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AN EMPIRICAL EVALUATION OF PRICE LINKAGES IN THE INTERNATIONAL CORN MARKET

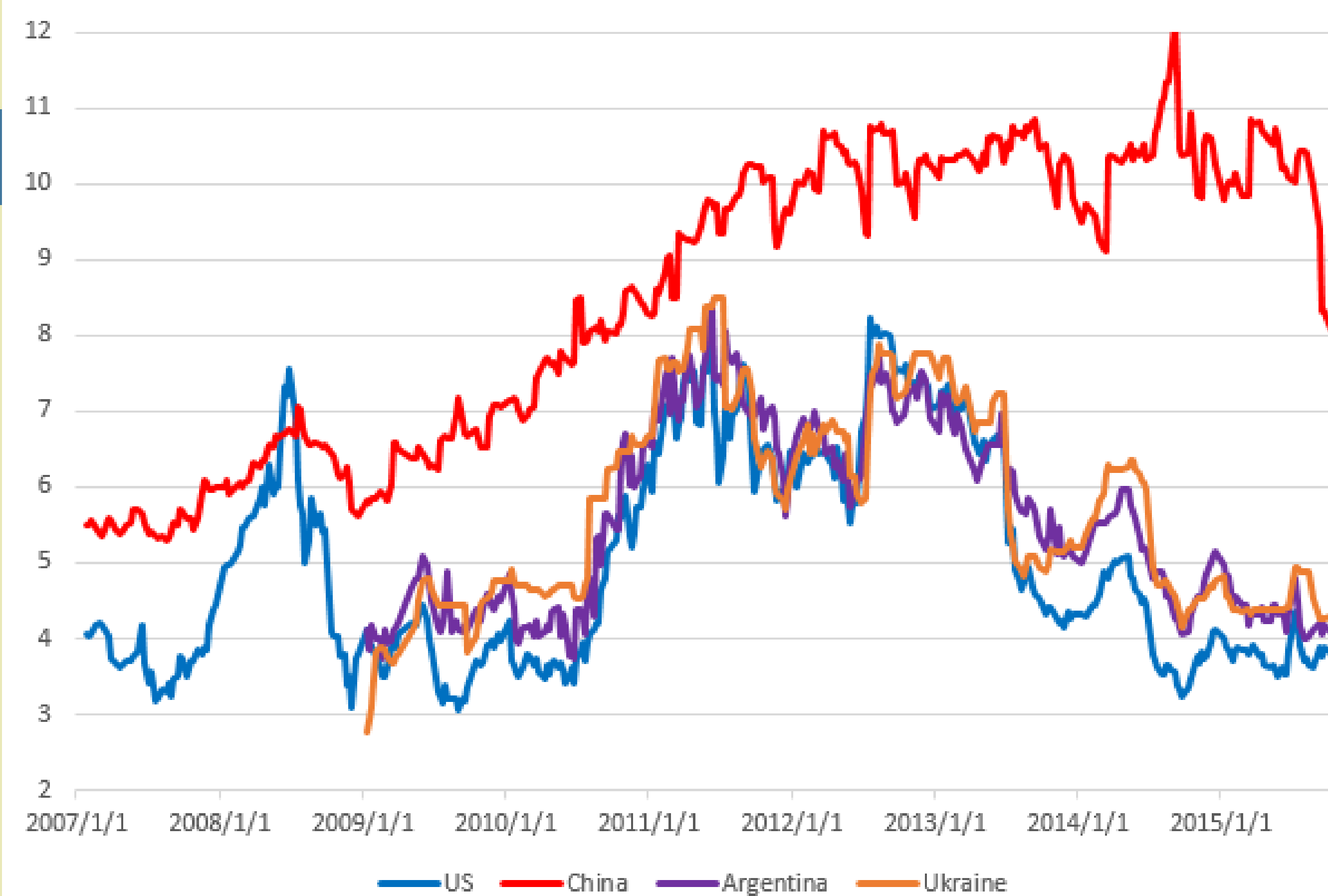


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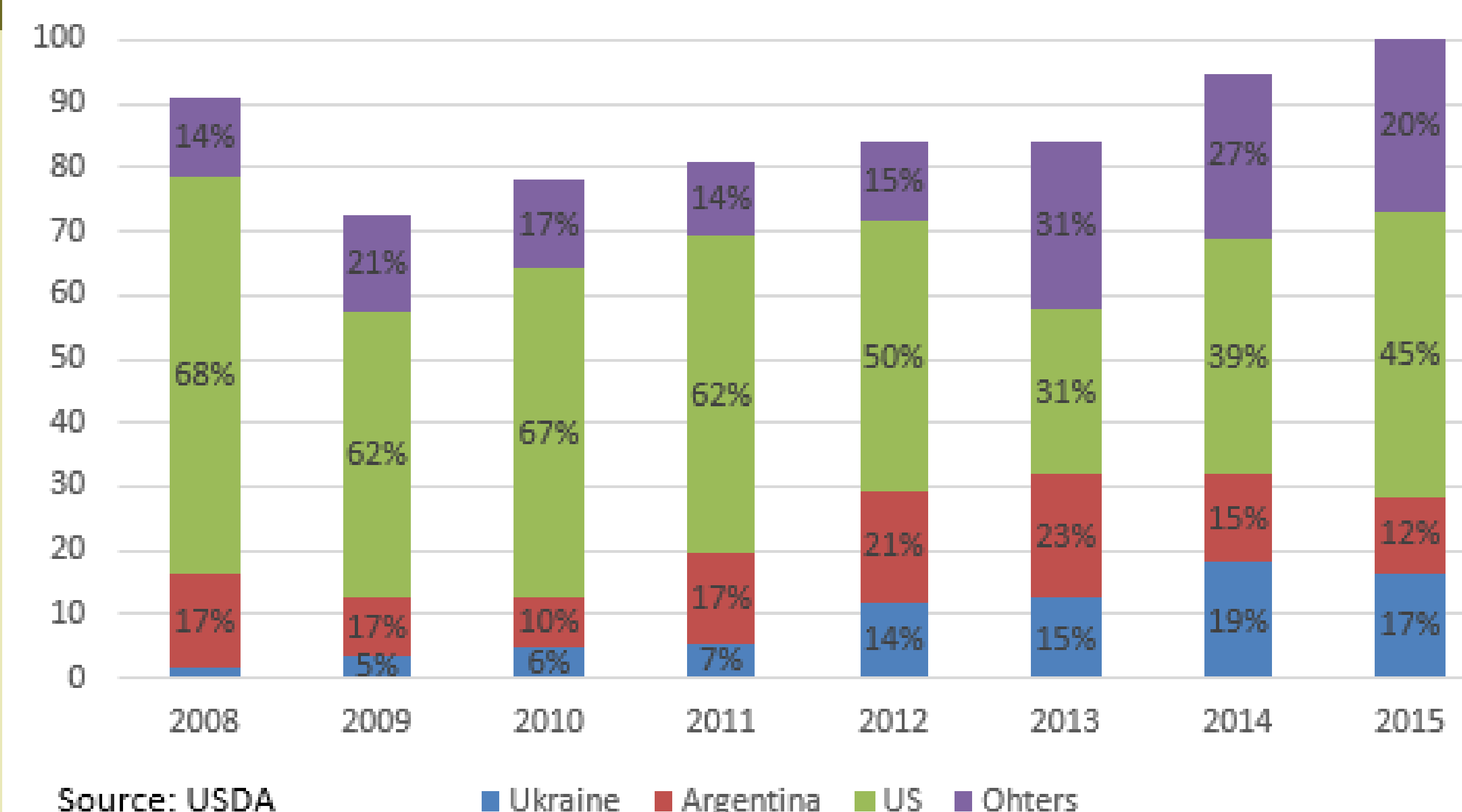
Background

- The price of corn fell dramatically in late 2008. To stabilize the price, China started a policy called Temporary Stock of Corn which enabled the government to buy corn directly from farmers at a given price higher than the international corn price. The policy was ended in 2015, and by that time the Chinese government had bought over 200 million tons of corn.
- The US had a tremendous drought in the year 2012, and the export was decreased to 26 million tons from 42 million. In the following years, the US corn exports recovered but its share in the world market was lower compared to the year before 2012.

Corn Price over Countries
(\$/Bushel)



World Corn Exports
(million tons)



Objectives

- Estimate how these two events changed the price relationship between China, US, and other two major corn export countries Ukraine and Argentina.

Methods

- The prices are obtained from the nearby future contracts in each country's future market and transformed into log term to reflect the percentage change. Daily prices are used for the model between US and China from 2007 to 2015. Weekly prices are used for other countries and are available from 2009.
- Bai and Perron (2003), Qu and Perron (2007) structural break test for linear regression model and the Vector Error Correction Model (VECM) with m breaks from $T_0, \dots, T_1, \dots, T_m, \dots, T_T$
 - Linear Regression: $y_{1t} = \alpha_j + \beta_j y_{2t} + \varepsilon_t \quad j = 1, 2, \dots, m + 1$
 - VECM: $\Delta y_{1,t} = \alpha_{1,j} + \beta_{1,j} \hat{\mu}_{t-1} + \gamma_{1,j} \Delta y_{1,t-1} + \varepsilon_{1,t}$
 - $\Delta y_{2,t} = \alpha_{2,j} + \beta_{2,j} \hat{\mu}_{t-1} + \gamma_{2,j} \Delta y_{2,t-1} + \varepsilon_{2,t}$
 - where $\hat{\mu}_{t-1}$ is the residual from OLS regression of $y_{1,t}$ on $y_{2,t}$
- The linear regression model requires the error term to follow a stationary process and is tested by Augmented Dickey-Fuller Test.
- The VECM requires the co-integration relation between two countries and is tested by Phillips-Ouliaris-Hansen and Johansen Rank Tests.

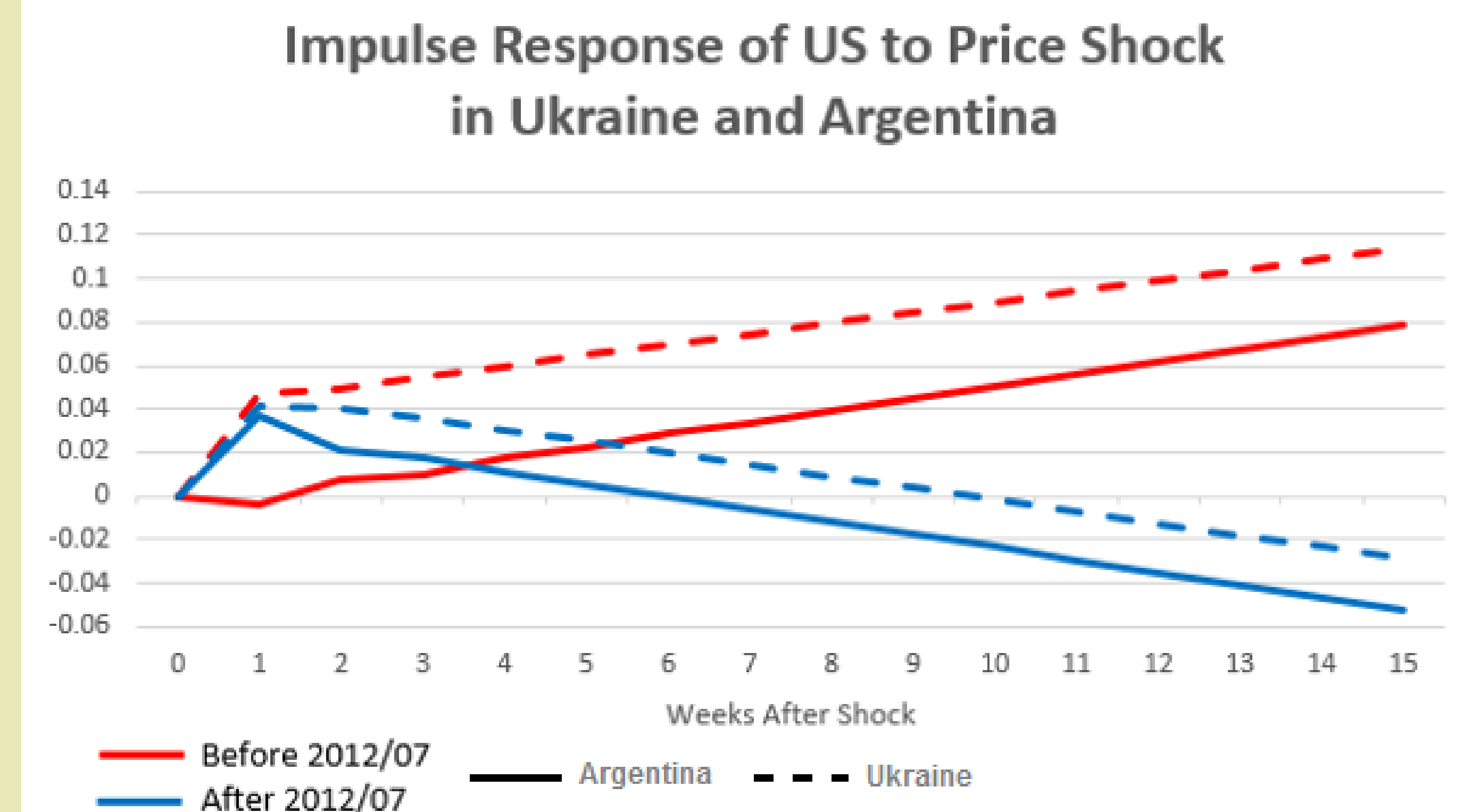
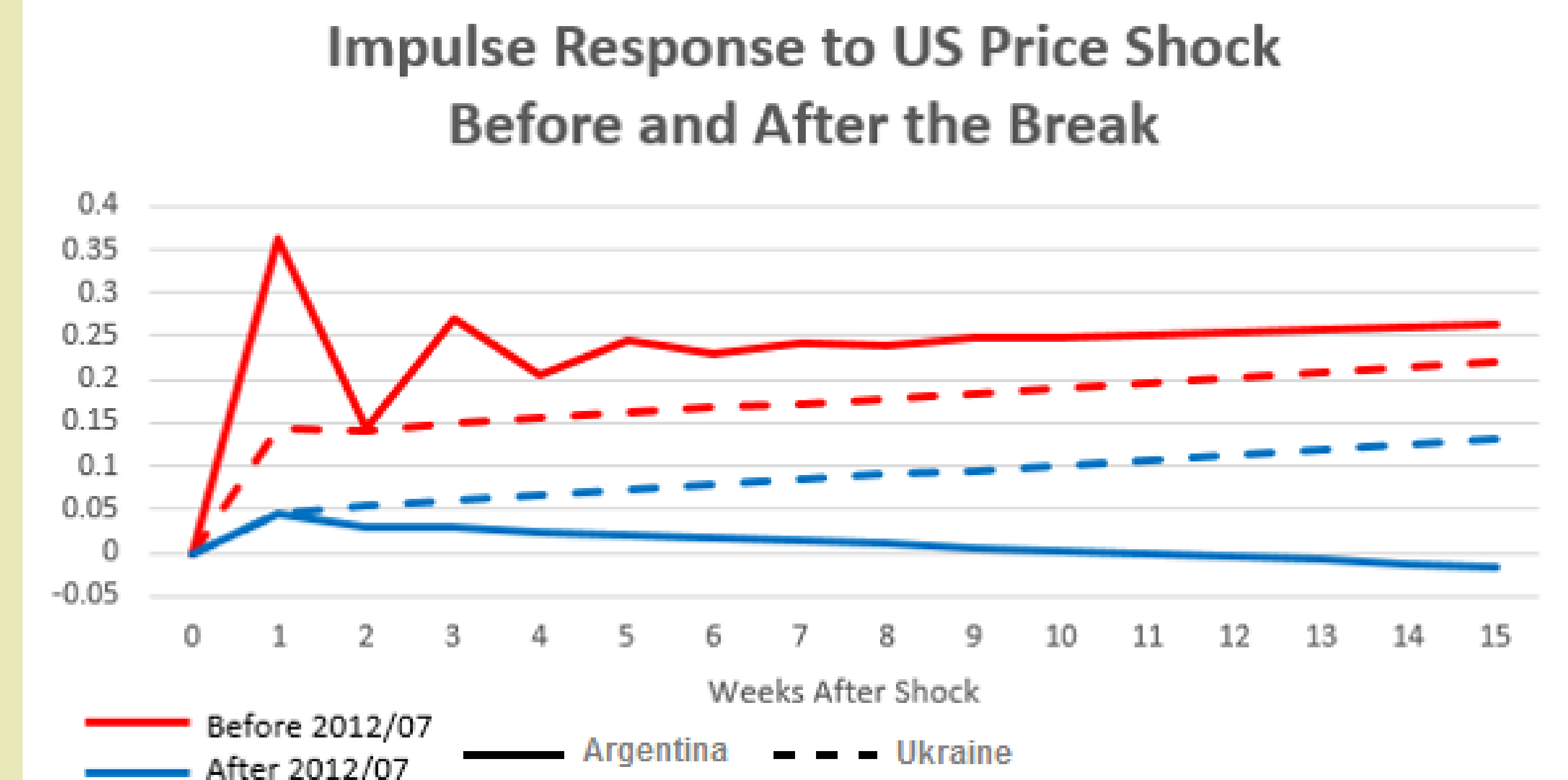
Results

	Structural Break for Linear Regression	
	1st Break	2nd Break
US & China	2013/07*	2008/10*
US & Ukraine	2010/08	2013/09
US & Argentina	2012/03	2013/06

*Significance are based on SupF Tests

Pairwise Co-integration Tests			Pairwise VECM Structural Break Model		
Pair	Test	Statistics	Pair	Variables	
US-China	Phillips-Ouliaris Z_ρ	-7.46	US-Argentina	Break Date T	2009/07/20
	Phillips-Ouliaris Z_τ	-1.89		US	Adj. Coefficient $\beta_{1,1}$
	trace test $r=0$	9.51	Argentina	Adj. Coefficient $\beta_{1,2}$	-0.036*
	Johansen test $r=1$	2.81		Adj. Coefficient $\beta_{2,1}$	0.358*
US-Argentina	ADF test on residual	-7.91*		Adj. Coefficient $\beta_{2,2}$	0.049*
	Phillips-Ouliaris Z_ρ	-53.64*	US-Ukraine	Break Date T	2009/07/20
	Phillips-Ouliaris Z_τ	-5.61*		US	Adj. Coefficient $\beta_{1,1}$
	trace test $r=0$	42.30*	Ukraine	Adj. Coefficient $\beta_{1,2}$	0.039*
Johansen test $r=1$	3.4		Adj. Coefficient $\beta_{2,1}$	0.137*	
US-Ukraine	ADF test on residual	-39.40*		Adj. Coefficient $\beta_{2,2}$	0.040*
	Phillips-Ouliaris Z_ρ	-36.32*			
	Phillips-Ouliaris Z_τ	-4.39			
	trace test $r=0$	22.07*			
Johansen test $r=1$	2.38				
ADF test on residual	-35.27*				

Result



Conclusion

- China's stock policy makes the price of corn in China isolated from other markets.
- After the US cut down its corn exports in 2012, the speed of adjustment on the long-run equilibrium between US and other major exporters become smaller.

Acknowledgement

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