Nonlinear Models of Exchange Rate Pass-Through in International Forest Product Markets

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INTRODUCTION

- Forest products are bulky commodities; therefore, they are costly to transport. Therefore, transactions costs should play an important role in shaping market linkages and reactions to market shocks for these products.
- Most previous work has used a linear (in parameters) approach to examine the price relationships and dynamic adjustment processes.
- However, the presence of transactions costs may lead to a "neutral band" within which prices are not linked to one another.
- This study aims adding to the empirical literature on international price linkages, exchange rate pass-through, and the law of the one price in international lumber markets by accounting for the unobservable transactions costs.
- A second objective is to test whether shocks to the exchange rates have an impact on the adjustment of market prices.

MODEL

- The basic arbitrage equation in the absence of transactions costs:

$$P_t^M = \Pi_t . P_t^X \qquad (1)$$

where
- P_t^M is *home*-currency price of imported good,
- P_t^X is export price expressed in units of home currency
- Π_t is nominal exchange rates expressed as units of home currency per unit of foreign currency.

- Taking logs of each variable (denoted as lower case letters) and writing the relationship in regression context yields:

$$p_t^m = \alpha + \beta_1 \pi_t + \beta_2 p_t^x + \varepsilon_t \qquad (2)$$

- If the import prices are expressed as units of *foreign* currency (i.e. $p^* = p^m - \pi$), the above relationship can be rewritten as:

$$p_t^* = \alpha + (\beta_1 - 1)\pi_t + \beta_2 p_t^x + \varepsilon_t \qquad (3)$$

- Accordingly,

if
- $\beta_1 = 1$ or $(\beta_1\text{-}1) = 0$
- $\beta_1 = 0$ or $(\beta_1\text{-}1) = -1$
- $0 < \beta_1 < 1$ or $-1 < (\beta_1\text{-}1) < 0$

} **complete** / **no** / **incomplete**

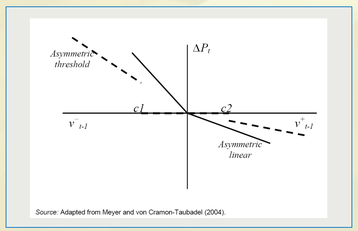
exchange rate pass through on import prices can be expected.

METHODS AND DATA

- We use a three-regime threshold vector error correction (TVECM) model introduced by Balke and Fomby (1997):

$$\Delta y_t = \sum_{i=1}^{3} \delta^i \left(\sum_{j=1}^{k} b_j^i \Delta y_{t-j} + d^i \varepsilon_{t-1} \right) + \upsilon_t$$

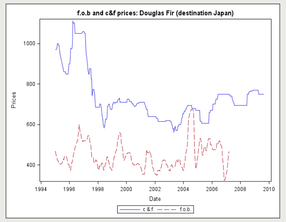
$y_t = [\, p_t^* \; p_t^x \; \pi_t \,]$ and δ^i is an indicator variable that defines each of the three regimes. Threshold variable is the error correction term.

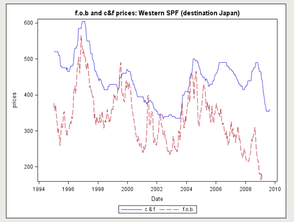


Source: Adapted from Meyer and von Cramon-Taubadel (2004).

- Data are biweekly f.o.b and c & f prices published by *Random Lengths* on two softwood lumber products that are traded between the U.S. and Japan: Douglas Fir and Western Spruce Pine Fir. Exchange rates are from the Federal Reserve Bank of St. Louis.

EMPIRICAL FINDINGS

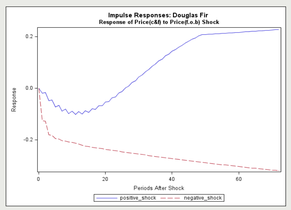


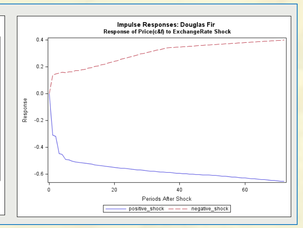


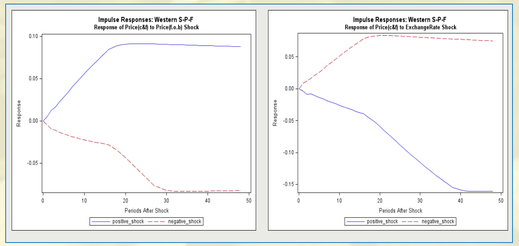
- The figure above gives the plot of the price series.
- The table below reports the results from linear multivariate cointegration tests and the estimated threshold parameters .

	Johansen Cointegration Tests (H0: Rank=1, H1=Rank>1)			Estimated Thresholds	
	Trace Statistics	5% Critical Value	Cointegration	Lower (c1)	Upper (c2)
Douglas Fir					
(H0: Rank=0,H1=Rank>0)	39.61	29.38	Yes	-0.11	0.12
(H0: Rank=1,H1=Rank>1)	9.66	15.34			
Western S-P_F					
(H0: Rank=0,H1=Rank>0)	16.60	29.38	No	-0.11	0.08
(H0: Rank=1,H1=Rank>1)	6.50	15.34			

- On average, the deviations from equilibrium should be larger than 10% in order to trigger the faster 'outside-band' adjustment.
- Last part of the analysis is computing nonlinear Impulse-Responses using the estimated Threshold VECM. We are especially interested in the extent to which prices adjust to restore price parity when exchange rates are shocked.







- Figures above show the responses of c & f (import) prices to a given shock in exchange rates and f.o.b prices.
- We observe asymmetric adjustments in response to positive and negative shocks.

DISCUSSION

- Empirical results indicate there is some evidence in favor of nonlinearity caused by transactions costs in the international softwood lumber markets.
- Estimating international price linkages in forest product markets using linear models might overlook such nonlinearities and potentially cause erroneous conclusions regarding the nature and the strength of international lumber price linkages.

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