An Empirical Analysis of Wholesale Cheese Pricing Practices on the Chicago Mercantile Exchange (CME) Spot Cheese Market

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Presentation Outline

- Chicago Mercantile Exchange *spot* cheese market
  - Role in the U.S. dairy industry pricing
  - Structure and participants
- Theoretical framework and hypotheses
  - Vertical price transmission
  - Cost pass-through
- Econometric model
- Data
- Estimation results
- Conclusion

CME *Spot* Cheese Market

- ***Spot** cheese market* is a private industry institution
- In the past it took place on the National Cheese Exchange and Wisconsin Cheese Exchange; it was moved to CME in 1997
- Originally it was used to trade surpluses of cheese (at the beginning of the last century)
- Over time, it became *an institution performing **a primary price discovery function** in the U.S. dairy industry*
  - *CME spot cheese prices* are used as *reference prices in cheese contracts* used to transact more than 90% of cheese produced in the country
  - *CME spot cheese prices influence milk prices set* within the Federal and State Milk Marketing Orders
    - Milk prices that first level handlers have to pay to dairy farmers are determined using a set of price formulas
    - A survey-based *wholesale cheese price* is the main determinant of milk price in these price formulas

- CME spot cheese market *is a thin (a low volume) market*
  - < 1% of the total cheese volume produced in the country traded
- *A relatively small number of traders* participate on a regular basis
  - These are large ag cooperatives and food processing companies
  - They also operate in the cheese contract market
- Occasional concerns about market (price) manipulations are raised
  - They attract attention due to the role of CME spot cheese market in price discovery in the U.S. dairy industry

- Research on cheese pricing relevant to the CME spot cheese market is practically absent

- **Our research objective** is *to analyze the nature of wholesale cheese pricing practices* used by cheese wholesalers on CME spot cheese market
  - An analysis of *vertical price transmission process*, which reflects the nature of *cost pass-through (CPT) for cheese wholesalers*
  - Milk is the main input used to produce cheese
  - The CPT magnitude is used to conclude on the nature of cheese pricing: perfectly competitive or imperfectly competitive and a particular type of wholesale cheese pricing method

- ***A linear vertical price transmission process: WP = a + b*FP***
- *WP* is the CME wholesale cheddar cheese price ("output price")
- *FP* is FMMOs Class III milk price ("input price" or "farm price")
- *a* is a non-negative constant
- *b is a farm price transmission coefficient (cost pass-through)*
  - The magnitude of "b" and "a" is used to determine the pricing method used by wholesalers

Hypotheses (are based on profit-maximizing FOC)

- b=1 and a>0 -> *perfect* competition; *a fixed absolute mark up pricing*
- b<1 -> *imperfect* competition: seller market power/<u>linear</u> *demand*
  - b=0.5 monopoly and 0.5<b<1 oligopoly
  - Consistent with *a fixed-percentage mark up pricing method (a margin stabilization pricing)*
- b>1 -> *imperfect* competition: seller market power/<u>non-linear</u> *demand*
  - Impossible to distinguish monopoly and oligopoly
  - Consistent with *an output price stabilization pricing method*

- **WP = a + b*FP** is used to specify an econometric model
- **Asymmetry in farm price transmission process** is introduced in the econometric model
  - Assumption: *milk price increases are transmitted at a different rate than milk price decreases (common in dairy industry)*

$$WP_t^* = \alpha_0 \times t + \sum_{i=0}^{N} \beta_i^+ \times FP\_INC_{t-i}^* + \sum_{i=0}^{M} \beta_i^- \times FP\_DEC_{t-i}^* + u_t$$

- *WP* is the sum of all period-to-period changes in wholesale cheese price from its initial value*
- *FP_INC* (>0) is the sum of all period-to-period increases and FP_DEC* (<0) is the sum of all period-to period decreases in milk price from its initial value*
- *N and M are the number of lagged terms for increasing and decreasing phases of milk price*
- *Betas are vertical price transmission coefficients (cost pass-through) for the FP increasing phase and for the FP decreasing phase*

- *CME cheddar cheese prices ($ per pound)*
  - USDA Agricultural Marketing Service (AMS) Dairy Market News Portal
  - Cheddar cheese prices for two styles of cheese currently traded
    - Cheddar sold in 500 pound barrels
    - Cheddar sold in 40 pound blocks
- CME cheese prices are daily prices, also reported on a monthly basis

- *Class III milk price ($ per hundredweight)*
  - USDA AMS Milk Marketing Order Statistics Public Database
  - Is determined by USDA on a monthly basis and is publicly announced

- The econometric models are estimated using monthly data
  - Separate model for cheddar barrel and cheddar block
  - Class III milk price is converted into $ per pound

- Period of analysis: January 2000 – December 2014

OLS Estimation Results

Independent variable	Dependent variable: CME cheddar block price	
	Est. coef. (CPT)	T-ratio
$FP\_INC_t^*$ (β_0^+)	1.23*	7.62
$FP\_INC_{t-1}^*$ (β_1^+)	-0.58*	-3.24
$FP\_DEC_t^*$ (β_0^-)	0.64*	12.04
Constant	0.03	1.47
$\beta_0^+ + \beta_1^+$	0.64	12.90
DW-statistic	1.28	
R2	0.76	
Sample size	178	

- FP decreasing phase: only current month effect is statistically significant
- FP increasing phase: the current month and the first lag are statistically significant
- The immediate impact of FP change: asymmetry in FP transmission
   - Milk price increase is transmitted at a much higher rate than decrease
- The cumulative impact of FP change: symmetry in FP transmission

A). The *cumulative effect* of milk price changes on cheese price

· ***Symmetric ->*** *milk price increases are transmitted at the same rate as milk price decreases*

· ***Cost pass-through (CPT) is 0.64*** *-> imperfectly competitive pricing*

· *A null hypothesis of a perfectly competitive pricing is rejected*

· *Evidence of **oligopolistic pricing** in a **linear demand** market*

· *Wholesale cheese price stabilization pricing method*

B). The *immediate (current month) effect* of milk price changes on cheese price

· ***Asymmetric ->*** *milk price increases are transmitted at a much higher rate than milk price decreases (almost 2 times)*

· *A null hypothesis of a perfectly competitive pricing is rejected*

· ***CPT for <u>milk price increase</u> is 1.23*** *(more than a complete CPT)*

· ***Oligopoly or monopoly pricing** in a **non-linear demand** market*

· *Fixed-percentage mark up pricing (wholesale margin stabilization)*

· ***CPT for <u>milk price decrease</u> is 0.64*** *(incomplete CPT)*

· ***Oligopoly pricing** in a **linear demand** market*

· *Wholesale cheese price stabilization pricing method*

- The empirical evidence indicates that pricing practices used by cheese wholesalers at CME spot cheese market are consistent with the ones used by profit-maximizing oligopolists
- This evidence reflects pricing methods that can be found in markets with similar to CME spot cheese market structural characteristics
  - A relatively small number of traders
  - A homogeneous product
  - An inelastic demand and a limited entry

- CME spot cheese market is a low margin market
  - Wholesale cheese margin is 5% on average
  - Seller market power is reflected in the asymmetric transmission of milk price increases and milk price decreases
  - In the case of the current month effect
    - The milk price increase transmission is more than a complete
      - Wholesale margin increases
    - The milk price decrease transmission is incomplete
      - Wholesale margin increases as well

Questions ???

Comments ...

Thank You

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