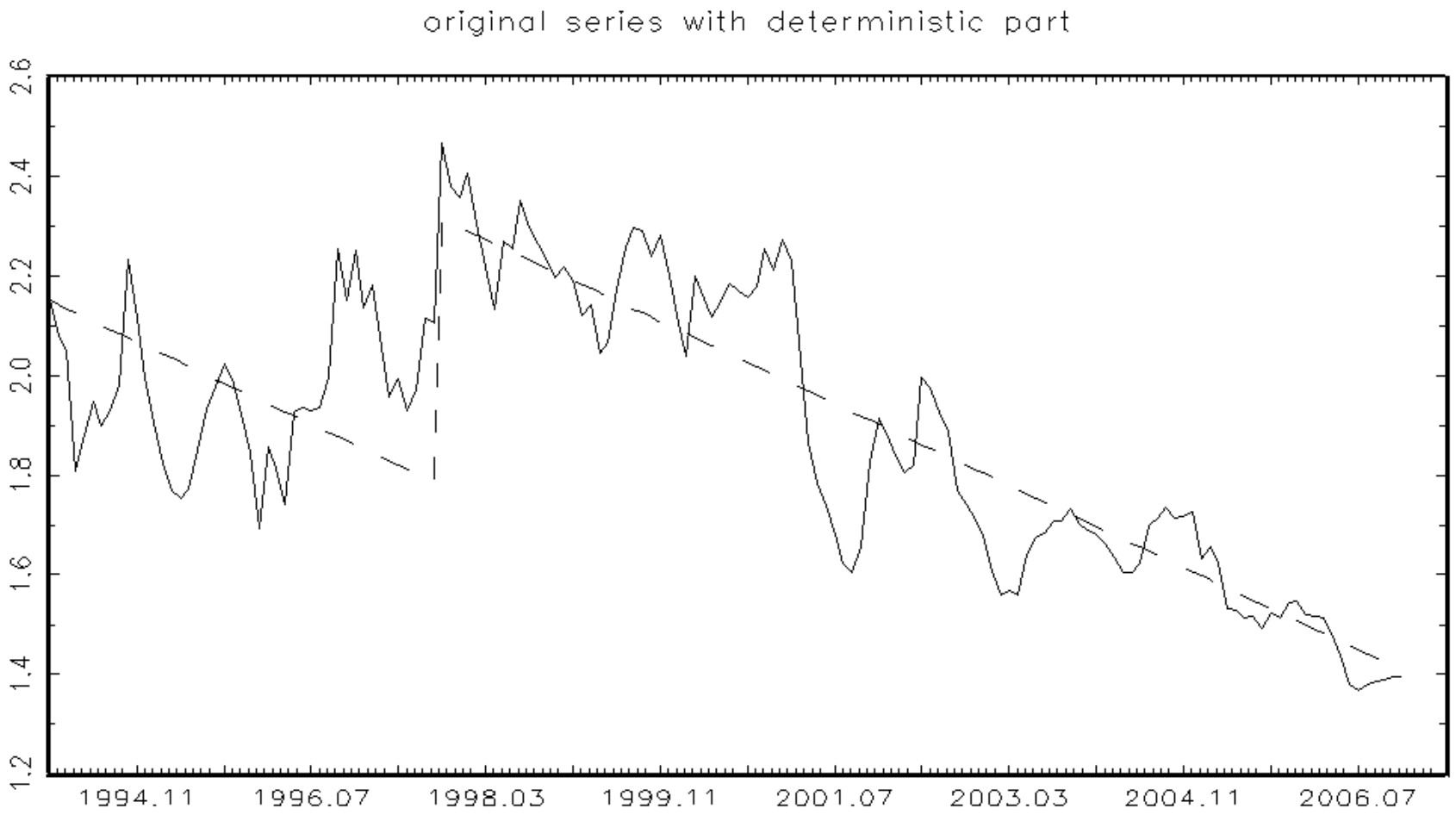
- Downstream retailers are even more concentrated than dairy firms
  - Supermarkets, need to study the relationship btw wholesale and retail prices before reaching a firm conclusion on consumer welfare.

Appendix, unit root

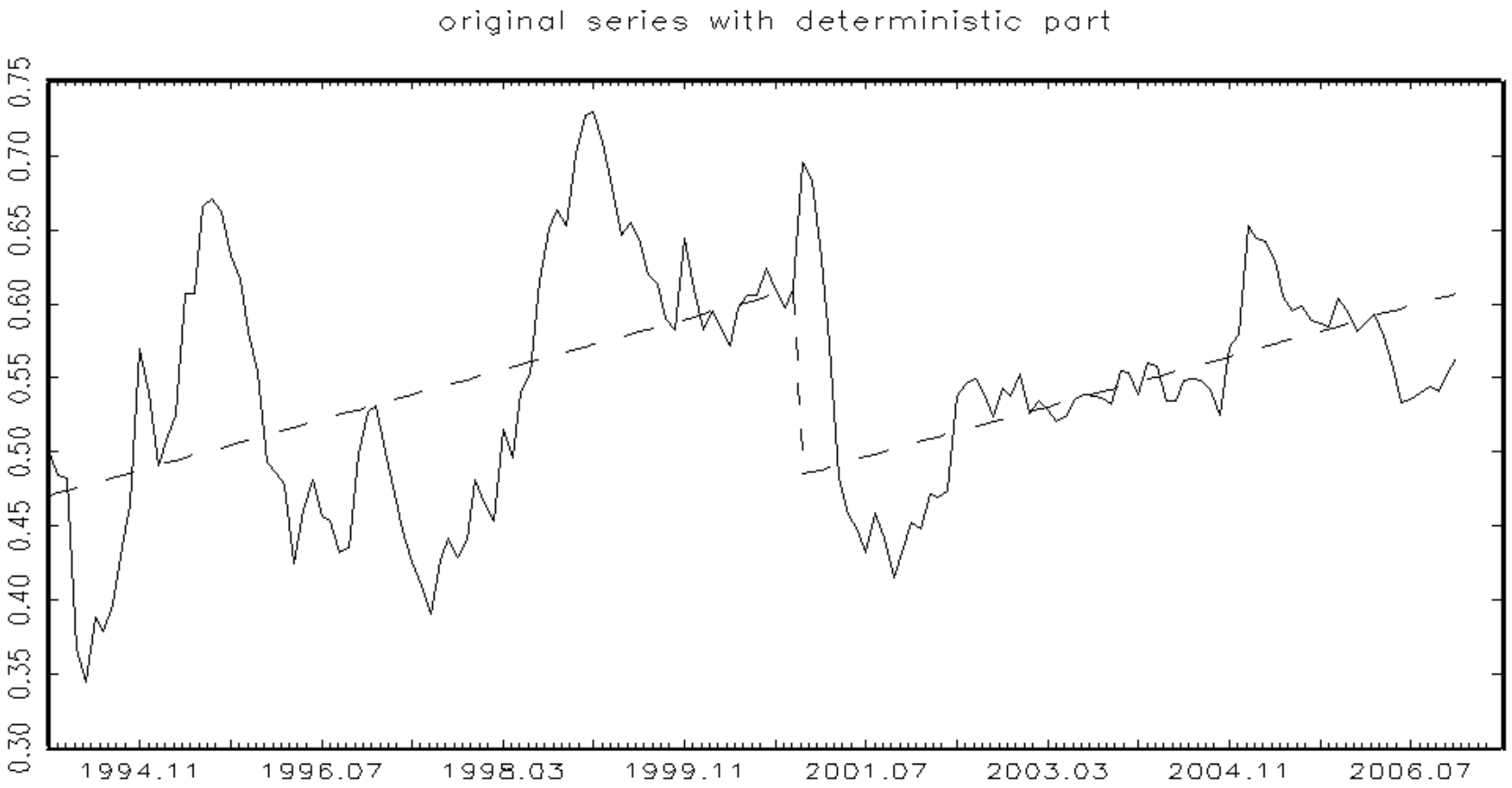
Table 4: Unit root tests for UHT and farm-gate milk prices and labor productivity index

Variable	Test	Structural break date	trend variable	Lags	Test score	Conclusion
UHT milk real price	DF		yes	13 lags	-1.5562	FTR Ho of unit root
	KPSS		yes	13 lags	0.2455	Reject Ho of stationarity
	Structural break	1997 M10	yes	3 lags	-4.0588	Reject Ho of unit root
farm-gate milk real price	ADF		no	1 lag	-2.9748	Reject Ho alpha=.05
	ADF		yes	1 lag	-2.7427	FTR Ho of unit root
	KPSS		no	1 lag	0.781	Reject Ho of stationarity
	KPSS		yes	1 lag	0.271	Reject Ho of stationarity
	Structural break	2000 M12	yes	1 lag	-2.6061	FTR Ho of unit root
productivity index	ADF		yes	22 lags	-1.1158	FTR Ho of unit root
	KPSS		yes	22 lags	0.1407	Reject Ho of stationarity
	Structural break	1997 M10	yes	22 lags	-1.6154	FTR Ho of unit root

Appendix cont'd, UHT



Appendix cont'd, farm-gate



Appendix cont'd, cointegration

Table 5: Cointegration tests for farm-gate, UHT milk prices and labour productivity index

Johansen Trace test - Constant			
Variables	**Structural break**	**Lags**	**Conclusion**
Farm-gate and UHT	No	2	0 cointegrating vector
Farm-gate , UHT, productivity index	No	8	0 cointegrating vector
Farm-gate and UHT	1997 M10	2	0 cointegrating vector
Farm-gate , UHT, productivity index	1997 M10	8	1 cointegrating vector 10 %
Farm-gate and UHT	1997 M10; 2000 M12	2	1 cointegrating vector
Farm-gate , UHT, productivity index	1997 M10; 2000 M12	8	1 cointegrating vector
Johansen Trace test - Constant & trend			
Farm-gate and UHT	No	2	0 cointegrating vector
Farm-gate , UHT, productivity index	No	8	0 cointegrating vector
Farm-gate and UHT	1997 M10	2	0 cointegrating vector
Farm-gate , UHT, productivity index	1997 M10	8	1 cointegrating vector
Farm-gate and UHT	1997 M10; 2000 M12	2	1 cointegrating vector
Farm-gate , UHT, productivity index	1997 M10; 2000 M12	8	2 cointegrating vectors
Johansen Trace test - orthogonal trend			
Farm-gate and UHT	No	2	0 cointegrating vector
Farm-gate , UHT, productivity index	No	8	0 cointegrating vector
Farm-gate and UHT	1997 M10	2	0 cointegrating vector
Farm-gate , UHT, productivity index	1997 M10	8	0 cointegrating vector
Farm-gate and UHT	1997 M10; 2000 M12	2	0 cointegrating vector
Farm-gate , UHT, productivity index	1997 M10; 2000 M12	8	1 cointegrating vector
Saikkonen & Lütkepohl test	**Test type**	**Lags**	
Farm-gate and UHT	constant	2	1 cointegrating vector 10 %
Farm-gate , UHT, productivity index	constant	8	1 cointegrating vector
Farm-gate and UHT	constant & trend	2	1 cointegrating vector 10 %
Farm-gate , UHT, productivity index	constant & trend	8	1 cointegrating vector 10 %
Farm-gate and UHT	orthogonal trend	2	1 cointegrating vector 5 %
Farm-gate , UHT, productivity index	orthogonal trend	8	1 cointegrating vector 5 %

*: Breaks are ignored for 'trend orthogonal' case. For constant and constant-and-trend cases, only breaks in levels assumed.

TAR & M-TAR Model

- TAR Model:

$$\Delta\mu_t = I_t\rho_1\mu_{t-1} + (1-I_t)\rho_2\mu_{t-1} + e_t$$

$$I_t = \begin{cases} 1 & if \ \ \mu_{t-1} \geq c \\ 0 & if \ \ \mu_{t-1} < c \end{cases}$$

- M-TAR Model:

$$\Delta\mu_t = I_t\rho_1\mu_{t-1} + (1-I_t)\rho_2\mu_{t-1} + e_t$$

$$I_t = \begin{cases} 1 & if \ \ \Delta\mu_{t-1} \geq c \\ 0 & if \ \ \Delta\mu_{t-1} < c \end{cases}$$

Appendix cont'd, TAR & M-TAR

decay faster when above equilibrium

Table 6: Results of TAR and M-TAR for inflation indexed UHT milk price

	Threshold	ρ_1^a	t-value	ρ_2^b	t-value	Φ^c	$\rho_1 = \rho_2^d$	p-value
TAR								
c=0		(0.217)	-3.55	(0.133)	-1.87	8.06	0.79	0.38
c ≠ 0	0.131	(0.253)	-3.88	(0.110)	-1.68	8.95	2.4	0.12
M-TAR								
c=0		(0.362)	-6.20	0.044	0.67	19.44	21.49	0.00
c ≠ 0	0.058	(0.445)	-6.62	0.000	0.00	21.89	25.93	0.00

a: Coefficients and t-statistics for the null hypothesis $\rho_1 = 0$.

b: Coefficients and t-statistics for the null hypothesis $\rho_2 = 0$. t-Max critical values:
when c=0: TAR: 1%: -2.55, 5%: -2.11, 10%: -1.90. M-TAR: 1%: -2.57, 5%: -2.14, 10%: -1.91.
when $c \neq 0$: TAR: 1%: -2.35, 5%: -1.85, 10%: -1.61. M-TAR: 1%: -2.37, 5%: -1.90, 10%: -1.65.

c: F statistics for the joint hypothesis $\rho_1 = \rho_2 = 0$.
when c= 0: TAR: 1%: 8.24, 5%: 5.98; 10%: 5.01; M-TAR: 1%: 8.78, 5%: 6.51, 10%: 5.45.
when $c \neq 0$: TAR: 1%: 9.27, 5%: 6.95; 10%: 5.95; M-TAR: 1%: 9.14, 5%: 6.78, 10%: 5.73.

d: F statistics for the joint hypothesis $\rho_1 = \rho_2$ to test for asymmetric price transmission.
The test statistics are taken from Enders and Siklos (2001).