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Selected Poster/Paper prepared for presentation at the Agricultural & Applied Economics Association's 2017 AAEA Annual Meeting, Chicago, Illinois, July 30-August 1, 2017

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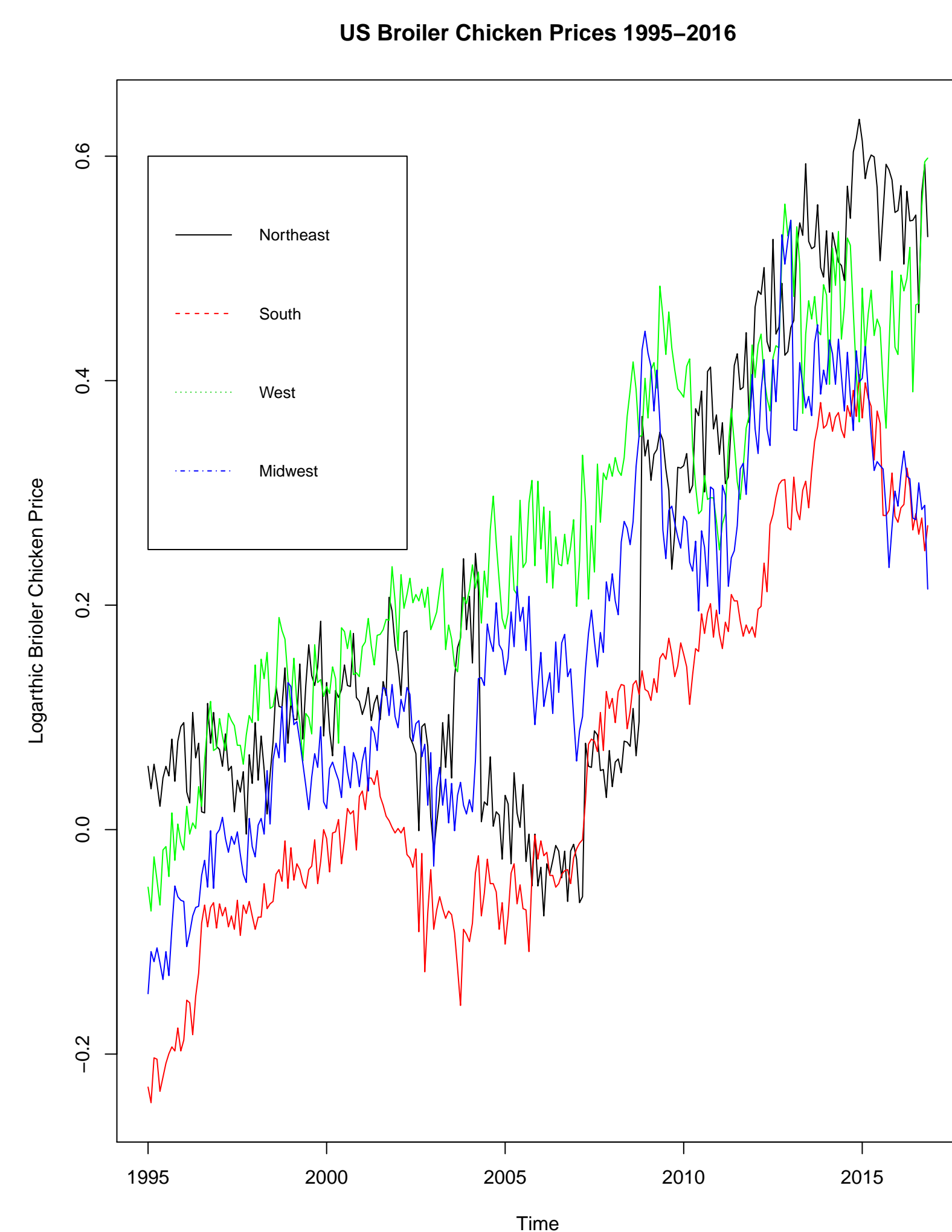
Spatial Price Transmission and the Extent of the Market: Price Behavior in the United States Broiler Chicken Industry

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Motivation

- The United States Broiler Industry has experienced increased concentration and vertical integration.
- Allegations of Price Fixing among several dominant firms in the broiler chicken industry beginning in 2008 including:
 - Prior to 2008, prices were characterized by boom-and-bust pattern
 - Output restricted and prices increased among cooperating firms beginning in 2008
 - A second round of output cuts took place in 2010 when non-cooperative firms began increasing output



- The objective is to quantify the effects of price-fixing, if any, beginning in 2008 on spatial price dynamics in the US broiler industry

Methods

- Analysis conducted using logarithmic transformations of monthly wholesale prices for whole, fresh broiler chicken from Bureau of Labor Statistics for four regions:
 - Northeast (NE)
 - South (S)
 - West (W)
 - Midwest (MW)
- Phillips-Ouliaris-Hansen and Johansen Cointegration Tests
 - Test each series $I(1)$ using augmented Dickey-Fuller Tests
 - Test for pairwise cointegration for evidence of Law-of-One-Price
 - Test for cointegration among all $I(1)$ series for evidence of long-run equilibrium

- Generalized impulse response functions are used to consider the timing of shocks and resulting price adjustments

- A three-regime threshold autoregression used to analyze behavior of price differentials:

$$y_t = \begin{cases} \rho^{(1)}y_{t-1} & \text{if } y_{t-1} \leq c_1 \\ \rho^{(2)}y_{t-1} & \text{if } c_1 < y_{t-1} < c_2 \\ \rho^{(3)}y_{t-1} & \text{if } c_2 \leq y_{t-1} \end{cases}$$

- Qu and Perron (2007) Multivariate test for structural break dates and impulse responses to shed light on differences in long-run pricing behavior:

$$y_t = \begin{cases} F^{(1)}(y_{t-1}, y_{t-2}, \dots, y_{t-p}) + u_t & \text{if } t \leq T^* \\ F^{(2)}(y_{t-1}, y_{t-2}, \dots, y_{t-p}) + u_t & \text{if } t > T^* \end{cases}$$

Results

- Augmented Dickey-Fuller tests were conducted with time trends
 - West is not $I(1)$, so excluded from cointegration analysis

Pairwise Cointegration Tests

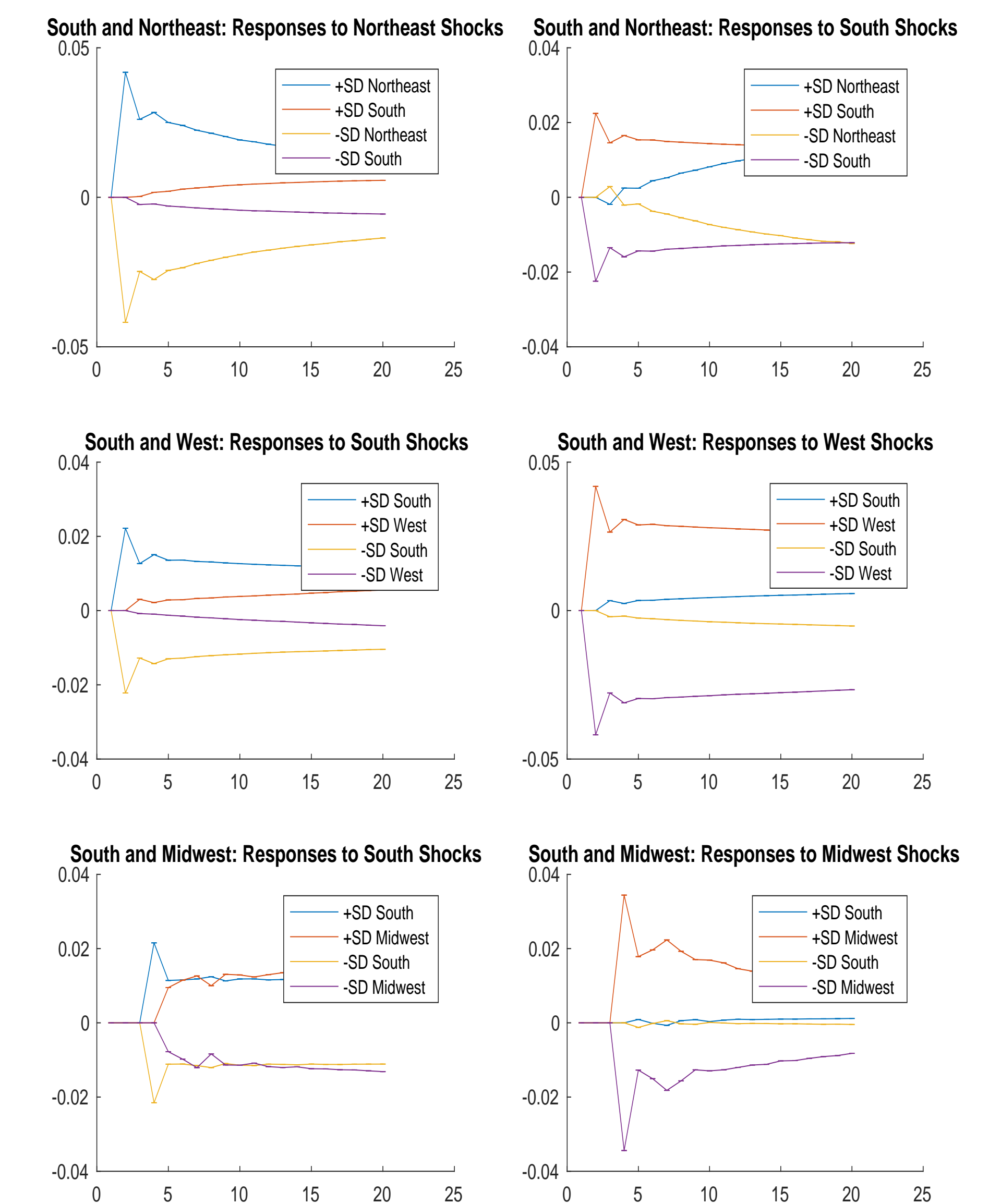
Pair	Test	Statistic
NE-S	LR Test: $\alpha = 0, \beta = 1$	333.31*
	max eigen. test $r = 0$	15.22*
	trace test $r=0$	10.29*
	Johansen test $r=1$	5.07
NE-MW	LR Test: $\alpha = 0, \beta = 1$	25.17*
	max eigen. test $r=0$	9.93
	trace test $r=0$	13.47
	Johansen test $r=1$	3.54
S-MW	LR Test: $\alpha = 0, \beta = 1$	303.1*
	max eigen. test $r=0$	14.22*
	trace test $r=0$	20.30*
	Johansen test $r=1$	6.08
	ADF test on differential	-2.72*

- Multivariate test for long-run equilibria, while pairwise test for Law-of-One-Price

Multivariate Johansen Tests

H_0	Trace Test	Max. Eigenvalue Test
$r \leq 2$	5.96	5.96
$r \leq 1$	16.05	10.08
$r = 0$	40.97*	24.93*

Results



Conclusion

- Cointegration tests fail to support Law-of-One-Price and long-run equilibrium
- Spatial markets exhibit similar responses to shocks in the four locations
- Prices converge more quickly in response to South shocks, where production is highly concentrated

Acknowledgements

I would like to thank Barry Goodwin for his helpful suggestions.