

Do Forest Products Prices Display Long Memory?

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Outline

- Why are the time series properties of prices important?
- Previous work
- Introduce long memory series
- Lumber and pulp price results
- Implications



Time series properties of prices – who cares?

- Informational efficiency of market
- Harvest timing (real option) depends on whether prices are stationary or random walk (non-stationary)
- Forest dependent communities – persistence of shocks to primary commodities
- Structural econometric modeling: co-integration?



Previous Work

- Initial focus on timber prices in US South but spread to other regions and products.
- Results vary depending on test, data frequency, aggregation (product, spatial and temporal).
- May have stationary and non-stationary components
- Co-integration work focused on law of one price, vertical price transmission
- Dichotomy: $I(0)$ vs $I(1)$



Long memory background

- $I(d)$ with $0 < d < 1$ (i.e., fractional integration)
- Stationary if $d < 0.5$
- Related to Hurst effect found with many geophysical time series ($H = d + 0.5$)
- Called the Joseph effect by Mandelbrot (seven years of plenty followed by seven years of famine)
- Creates “fat tail” return distributions



Long Memory symptoms and diagnosis

- Slowly declining correlogram
- First difference of series appears “overdifferenced” – alternating positive and negative autocorrelations.
- Use tests for $I(1)$ and $I(0)$ – rejection of both indicates fractional integration
- Estimate d with Geweke and Porter-Hudak (GPH) or alternative method
- Spurious long memory – series with infrequent breaks

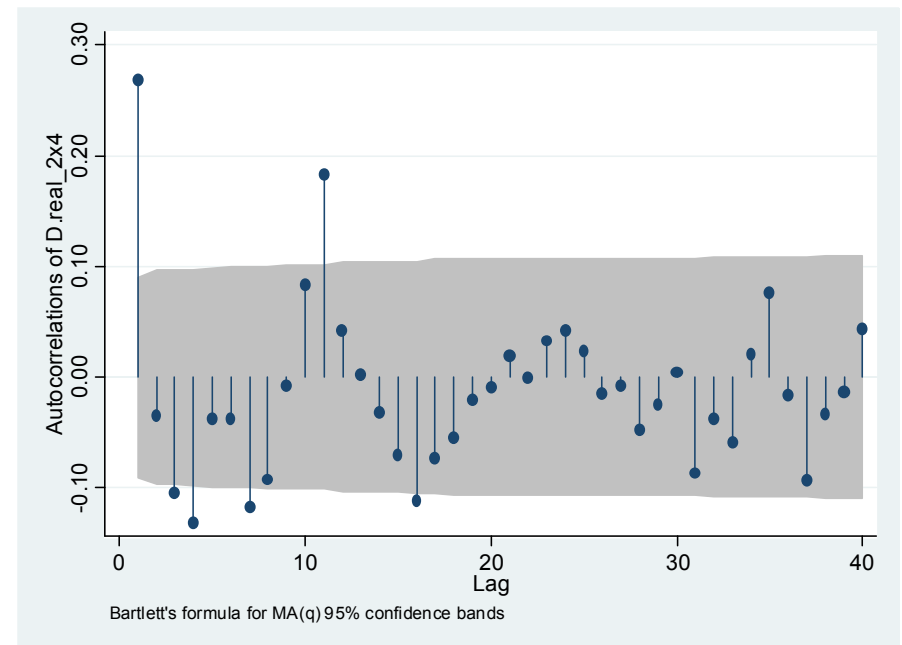
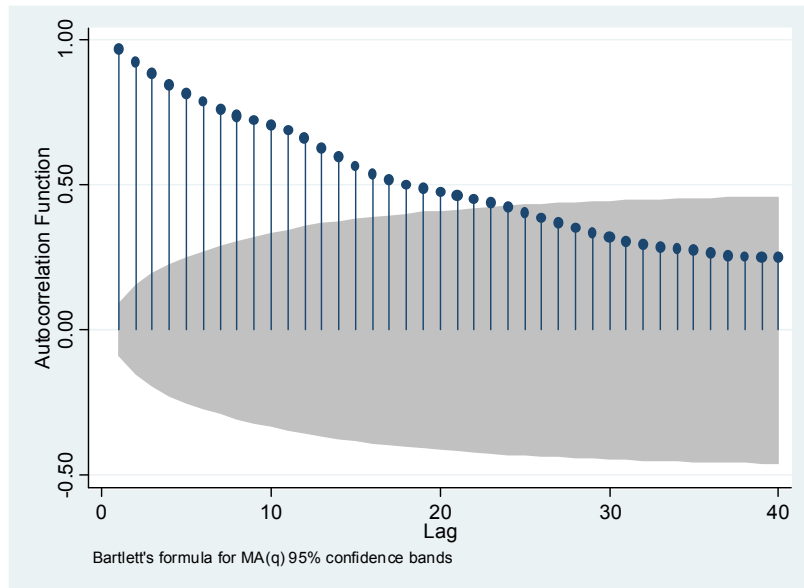


Data

- Monthly Random Lengths dimension lumber prices.
- SPF (1969:1 to 2010:7), Douglas-fir (1964:1 to 2010:7) and westside SYP (1971:1 to 2010:7)
- Bleached sulphate pulp price index from Statistics Canada (1956:1 to 2009:5)
- Deflate with CPI and PPI (sensitivity)



Results – Correlograms SYP



Results – Unit Root tests

Table 3. Results of DF-GLS and KPSS tests

Product	DF-GLS ^a	DF-GLS ^b	KPSS ^c
DF 2×4 (CPI-deflated)	-2.86 (2)***	-2.13 (7)**	3.81 (4)***
DF 2×4 (PPI-deflated)	-3.44 (1)***	-2.29 (7)**	0.96 (4)***
DF 2×10(CPI-deflated)	-2.74 (2)***	-1.94 (7)*	3.81 (4)***
DF 2×10(PPI-deflated)	-2.34 (4)**	-2.03 (7)**	1.25 (4)***
SYP 2×4 (CPI-deflated)	-3.03 (1)***	-1.85 (7)*	4.13 (4)***
SYP 2×4 (PPI-deflated)	-3.33(1)***	-1.90 (8)*	1.23 (4)***
SYP 2×10 (CPI-deflated)	-3.58 (1)***	-1.85 (12)*	4.79 (4)***
SYP 2×10 (PPI-deflated)	-4.13 (1)***	-2.21 (12)**	1.78 (4)***
SPF 2×6 (CPI-deflated)	-1.13 (4)	-1.00 (7)	3.38 (4)***
SPF 2×6 (PPI-deflated)	-1.45 (4)	-1.30 (7)	1.12 (4)***
SPF 2×10 (CPI-deflated)	-1.55 (4)	-1.20 (17)	3.25 (4)***
SPF 2×10 (PPI-deflated)	-2.05 (4)**	-1.58 (17)	0.92 (4)***
Sulfate pulp (CPI-deflated)	-3.13 (6)***	-3.13 (6)***	1.97 (4)***
Sulfate pulp (PPI-deflated)	-4.32 (6)***	-4.09 (7)***	0.91 (4)***

Notes: *, **, *** denote rejection of the null hypothesis at the 10%, 5%, and 1% levels, respectively.

Lag orders are given in parentheses.

^aLag selected by the Swartz information criterion.

^bLag selected by modified Akaike information criterion (Ng and Perron 2001).

^cMax lag order selected by Newey and West (1994) procedure.



Results – GPH estimates of d

Table 4. Geweke and Porter-Hudak (1983) estimates of long memory parameter (d)

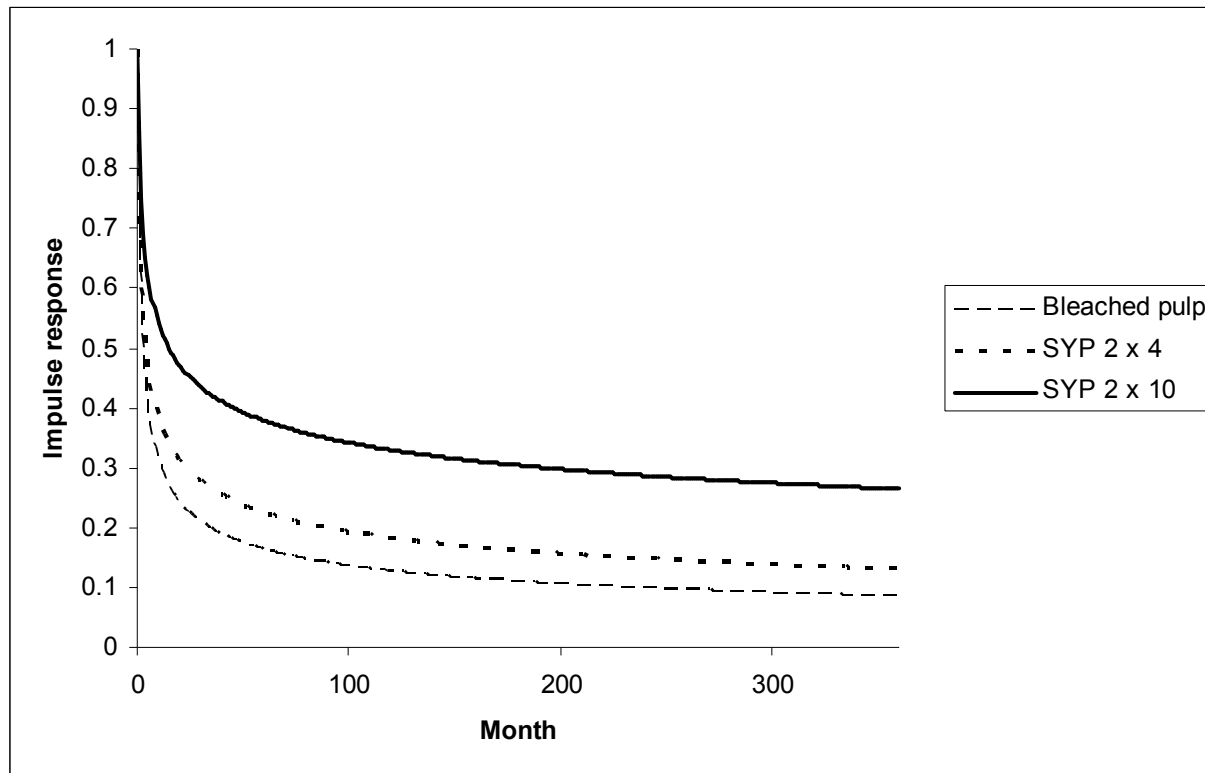
Product	d	$t(H_0: d = 0)$	KPSS ^a
DF 2×4 (CPI-deflated)	0.678	4.982***	0.308 (4)
DF 2×4 (PPI-deflated)	0.231	1.220	0.835 (4)***
DF 2×10 (CPI-deflated)	0.808	5.930***	0.159 (4)
DF 2×10 (PPI-deflated)	0.577	4.308***	0.396 (4)*
SYP 2×4 (CPI-deflated)	0.696	3.978***	0.118 (4)
SYP 2×4 (PPI-deflated)	0.552	2.872***	0.221 (4)
SYP 2×10 (CPI-deflated)	0.795	4.293***	0.080 (4)
SYP 2×10 (PPI-deflated)	0.677	3.147***	0.156 (4)
SPF 2×6 (CPI-deflated)	0.694	4.255***	0.172 (4)
SPF 2×6 (PPI-deflated)	0.541	3.046***	0.242 (4)
SPF 2×10 (CPI-deflated)	0.737	3.638***	0.159 (4)
SPF 2×10 (PPI-deflated)	0.452	2.089**	0.347 (4)
Sulfate pulp (CPI-deflated)	0.636	3.457***	0.235 (4)
Sulfate pulp (PPI-deflated)	0.500	2.590**	0.277 (4)

Notes: *, **, *** denote rejection of the null hypothesis at the 10%, 5%, and 1% levels, respectively.

^aKPSS test is on demeaned fractionally differenced series. Lag order given in parentheses.



Impulse response function



Wrap up

- Implications for option pricing, structural econometric models
- Rejection of unit root does not automatically mean series is stationary
- Theoretical development of long-memory finding needed
- Future research: compare against other non-linear time series models

