

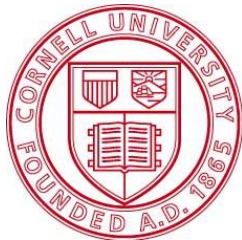
Issues of and Solutions to Milk Price Volatility in the United States

Andrew M. Novakovic, PhD

The E.V. Baker Professor of Agricultural Economics

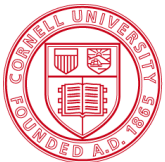
Cornell University

Ithaca, New York, USA



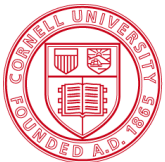
Outline

1. A quick overview of the structure of the US dairy sector and milk pricing – with contrasts to Europe
2. Milk price volatility – patterns and issues
3. Dairy risk management options – what we have, what we use, what we think we want



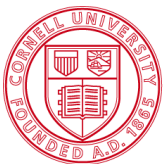
Salient Characteristics of the U.S. Dairy Sector

- The Structure of Dairy Farming
 - Milk produced throughout the U.S. – spatially dispersed
 - But, with increasing concentration in 3-4 regions.
 - Wide range of farm sizes and production systems, with associated differences in cost structures and risk profile. Half the farms less than 50 cows, half the milk produced by farms of 500 or more.
- National Milk Production
 - Total production increases about 2 billion pounds (907 MT) per year since 1975
 - Yield per cow increases 274 pounds per year (124 kg) since 1953
 - Number of cows mostly declining about 5% per year since 1945; slight ups and downs since 1996
 - Number of farms has declined 50% every 12-15 years since 1973



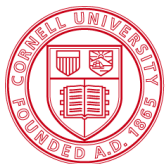
Market Coordination and Pricing in the US Dairy Supply Chain

- Dairy farmers rely heavily on cooperatives to:
 - Pick up milk under contract with private haulers
 - Identify and service milk customers
 - Negotiate prices for milk and transportation
 - Provide other supplies and services
- About 85% of US milk supply marketed through coops
- Coops use about half of their members milk in their own plants
- Proprietary buyers may buy from coops exclusively, partially or not at all



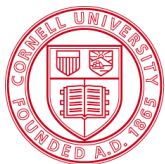
Key Elements of US Milk Pricing

- Essentially a closed economy from 1951 to 1996:
- DPSP, similar to European intervention system, reduced to very low levels since 1989
- MILC has been a countercyclical payment subsidy since 2000, with serious payment limit by size (~ first 100 to 150 cows)
- Classified pricing and pooling by regions under Federal and State milk marketing orders – milk is price monthly, with underlying data that is daily, weekly, and monthly
- Without DPSP, US policy does little to distort market prices
- Wholesale prices are signaled on the Chicago Mercantile Exchange and become the basis for valuing farm milk



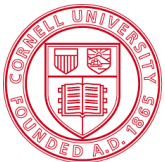
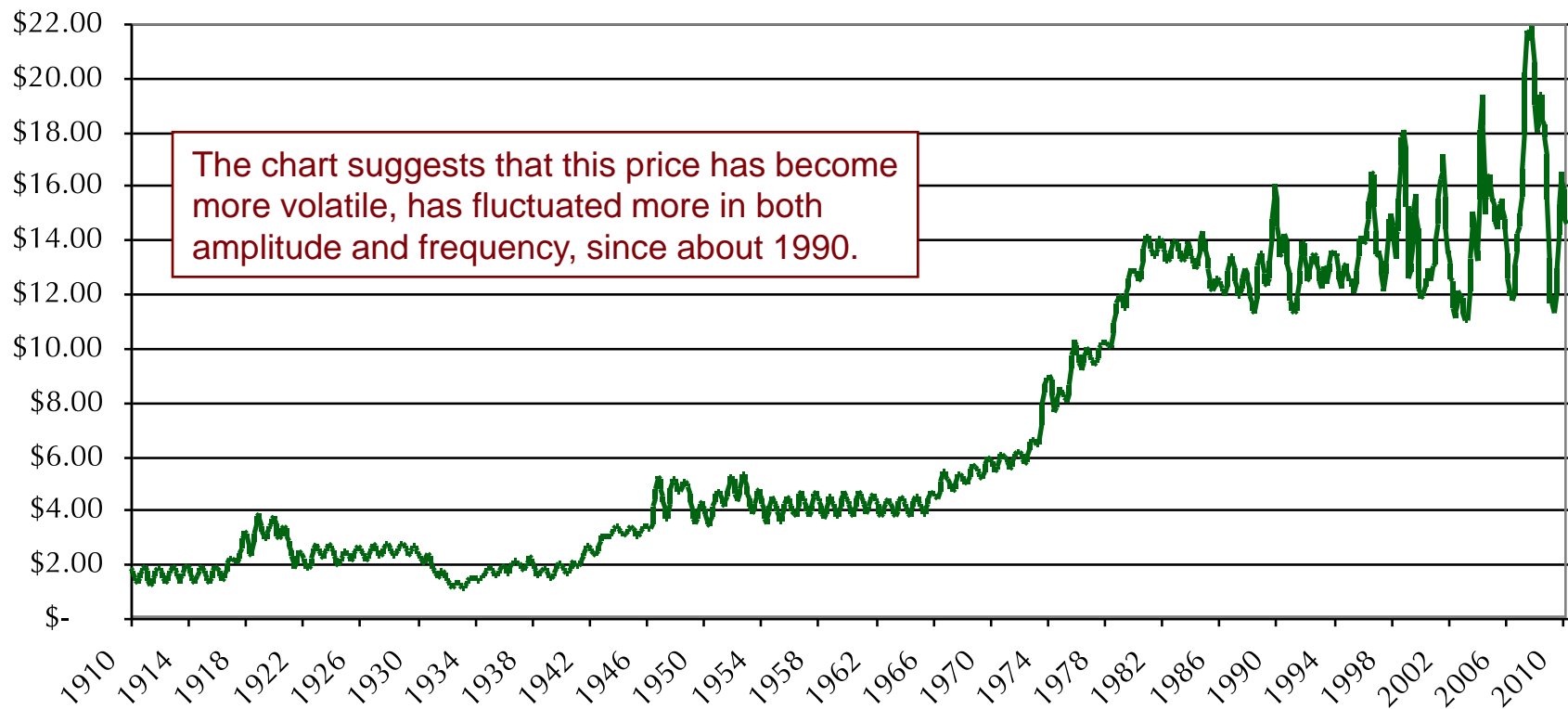
Outline

1. A quick overview of the structure of the US dairy sector and milk pricing – with contrasts to Europe
2. Milk price volatility – patterns and issues
3. Dairy risk management options – what we have, what we use, what we think we want



Why are we interested in “volatility” in the US Average Price for All Milk?

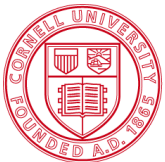
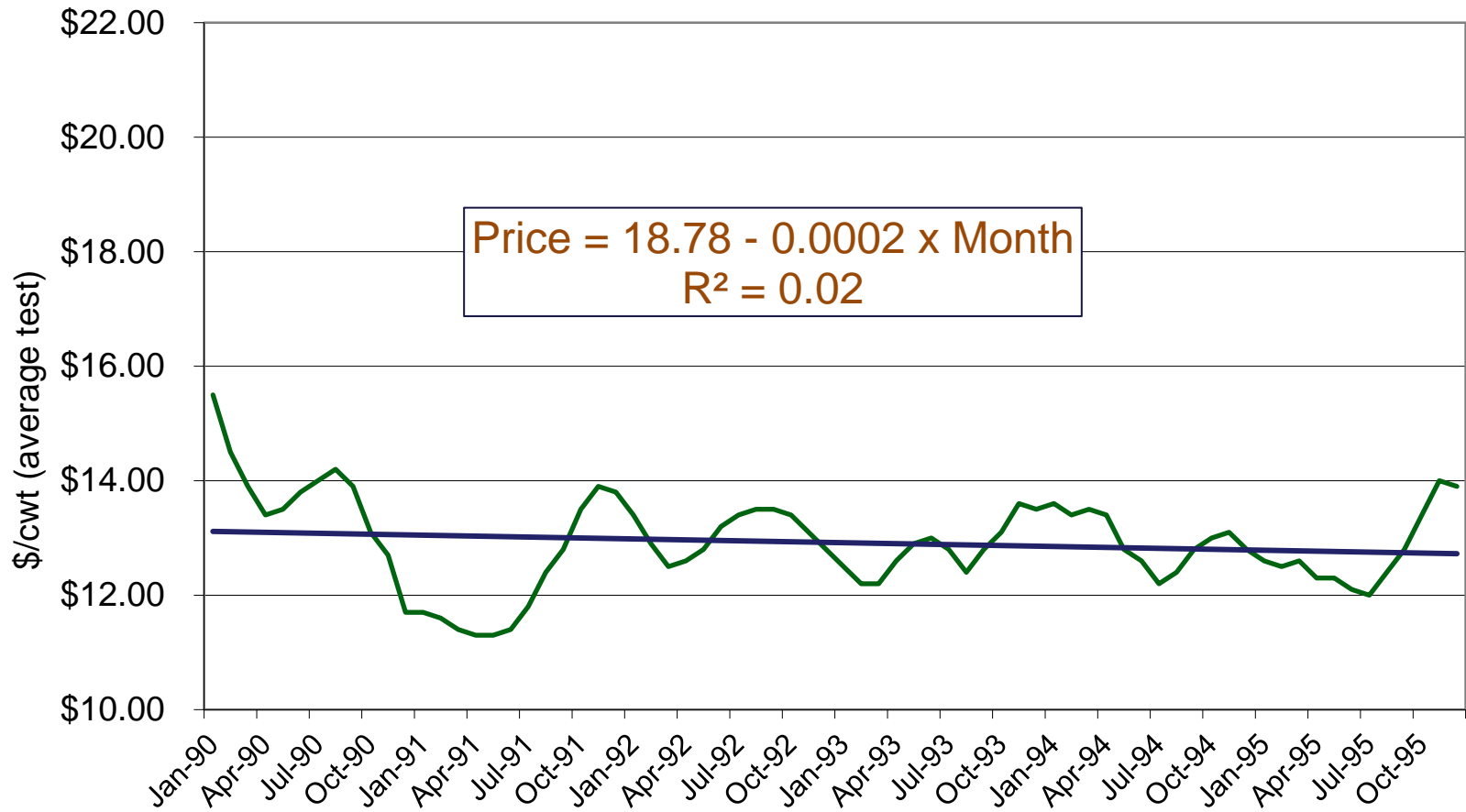
U.S. Average Monthly Price for All Grades of Farm Milk, 1910 to 2010
(not adjusted for inflation)



Historical lessons of the early 1990s

(adapting to little to no government supports)

US Average Monthly Price for All Milk, 1990 to 1995



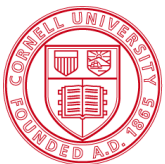
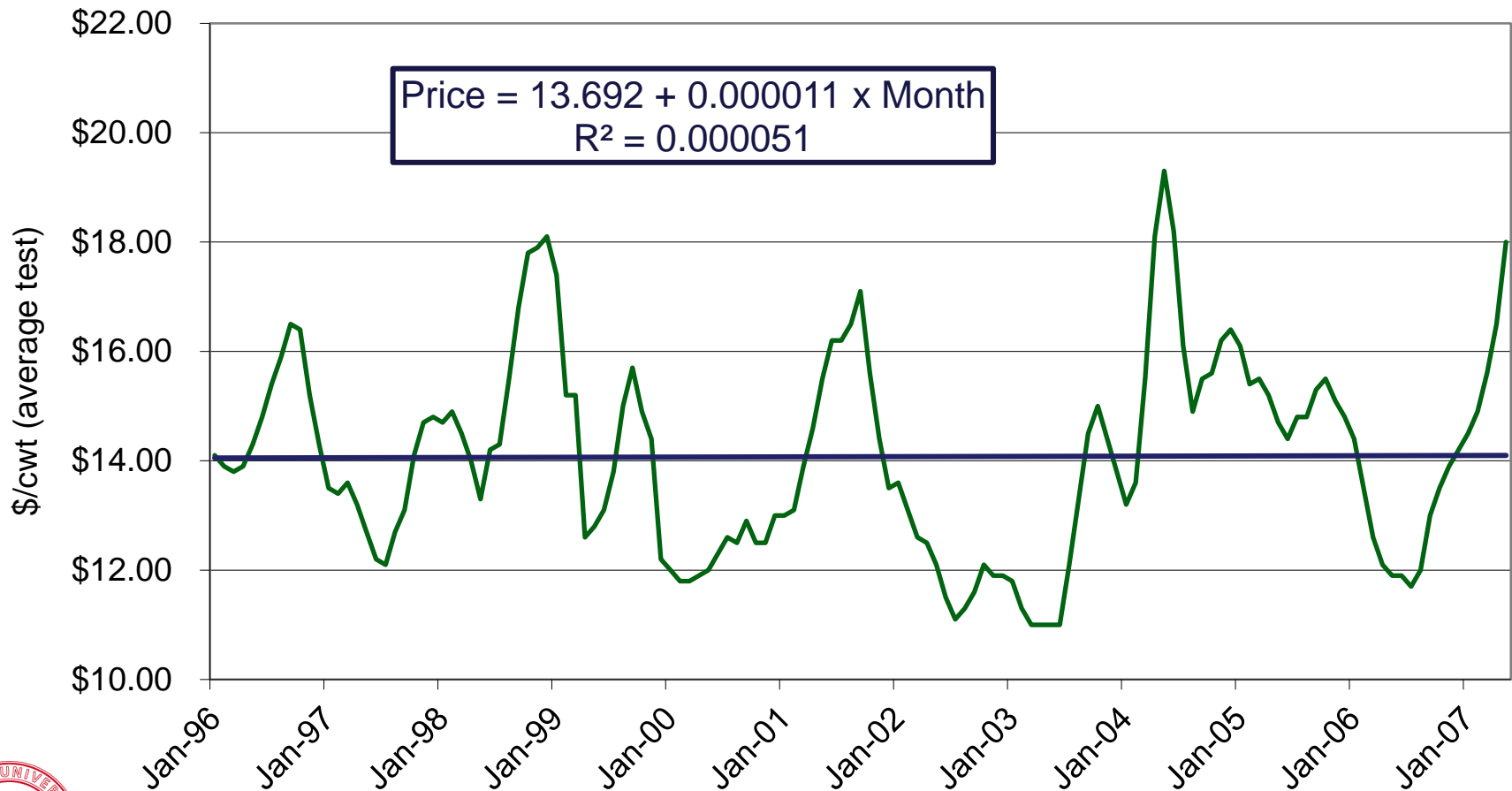
Cornell University

Charles H. Dyson School of Applied Economics and Management

Historical lessons of the late 1990s

(adapting to little to no government supports AND freer trade)

US Average Monthly Price for All Milk, 1996 to April 2007 (just before the big increase in corn price)



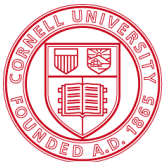
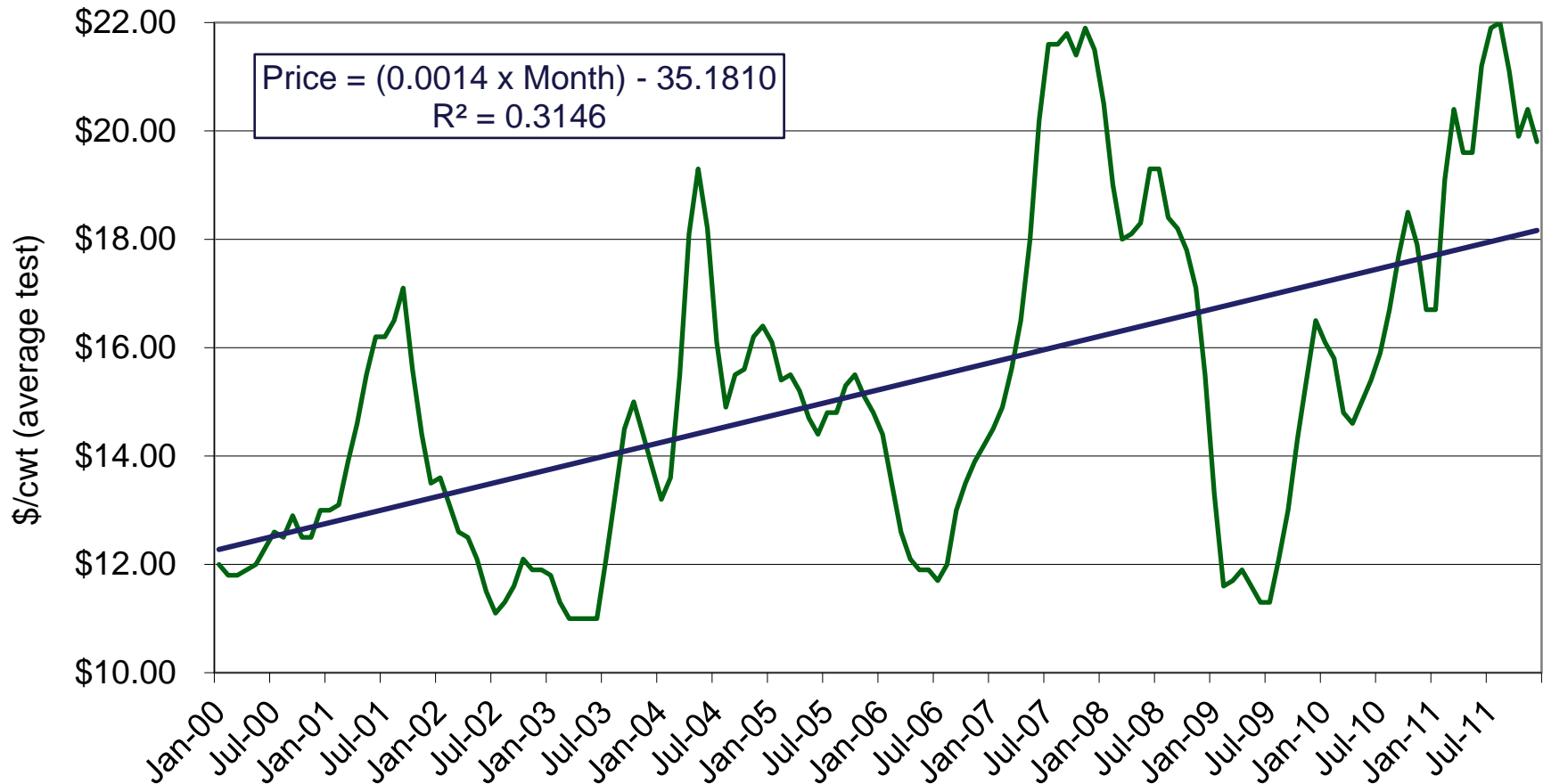
Cornell University

Charles H. Dyson School of Applied Economics and Management

And Then the 21st Century

(adapting no supports AND freer trade AND high corn prices)

US Average Monthly Price for All Milk, 2000 to 2011



Cornell University

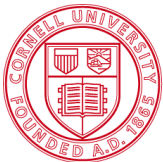
Charles H. Dyson School of Applied Economics and Management

What Are the Challenges and Issues with Respect to Price Volatility? (some working definitions)

Three Very Different Characteristics of Price

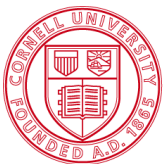
- Uncertainty/Certainty (or predictability) - good, bad or otherwise, to what degree can I predict what the price will be?
- Instability/Stability - good, bad or otherwise, prices do/don't change much from one month or period to the next
 - o Perfectly stable implies certainty, but certainty does not imply stability
- Inadequacy/Adequacy - stable or not, are prices enough to cover my costs and yield a profit or positive cash flow?

Volatility? - implies unstable prices that are hard to predict and are inadequate on the downside



Some Basic Questions about Price Volatility

- Does it exist? (yes)
- How much is it? (measurement is tricky)
- Is it a problem? (yes)
- In what way is it a problem? (industry attestation, but this one is trickier than it may sound)
- For whom is it a problem? (good question -- farmers, processors, retailers/foodservice, consumers)
- What can be done about it?
 - To treat the symptoms or to treat the cause
 - Public solutions vs private solutions
 - Existing tools or new tools?
- Has price volatility existed in the past? What did we do about it? Did any of it work?

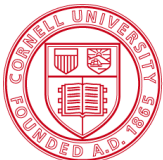


More Than One Kind Of Pattern

- Milk prices have several different patterns
 - ✓ Trend in annual averages
 - ✓ Seasonality in monthly prices
 - ✓ Cyclical behavior in annual or monthly prices

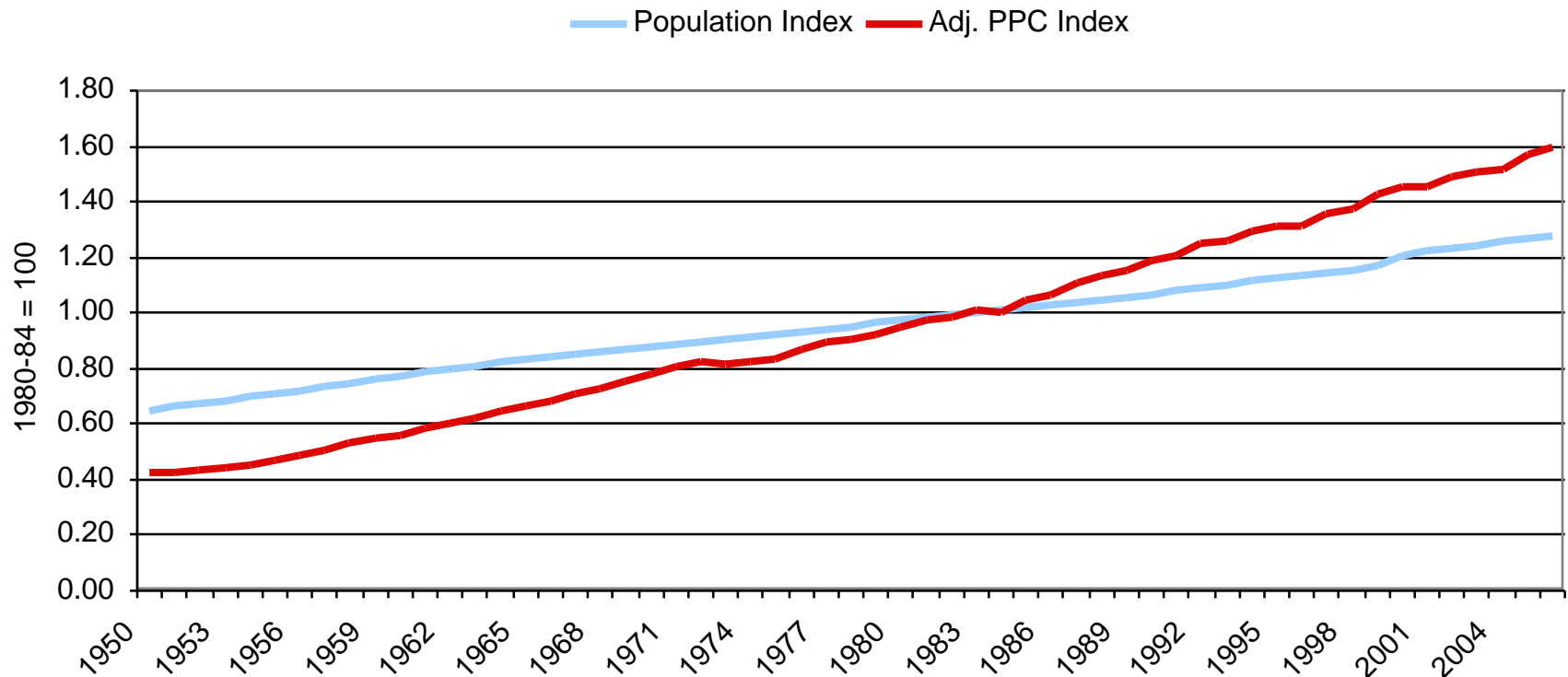
Causes of patterns are understood to varying degrees

- ✓ Price trend responds to long term trends in production and consumption
- ✓ Seasonal patterns reflect in large part the seasonal differences in milk production vs milk needs
- ✓ Cyclical behavior is new
 - Complicates the seasonal pattern
 - Has causes that are not well known or understood

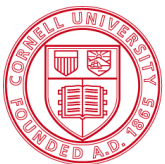


Trend – Basic Drivers of Supply and Demand are very stable

Comparison of US Population vs Milk Production Per Cow Trends,
Index 1982-84 = 100



Long term, slightly downward trend in real milk price
determined by milk supply pushed by linear trend in yield and
dairy demand driven by linear trend in population

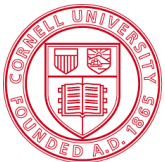
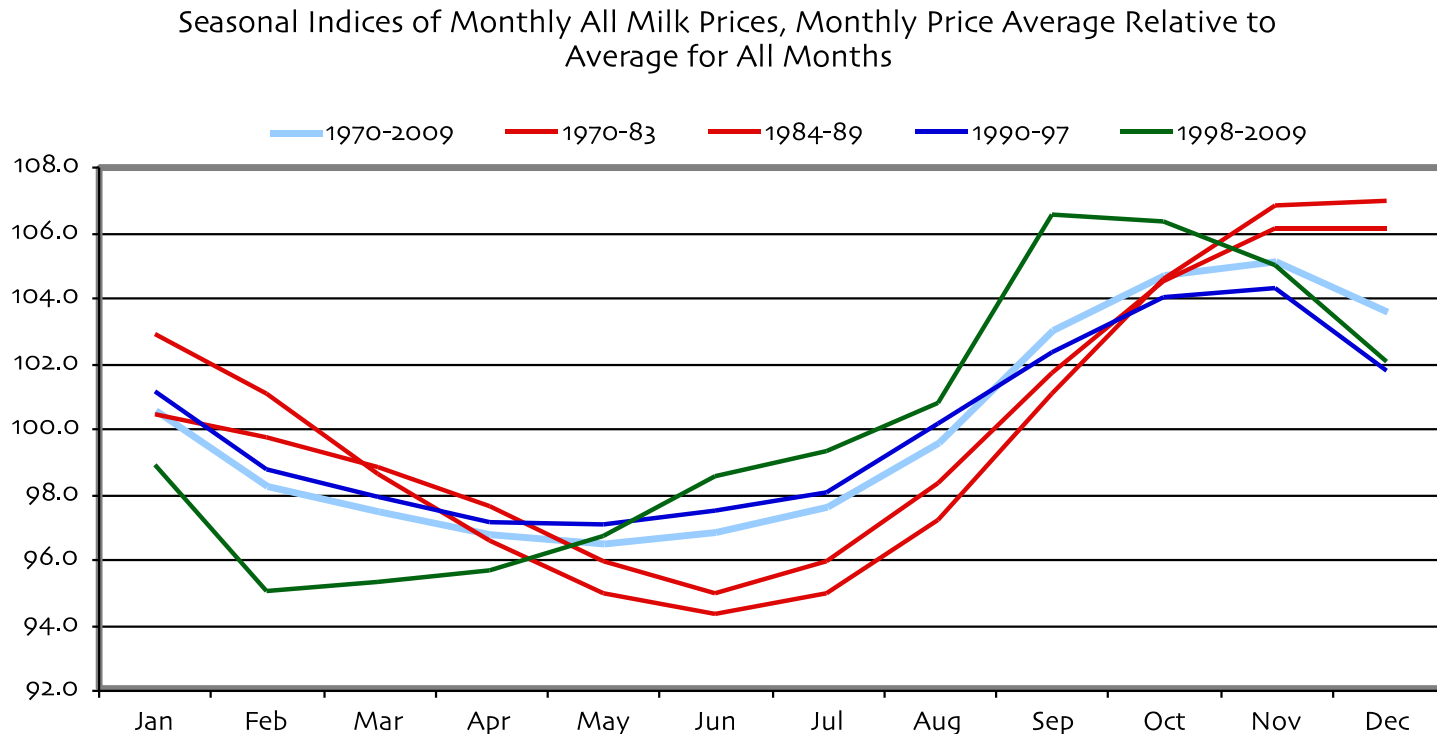


Cornell University

Charles H. Dyson School of Applied Economics and Management

Seasonality – Similar to times past but overwhelmed by cycles

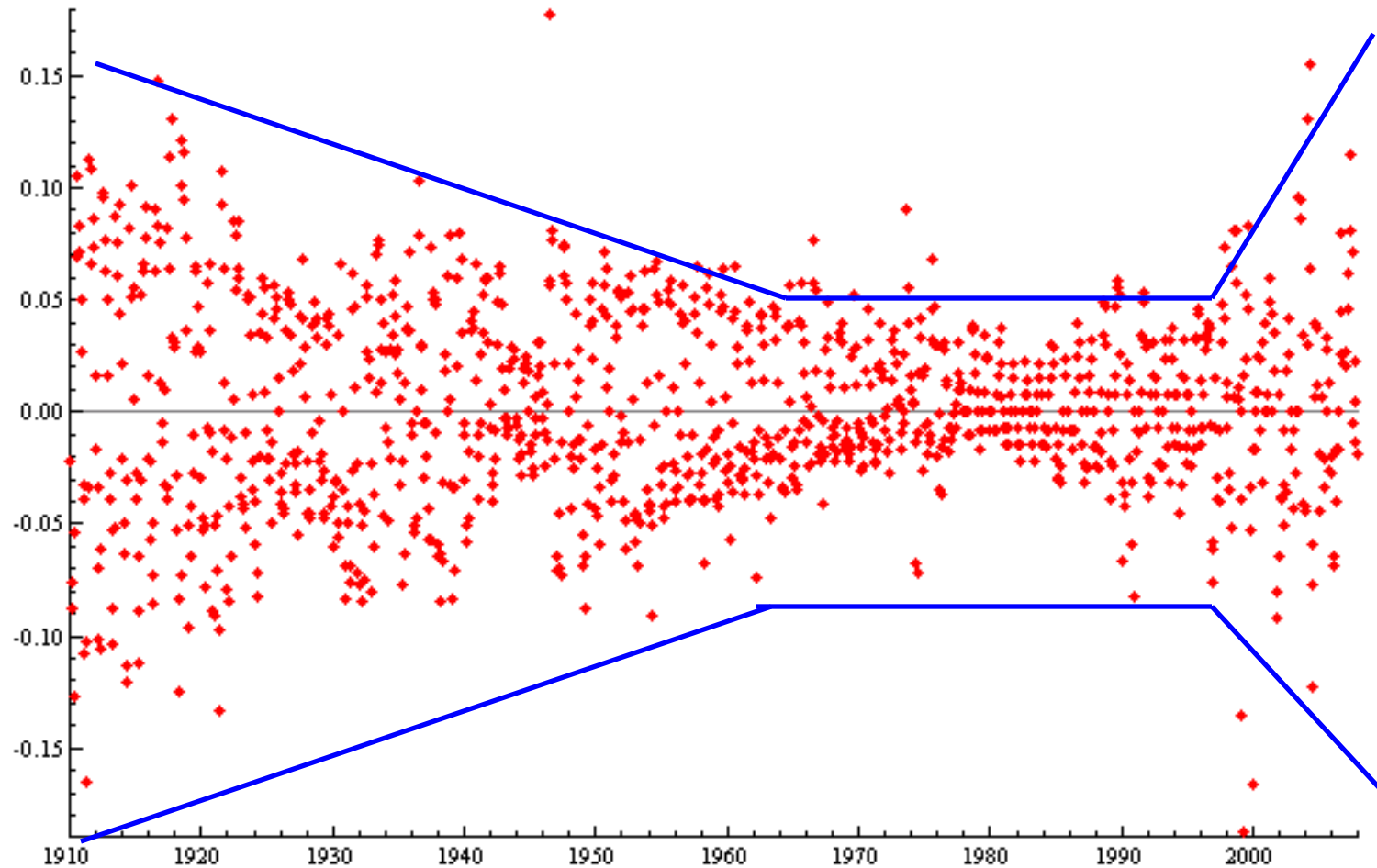
- Seasonality is less obvious but remains a distinct element of US price patterns
 - Farm milk prices have a distinct seasonal pattern, with lows in the early spring and highs in the fall.
 - The seasonal nadir and zenith of milk prices has shifted as milk production has moved to the Southwest
 - New cycles obscure seasonal component



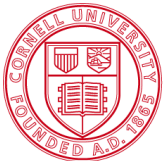
Cornell University

Charles H. Dyson School of Applied Economics and Management

Relative Monthly Milk Price Variability since 1910, percent change from one month to the next



Current variability is of similar magnitude to early 20th century – but less predictable?

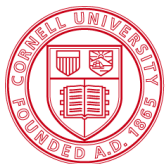


Cornell University

Charles H. Dyson School of Applied Economics and Management

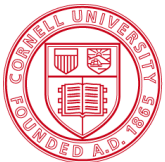
Key Results of Dynamic Analysis

- Dominant components vary
 - Seasonal component dominates 1948-67
 - Longer cycles dominate 1988-2007
- Several Cycles in 1988-2007
 - Triennial, 36-month cycle - large and exploding
 - Biennial, 26-month cycle - quite large and exploding?
 - Annual, 12-month cycle - smaller, erratic
 - 9-month cycle - small and stable
- Variation much larger 1988-2007



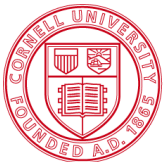
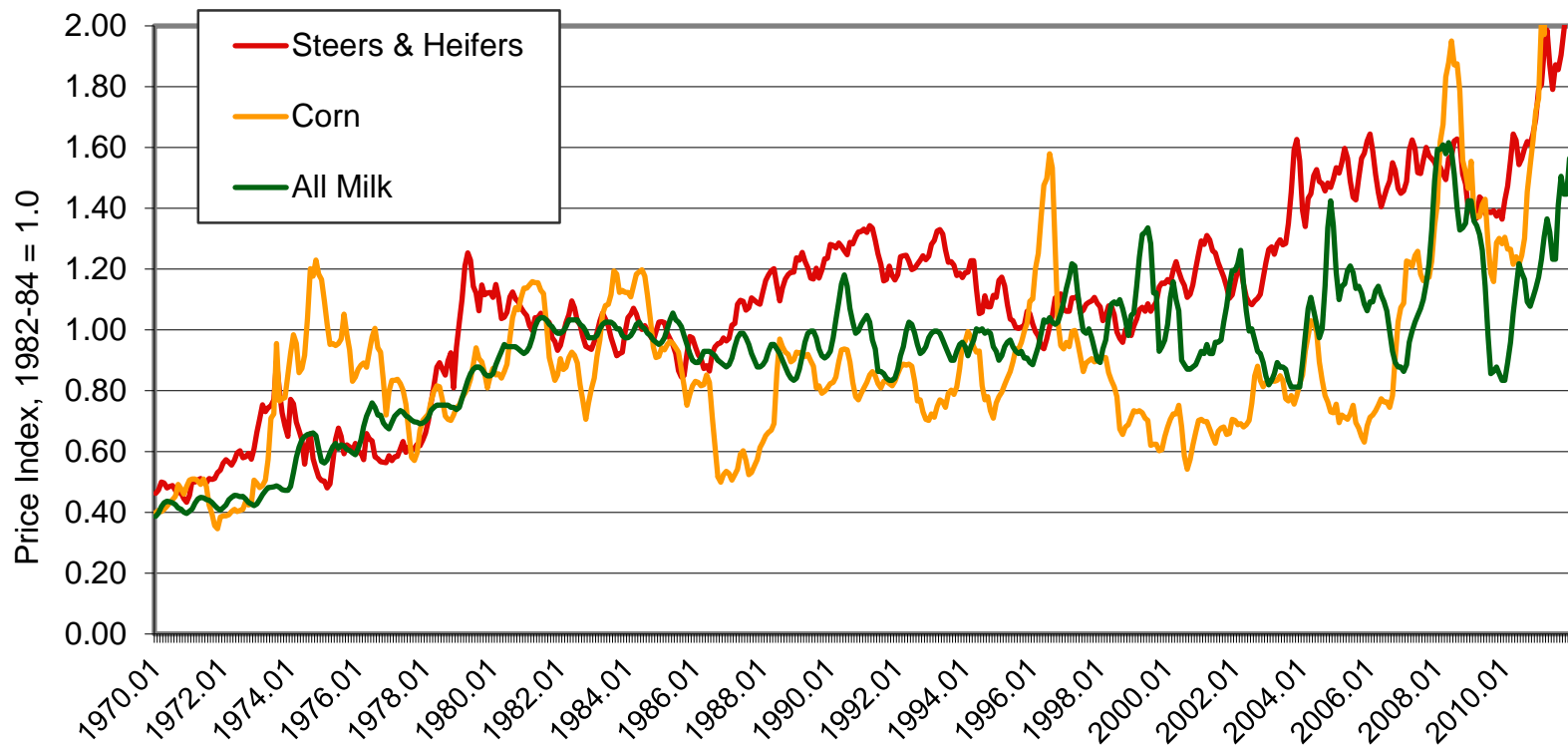
Cycles – A relatively new but powerful phenomenon

- Longer-period cycles have become defining feature in last 20 years
 - Question: Why?
 - Beef sector has cycle related to price-induced expansion and contraction in capital assets, is that the explanation for dairy?
 - What role does dairy demand play?
 - Has expanding role of world trade increased volatility? (contrary to economic theory?)
 - Increased volatility is consistent with results from other dynamic economic modeling work at Cornell that incorporates elements of market behavior and psychology (can we learn our way out of this?)
- Farm Milk prices are now among the most volatile in US agriculture (but the causes are different from crops)



Can We Compare Price Changes Across Agricultural Commodities?

National Average Monthly Prices Received by Farms for Corn, Beef, and Milk



Cornell University

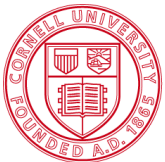
Charles H. Dyson School of Applied Economics and Management

What Are the Challenges and Issues with Respect to Price Volatility? (some working definitions)

Three Very Different Characteristics of Price

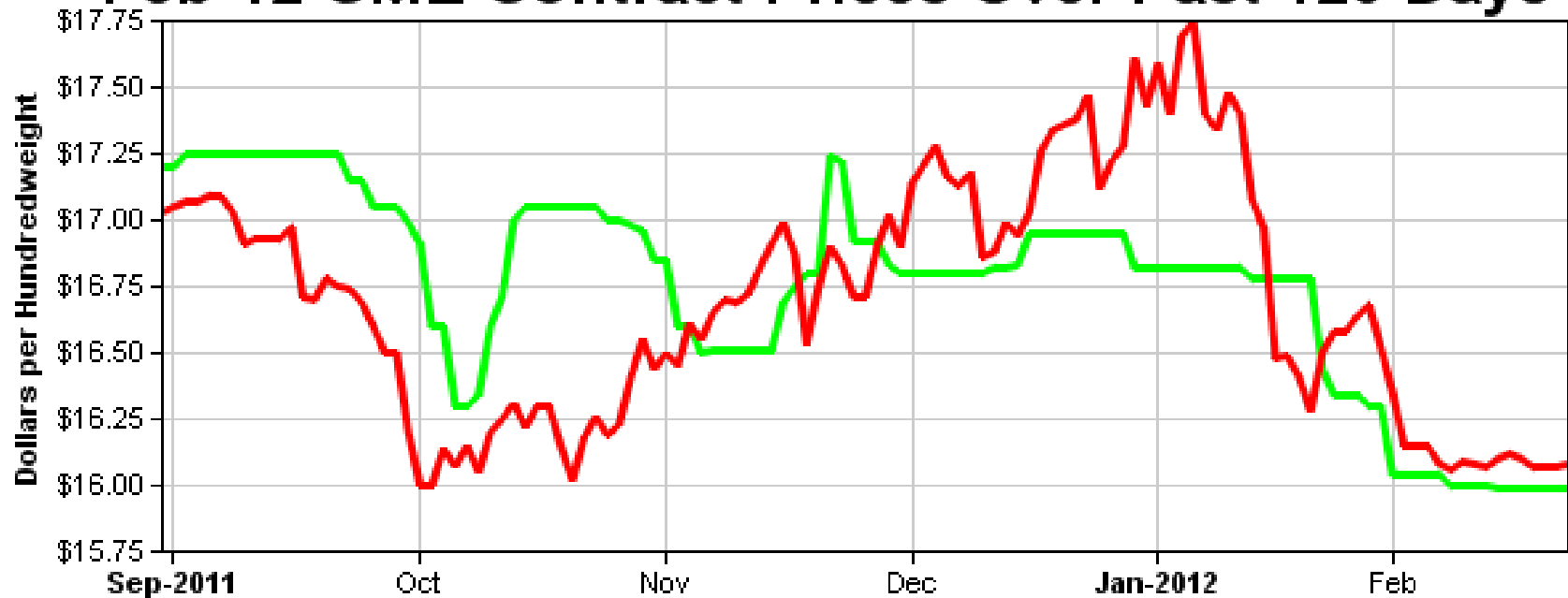
- Uncertainty/Certainty (or predictability) - good, bad or otherwise, to what degree can I predict what the price will be?
- Instability/Stability - good, bad or otherwise, prices do/don't change much from one month or period to the next
 - o Perfectly stable implies certainty, but certainty does not imply stability
- Inadequacy/Adequacy - stable or not, are prices enough to cover my costs and yield a profit or positive cash flow?

If the foregoing was about instability, what can we say about uncertainty and adequacy?



How About Uncertainty?

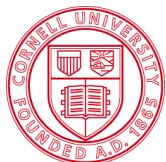
Feb-12 CME Contract Prices Over Past 120 Days



Updated 2/23/12

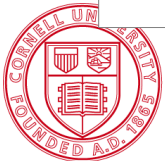
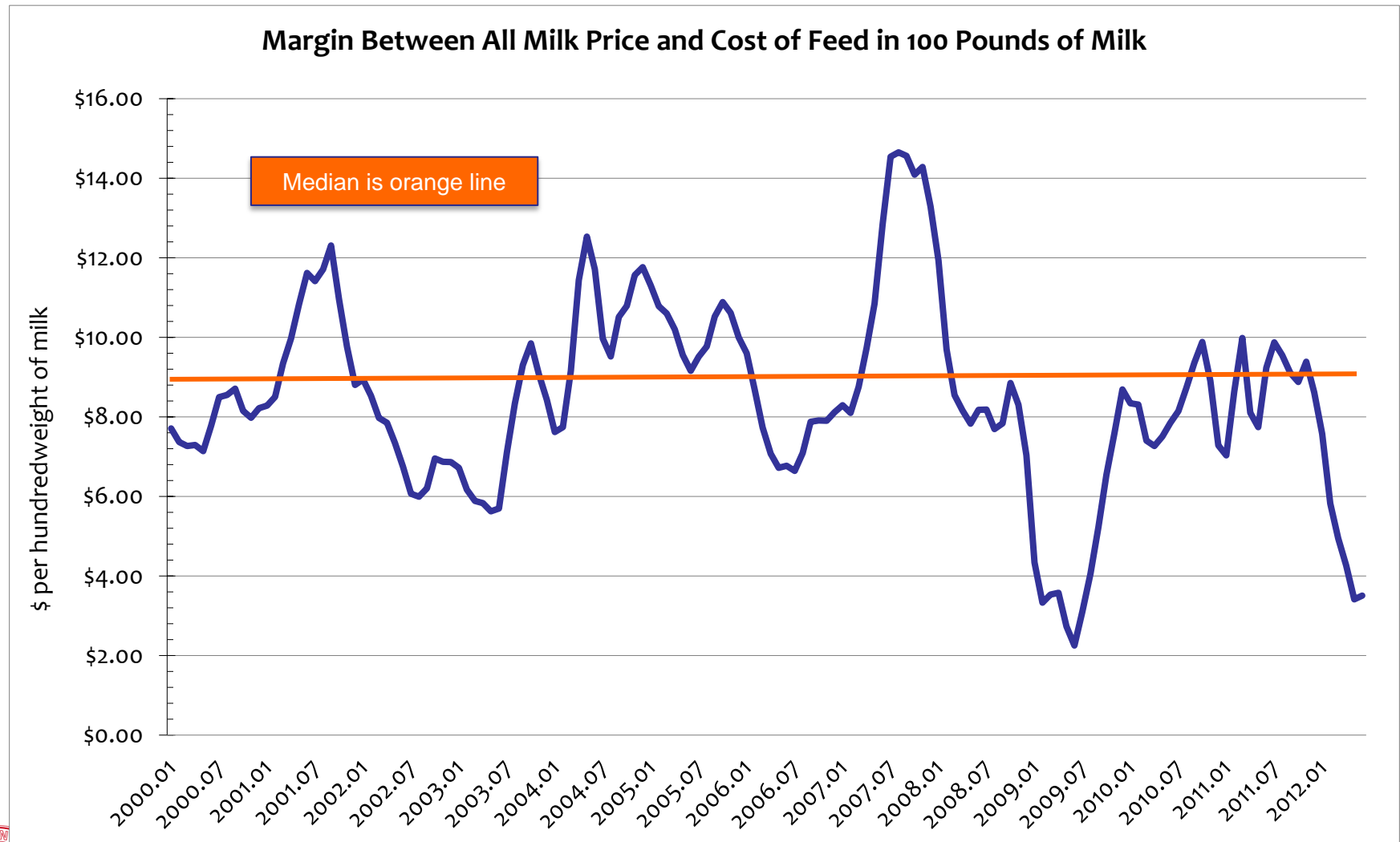
■ Class III Futures
■ Class IV Futures

\$1.50 (10%) Price Swing, twice, in 5 months



Cornell University
Charles H. Dyson School of Applied Economics and Management

How About Adequacy?

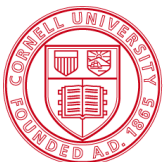


Cornell University

Charles H. Dyson School of Applied Economics and Management

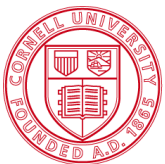
Some Bottom Lines...

- Milk Price volatility isn't really new, but
 - It was more predictable before (and then DPSP began to smooth prices out)
 - Cash flow was likely still a challenge, but with most farms grew their own feed, the problem was different than today. (role of cash reserves?)
- Volatility in Margin or Net Income or Profitability is the challenge today, because:
 - Milk prices are volatile but so are
 - Prices of inputs, especially, but not only, feeds
- This isn't likely to change soon
 - Economic instability in the world
 - Political instability in parts of the world
 - Climate issues (whether they are short term or long term)



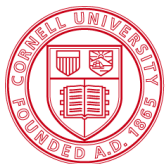
Outline

1. A quick overview of the structure of the US dairy sector and milk pricing – with contrasts to Europe
2. Milk price volatility – patterns and issues
3. Dairy risk management options – what we have, what we use, what we think we want



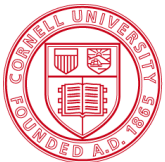
Risk Management Characteristics and Alternatives

- What risk?
 - Production or yield: important for crops but not for milk?
 - Price: outputs and/or inputs
 - Revenue: gross, net (what kind of net)
- Who provides protection?: Government or Private?
- Type of protection?: Subsidy, Hedge or Insurance
 - Subsidy: Government supports price or supports income
 - Hedge: Buyer and seller agree to a future price
 - Option: Buyer or seller pay a price allowing them to invoke a hedge at a later date if they choose
 - Insurance: Buyer or seller pays premium to indemnify a given loss at a future time



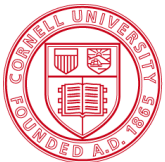
Summary of Industry Opinions (small sample of cooperative and private processors)

- Volatility is an important issue
 - Not as big an issue as adequacy (but somewhat inseparable)
 - Has become a bigger problem over time and is substantial or unbearable for many
 - Complicates planning and management decisions, adds risk, results in negative returns periodically
- The policy response to volatility?
 - Majority of buyers say firms should manage their own risk
 - 43% (coops) say a policy response is appropriate



What can/could be done?

- Existing Policy or Public Tools -
 - Federal Milk Marketing Orders
 - Dairy Price Supports
 - Milk Income Loss Contracts
 - Something old? (Dairy Termination Program, Marketing Agreements)
 - Something new?
 - Growth Management (DMSP)
 - Margin (Returns to Milk over Feed Prices) “Insurance” (DPMPP)
 - Farm Savings Accounts
- Private or Collective/Cooperative Tools -
 - Quasi-Private: RMA Insurance (LGM-D)
 - Collective:
 - Contracting (price or, price and quantity, forward contracts)
 - CWT – “growth management” via supply and/or demand
 - Private: Hedging (outputs, inputs, options, etc)



Dairy Producer Margin Protection Plan

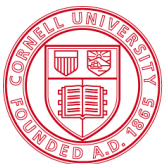
<http://www.futurefordairy.com/program-details/dairy-producer-margin-protection-program.html>

Switches focus of dairy farm risk support to

- Margin between milk price and cost of major dairy feeds (not the price of milk alone) – unlike old MILC and different from new MILC
- An insurance type of payment that is based on fixed margin levels, unlike futures-based LGM-Dairy

Requires some producer payment responsibility

- Minimal, catastrophic level is free
- Opportunity to buy higher levels at increasing premium



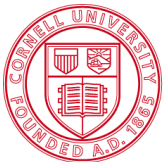
Dairy Margin Stabilization Plan

<http://www.futurefordairy.com/program-details/dairy-market-stabilization-program.html>

Concept: when margins are low, try to restrict the supply of milk to cause milk price to rise. When margin recovers, suspend restrictions.

Is it “supply management”

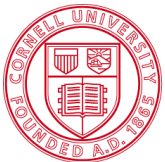
- How often?
- How serious?
- Who has to restrict marketings?
- Cutback relative to what – current? historical? What if you don't have a history?
- Voluntary? How voluntary?



Current Risk Management Tools for Dairy Farmers

- Cash reserves – not generally used
- Operating loans – used extensively in periods of low margins, provided by private lenders, government programs or combination
- Hedging with futures markets on price of corn or other feeds and/or price of (Class III) milk – more common with inputs than milk
- Options (puts) with futures markets, typically on price of milk – considered too expensive by most farmers
- LGM-Dairy, government-based margin insurance combining price of milk and prices of corn and soybeans – quite flexible but too complex? Too expensive or too subsidized?
- Forward Contracting with a buyer (usually the cooperative) where the buyers protects price risk with futures – more popular but still a minority of sales
- Over-the-Counter “Swaps” – a customized hedging tool for more complex price risk – too complex for most industry members.

Interesting potential comparisons between LGM-D and DPMPP

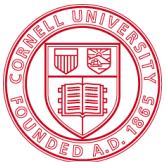


Cornell University

Charles H. Dyson School of Applied Economics and Management

Basic Private Price Risk Management Tools

- **Hedging:** To establish a fixed base milk price.
- **Put Options:** To create opportunity to establish a floor base milk price.
- **Cash Forward Contract:** To establish a fixed base milk price, or floor base milk price for one or more months.
- **Forward Contract - an alternative:** establish 1) the price, 2) the quantity, and 3) a duration
- **Livestock Gross Margin for Dairy** (LGM-Dairy) - an insurance type tool that is based on hedging both milk and feed.



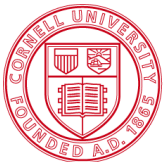
Hedging As A Risk Management Tool

Advantages

- Achieves a “specific” price or profit objective
- Can get out if market changes, or use an advanced strategy
- Not tied to a milk buyer

Disadvantages:

- Contract specifications don't quite match my products, situation or price
- Margin account and margin calls
- Forego opportunity for rising milk prices.



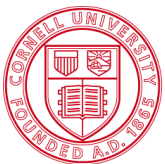
Put options as a risk management tool:

Advantages

- Protects against a price decline and leaves open the opportunity for higher prices.
- No margin money or margin calls.

Disadvantages:

- If prices fall, net mailbox price usually lower than if hedged because of an out-of-the-money PUT plus premium paid.
- Similar issues with product and price in contract matching my situation



LGM-Dairy: An Overview

Unlike traditional dairy price risk management system LGM-Dairy establishes a floor on *Gross Margins*

- *GM* \equiv Imputed Milk Revenue – Imputed Feed Costs
- Manages risk from both milk price and feed costs

Class III, corn, and SBM futures settlement prices determine expected prices at insurance sign-up and actual prices when contract matures

- Prices received/paid by producer not used
- No actual futures/options market activity

11-mo. insurance period (*up to* 10 covered mo.)

LGM-Dairy: Summary

LGM-Dairy is a flexible insurance program

- Need not insure all months or all monthly production
- May make sense to overlap contracts for same month

Covers Margin, not milk price

- Analogous to simultaneous use of Class III puts and corn/SMB call options
- Premiums compared to option costs are reasonable
- Premiums are very sensitive to deductible

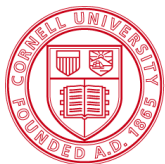
LGM-Dairy drawbacks

- Short sign-up window at the end of each month
- Expensive
- Too complicated

Cash Forward Contracting:

Milk plants have recently offered producers two types of cash forward contracts:

1. **Fixed base contract:** This is a Class III base contract. The producer receives all other premiums and discounts as before. This is similar to a producer hedge.
2. **Floor base contract:** This establishes a floor on the Class III price. The producer receives all of the premiums and discounts as before. This is similar to a producer PUT option.



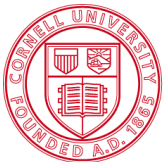
Cash Forward Contracting As A Risk Management Tool:

Advantages

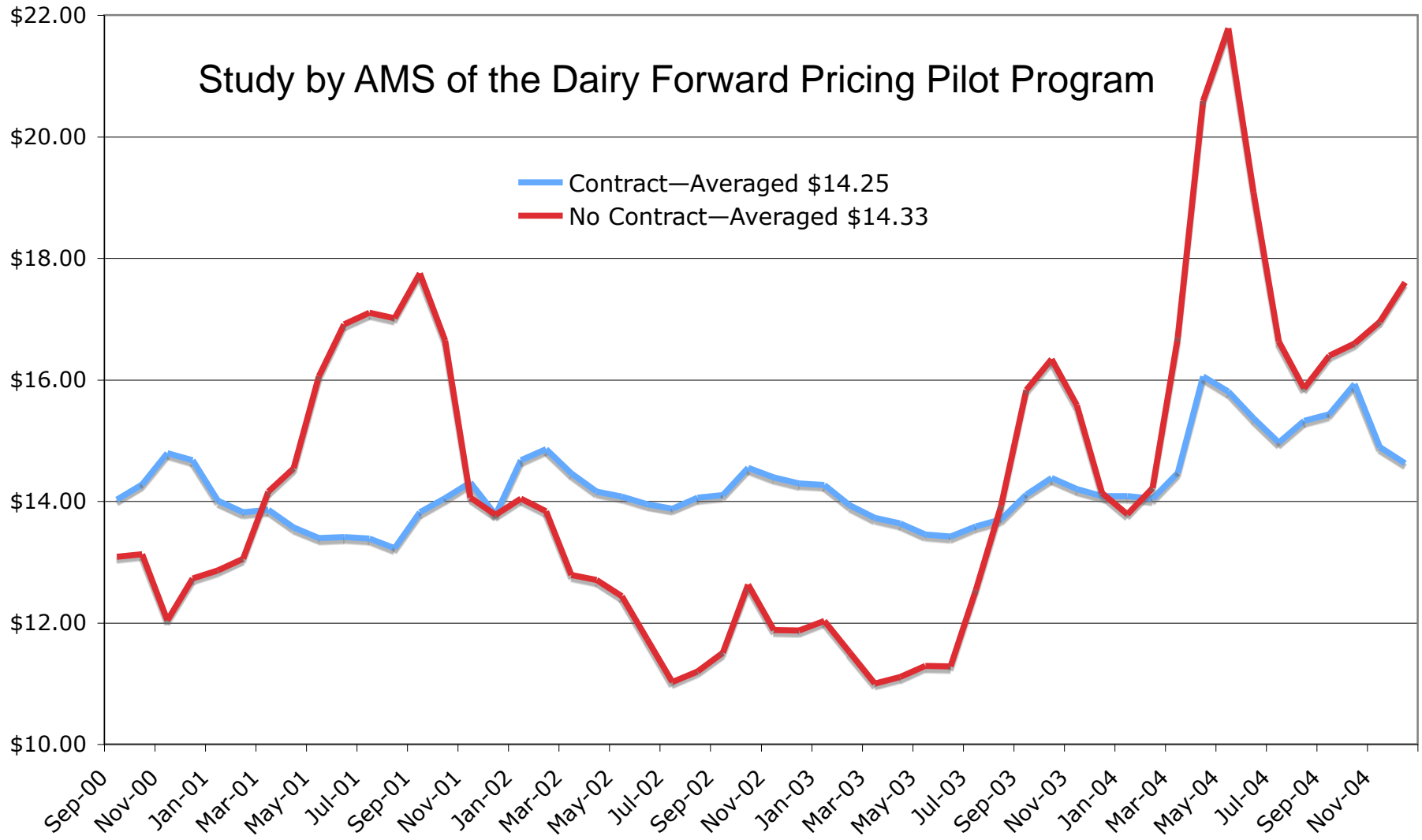
- Flexible in terms of quantities of milk protected
- Can protect a specific milk price or profit objectives; or a floor mailbox price.
- Simple to use—no broker account or margin money

Disadvantages

- Locked into a milk buyer
- With fixed price contract, can't get out if market changes
- Forgo opportunity for higher prices with fixed price contract.



Does Contracting Work? (Define “work”!)



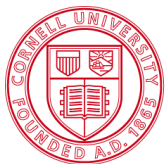
Cornell University

Charles H. Dyson School of Applied Economics and Management

What About a Contract That Goes Farther?

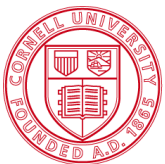
- Fix a price, with or without triggers or flex
 - Forward contracts for milk are currently framed to determine future price only
- Fix a quantity
 - Minimum guarantee, maximum allowed
 - It is common in many parts of agriculture (e.g., fruits and vegetables) for growers to contract on both price and amount (sometimes tonnage or other measures of volume, sometimes on acreage)
- Fix a duration
 - Farmers want longer, buyers want shorter
 - 6-12 months?
- Tying to both quantity and price allows much more discipline and coherence in managing supply to meet expected demand.

(n.b. Could be linked to government involvement)



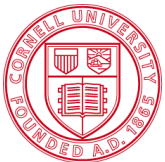
Farm Savings Accounts – To Create Incentives for Cash Reserves

- Eligibility: requires some rule for who qualifies as a farm business and under what income/net revenue conditions deposits can be made into the FSA
- Deposits: define a rule for the maximum deposit by a farmer, general a percentage of net revenue
- Incentive: may include a federal income tax deferral on deposits and/or a matching payment by the US government. Match may be an amount or a percentage, it may be fixed or variable. Variable incentive could be a higher percentage that declines or caps out with higher farm contributions or it could increase as need increases (e.g., Canadian disaster assistance concept)
- Withdrawal rules:
 - At discretion of farmer



Most Significant Need

- Dairy Farmers should have a Marketing Plan!
 - Firms should have a roadmap for action, what I will do if/when
 - Think through a course of action when you have time to think rationally and thoughtfully
- A Marketing Plan is part of and consistent with an overall business plan



Issues of and Solutions to Milk Price Volatility in the United States

Andrew M. Novakovic, PhD

The E.V. Baker Professor of Agricultural Economics

Cornell University

Ithaca, New York, USA

