Managing Wheat Price Volatility in India

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Food security in India

- Food security: top priority for policy makers
- Addressed through 3 pillars:
  - Availability: R&D, subsidized inputs (electricity, fertilizer, seeds, water, credit) and guaranteed prices.
  - Access: largest food schemes in the world
    - Targeted, quantity-constrained, releases of food to low income consumers
    - Set to expand under new Food Security Bill: 820 million people should receive subsidized food.
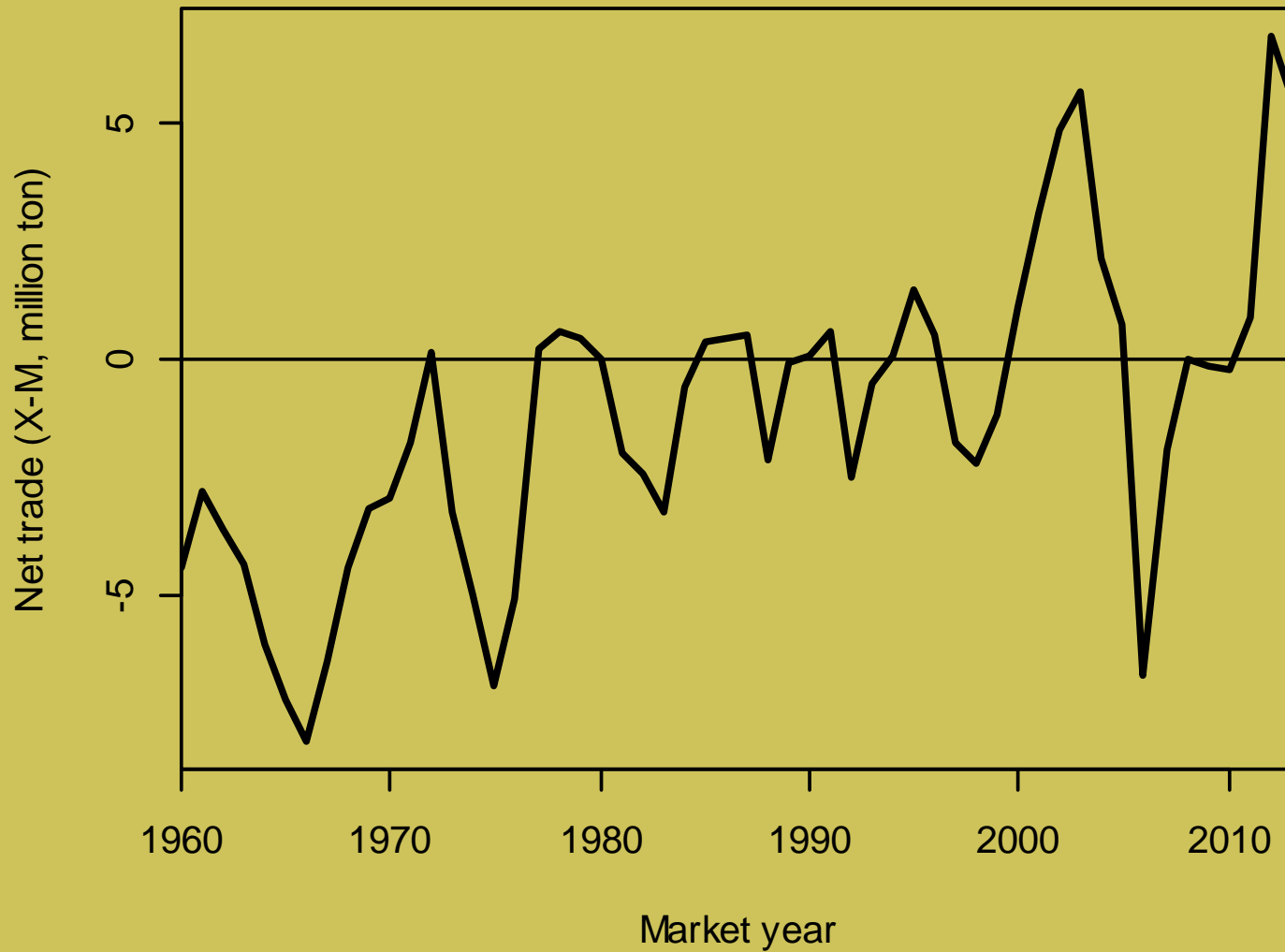 - Stability: stable prices through active trade and storage policies.
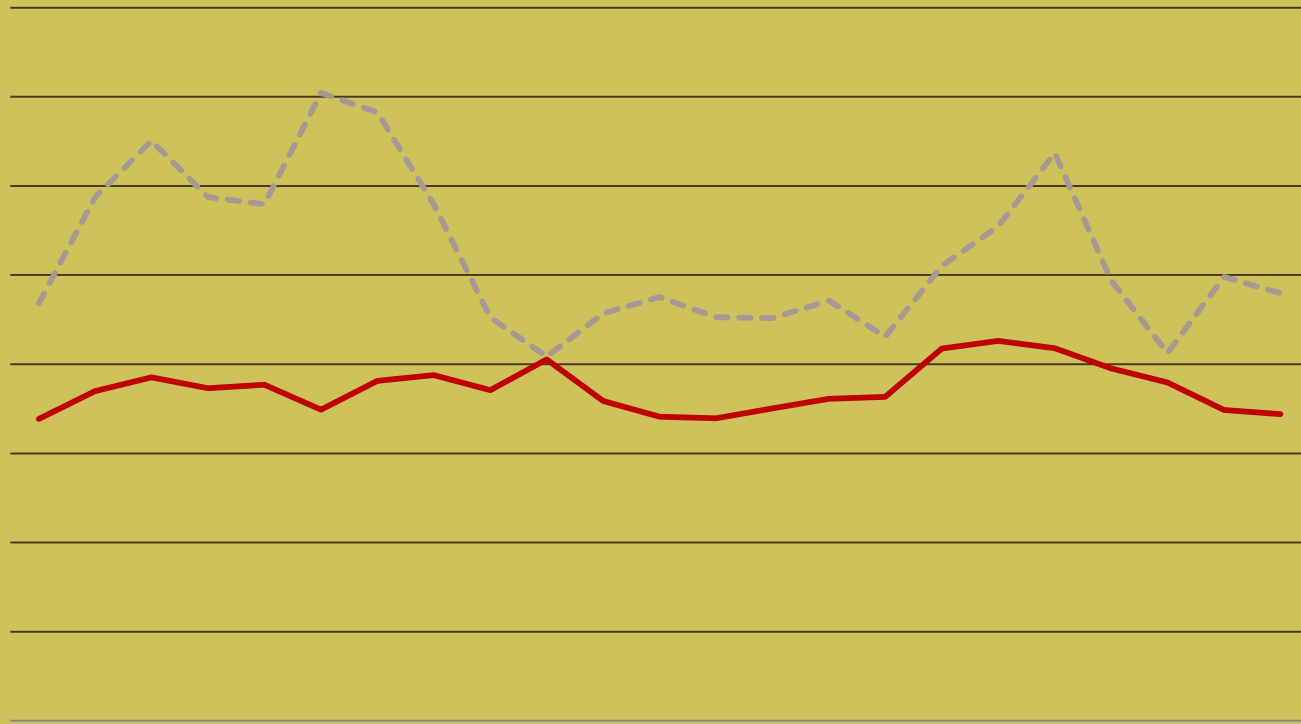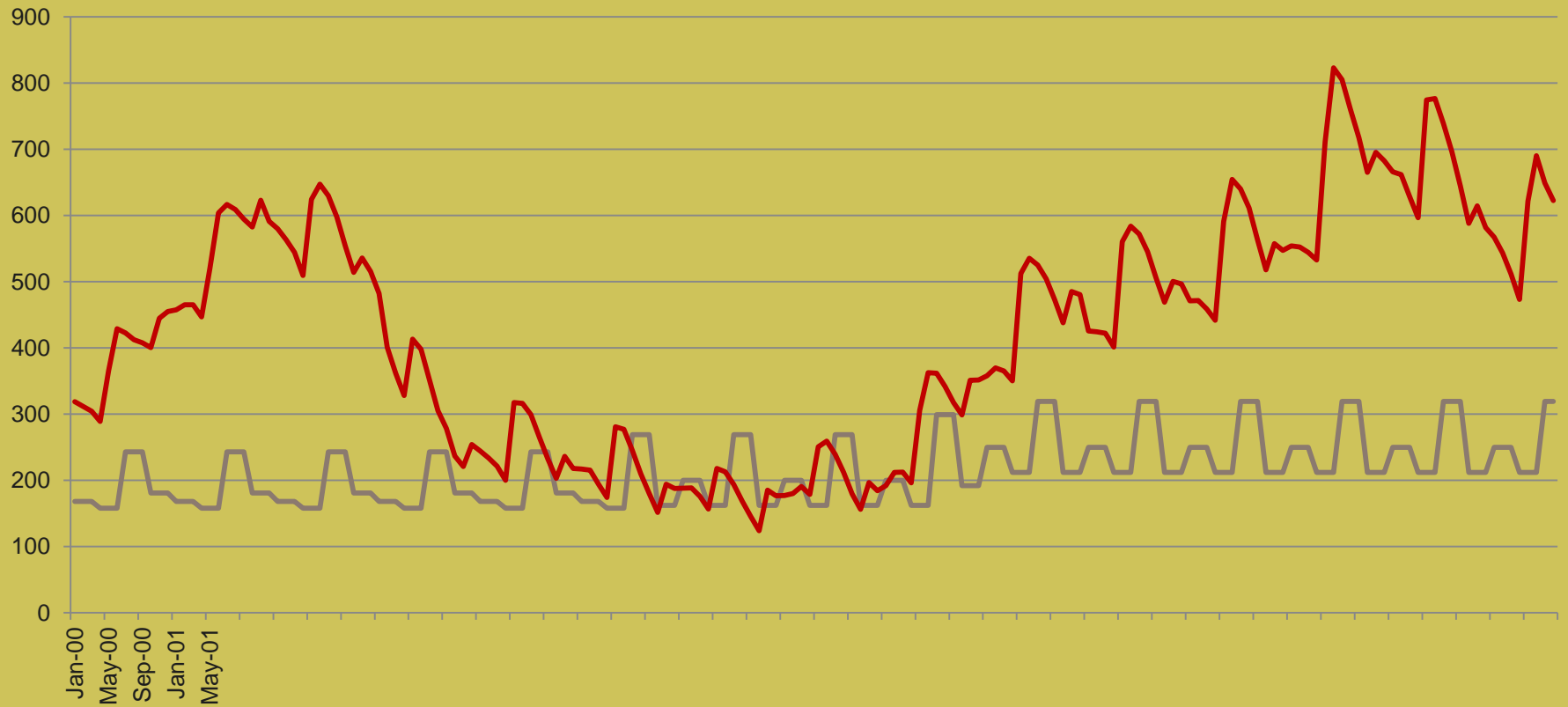
Food security in

India's wheat market

Stable domestic market

Grain stocks vs norms

Questions

- What are the implications of current policies?
  - For India and the world market

- Can a model identify better policies?
  - What is the optimalof storage and trade policies?

- Can simple rules yield similar results?

Modeling India's Wheat Market

- 2-country stochastic rational-expectations partial equilibrium model

  – India ( ) & the Rest of the World (   )

  – Production, consumption, storage & trade
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Producers respond to expected prices:

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Private

<u>Welfare:</u> sum of surpluses + loss function.

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Where

Parameter Values

Parameter	Value
India's Demand Elasticity	-0.3
ROW Demand Elasticity	-0.12
Wheat budget share %	10
Supply Elasticity	0.2
Private Storage Cost per ton	$22
Public Storage Cost per ton (source: FCI)	$87
Trade Costs per ton	
- Import	$65
-Export	$35
Standard deviation of production shocks in India and in ROW %	3.5

Estimating trade insulation

- Neglecting trade costs and assuming trade:

  .

- Prices likely cointegrated, so estimation in level would capture their long-run dynamics, not short-

Solution methods

- Rational expectations storage models do not have closed form solutions.

- The solution is approximated by numerical methods
  - Projection methods: grid of points on state variables on which the model has to hold exactly.
  - Spline interpolation between grid points.

- RECS solver (http://www.recs-solver.org/)

Impacts on welfare

	Laissez-faire	Trade policy	Storage policy	Both
Mean price%		-2.8	0.01	-3.3
Price CV (%)	14.4	10.7	10.1	3.1
Ave. Public storage	0	0	4.2	10.4
Ave. Private storage	0.10	0.02	0	0
RoW Price CV (%)	20.7	24.0	19.6	23.3
Contributions to India's Welfare (% of consumption expense)				
Cons Surplus		2.4	-1.3	2.1
Prod Surplus		-2.7	1.4	-2.2
Storage cost		0.0	-2.2	-3.7
Trade cost		0.08	0.0	0.13
Reduction in volatility cost		0.4	0.3	0.7
Total India welfare		0.2	-1.8	-3.0

Impacts of optimal policies & optimal simple rules

Fully optimal Policies

- Identify an active policy to maximize welfare
  - Model chooses trade tax & public storage levels
    - State-contingent policies (depend on current availability in the 2 regions and on history of the states: policies under commitment).
    - Analyze for different degrees of preference for price stability
- Allow to identify the best policy options, but
  - Very complex policies
    - Policies are function of variables that are not observable (e3st3x3(pli

- Compare with Simple – and potentially more tractable – rules for policy
  - Rules

Key impacts,

	Laissez-faire	Optimal Policy	Simple Rules	Current Policies
Mean price%		-2.8	-2.3	-3.3
Price CV %	14.4	4.8	8.5	3.1
Average Storage	0.10	0.95	0.95	12.5
RoW Price CV %	20.7	22.7	22.5	23.3
Contributions to India's Welfare (% of consumption expense)				
Consumer Surplus		1.66	1.70	2.1
Producer Surplus		-1.79	-1.84	-2.2
Storage cost		-0.09	-0.12	-3.7
Trade cost		0.11	0.17	0.13
Reduction in volatility cost		0.57	0.49	0.7

Optimal policies vs simple rules

	Share of total welfare achieved by optimal simple rules
0	77.8%
3	85.8%
6	86.3%
9	86.1%
12	85.7%

Optimal simple rules achieves less welfare gains when   :
- Gains come from terms-of-trade manipulation.
- OSR are not designed for this.

Optimal simple rules as

Variables	0	3	6	9	12
Price insulation ( )	-0.17	-0.41	-0.49	-0.53	-0.55
Storage subsidy ( )	0.02	0.72	0.97	1.08	1.15
Mean price %	0.0	-1.2	-1.5	-1.6	-1.7
Price CV (%)	12.8	9.9	8.5	7.8	7.2
Ave Private Storage	0.1	0.5	1.0	1.3	1.7
Contributions to India's Welfare (% of consumption expense)					
Consumer Surplus	0.64	1.53	1.70	1.77	1.80
Producer Surplus	-0.72	-1.68	-1.84	-1.91	-1.94
Storage cost	0.00	-0.05	-0.12	-0.17	-0.22
Trade cost	0.10	0.16	0.17	0.18	0.18
Reduction in volatility cost	0.00	0.21	0.49	0.79	1.10
Total India welfare	0.02	0.17	0.40	0.66	0.92

With high storage costs?

- Previous results based private storage costs.
- Optimal policies with current public costs (4x)?
  – Annual cost of storage = 61% of steady-state price.
- Optimal simple rule implies negligible levels of stocks
  – Better to let annual stocks be carried out in the RoW and to use trade policy to stabilize domestic market.

Thank you!

Error correction model

ADF test

Variable	Constant	Trend
Price		
India	-1.49 (1)	-0.73 (1)
US	-1.42 (2)	-3.15 (1)
Price differential		
India	-5.24*** (1)	-5.57*** (1)
US	-4.85*** (1)	-4.79*** (1)
Residual from cointegration eq.	-3.58** (1)	-4.00* (1)

Long-run equilibrium:

Adj-R²: 0.73.

Error-correction model:

Adj-R²: 0.11; DW: 2.21.

So   .

Data:
- India: Annual producer prices from FAOSTAT, converted to US dollars.
- World: US prices (IMF)
- Converted to real terms using US CPI.