

# Analysis of Options to Reduce Dairy Price Volatility

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## Work on Volatility

- Various Dynamic Models
  - Behavior based
  - All have major dairy programs and common components but different focus
    - One with great level of farm detail
    - One with great level of product specificity and world trade detail
- These behavioral models showed price volatility

## Work on Volatility

- Studied milk price cycles using Spectral Decomposition
  - Showed 4 cycles
    - 9 month
    - 12 month
    - 26 month
    - 36 month—this cycle is becoming dominant
- Our behavioral dynamic models also project a 36 month cycle

## Refundable Assessment Plan

- In 2007, Milk Producers Council asked us to look at a refundable assessment plan for dairy producers to help moderate milk production response.
- We used the dynamic model with a high level of farm detail.
- Found plan concepts could work.

## Voluntary Herd Retirement and Export Subsidy Plan

- In 2007, Dairy Farmers Working Together asked us to look at a plan that used the principles of CWT but was funded with a mandatory assessment.
- We used the dynamic model with a high level of world trade detail.
- Found plan concepts could work if cautiously applied (potential to make volatility worse).

## Growth Management Plan

- In 2009, Milk Producers Council came back with a modification of their earlier plan and asked us to look at feasibility.
- Again used farm detail model.
- Again found it could work to moderate milk price volatility.

## Proof of Concept

- We have always maintained that these results should be viewed as “proof of concept”.
- Modifying “off-the-shelf” models is a good start and saves time.
- More work should be done before decisions are made to implement policies.

## Model Merge

- Valid criticism of proof of concept work
  - Need more realistic farm size categories
  - Need adequate product detail
  - Need to incorporate trade impacts with farm detail
  - Need more recent dairy data
    - Assess impacts of major price shocks

## Model Basics

- “System Dynamics” modeling approach
  - Stock-Flow-Feedback structure
  - System of differential equations
  - Model decision point behaviors
- Monthly model, time horizon 2009-2018
  - Implement programs in 2012
- National-level (aggregated US) model
  - No regional impacts directly assessed

## Dairy Products in Model

- |                         |                        |
|-------------------------|------------------------|
| ■ Fluid milk (I)        | ■ Dry whey (III)       |
| ■ Yogurt (II)           | ■ WPC34/35             |
| ■ Frozen desserts (II)  | ■ WPC80+               |
| ■ Cottage cheese (II)   | ■ Other Whey (lactose) |
| ■ American cheese (III) | ■ Butter (IV)          |
| ■ Other cheese (III)    | ■ NDM (IV)             |
| ■ Fluid whey            | ■ Condensed skim       |
| ■ Separated whey        | ■ Other ECD            |
| ■ Whey cream            | ■ Casein/MPC (limited) |

## Policy Structure

- Federal Milk Marketing Orders
  - FMMO pricing formulas
  - 10% of cheese milk assumed not pooled
- Dairy Price Support Program included
  - Purchase prices less additional costs
  - Government inventories and buybacks possible
- MILC program with production caps
- Trade policy for “tradable” products
  - TRQ and export subsidies structure included

## Trade Structure

- Tradable Products (categories)
  - Cheeses, whey products, NDM, Butter, “Other ECD”, Yogurt, Ice Cream
  - Basically, all except fluid and cottage cheese
- Bi-directional flows allowed
  - This is the reality, based on data definitions
  - Allows one to look at “net exports” (imports)
  - Use annual data as base (2009, previous)
- Ad valorem and unit tariffs, TRQ and over-quota in separate categories

## Trade Structure

- Trade responds to relative changes in US and world prices
  - Increased US price decreases exports, increases imports
- Not a complete modeling of other countries
  - Modeled as “Rest of World”
- Will use scenario analysis to assess different world market conditions

## Components Balance

- Model explicitly balances components
  - For a given average raw milk composition, can determine product compositions and yields
  - Allocation of skim and cream is central
- Assume fixed proportions
  - Constant composition of milk and products
  - Constant use of intermediate inputs
  - Needed to simplify the model structure

## Intermediate Inputs

| Input   | Yogurt | Frozen | Am Cheese | Other Cheese |
|---------|--------|--------|-----------|--------------|
| NDM     |        | X      | X         | X            |
| CS      | X      | X      | X         | X            |
| DW      | X      | X      |           |              |
| WPC34   | X      | X      |           |              |
| WPC80+  | X      | X      |           |              |
| OtherWP | X      | X      |           |              |
| OthECD  |        | X      |           |              |

## Enterprise Accounting

- Margins are assumed for an “enterprise”, not a class or corporate entity
  - Fluid milk margins separate from ice cream margins, even if many companies make both
- Most important in cheese: margins for cheese separate from whey products
  - Could be combined or weighted
- FMMO obligations also calculated this way
  - Based on component usage (butterfat, skim)

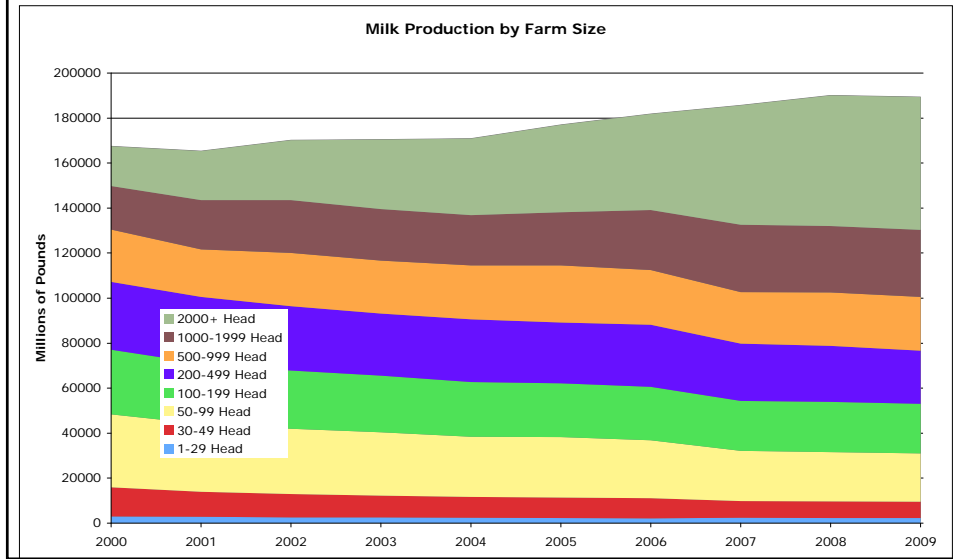
## Milk Allocation & Premiums

- Butter and NDM are assumed to be residual users of cream and skim milk
  - All other users get what they need to meet current demands
  - All remaining must be processed into butter and NDM
- Over-order premiums depend on balance of raw milk supply and demand
  - Base level \$0.31/cwt for 2004
  - Decrease if milk supplies loosen up

## Farm Accounting

- 4 farm size categories
- Farm numbers
- Exits & expansions
- Capital & debt tracking
- Cows and milk per cow
- Variable costs
- Net Farm Operating Income

# Farm Sizes



# 2009 Herd Size Profile

| Herd Size     | Number of Herds | Average herd size | Milk per Cow | Total Milk Production | Percent of Total Milk |
|---------------|-----------------|-------------------|--------------|-----------------------|-----------------------|
| 1-99 COWS     | 49,200          | 37                | 17,129       | 31,048                | 16.40%                |
| 100-499 COWS  | 12,450          | 183               | 20,076       | 45,626                | 24.10%                |
| 500-1999 COWS | 2,610           | 910               | 22,570       | 53,578                | 28.30%                |
| 2000> COWS    | 740             | 3705              | 21,543       | 59,068                | 31.20%                |

## Producer Decisions

- Production decisions are made based on Net Farm Operating Income
- Economies of scale are achieved at larger herd sizes
- Milk per cow can be increased in short-run
- Total cows can be increased in long-run
- Culling rates can be changed immediately
- Aside: can change % heifers born

## Example of Market Effects

Whey protein product promotion and farm milk prices

Promotional  
Activities

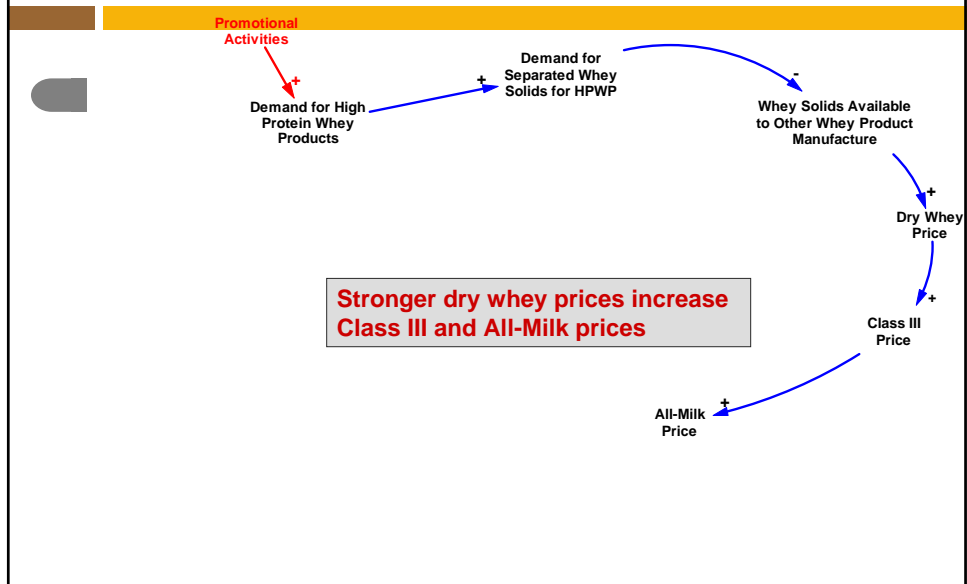
Demand for High  
Protein Whey  
Products

Promotion increases the  
demand for whey products

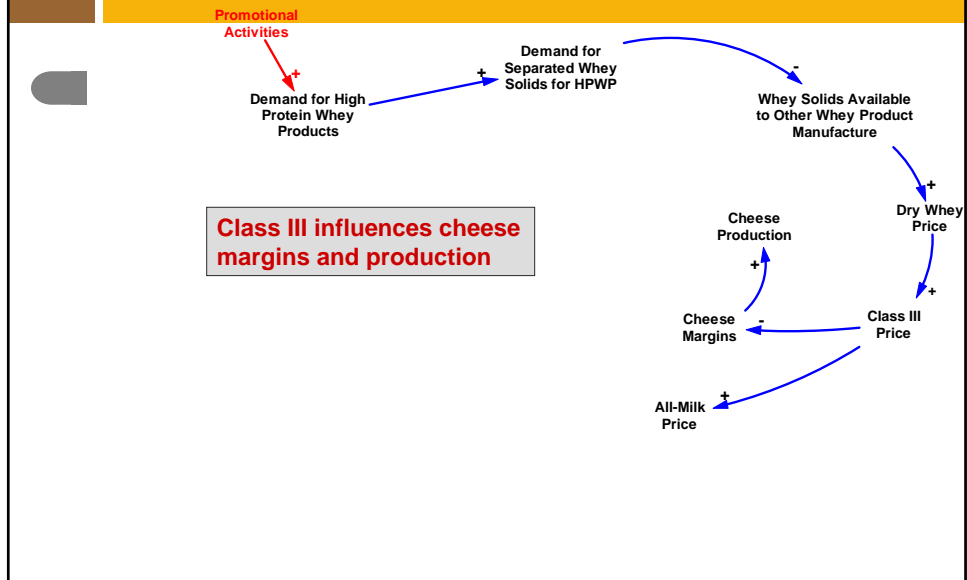
# Example of Market Effects



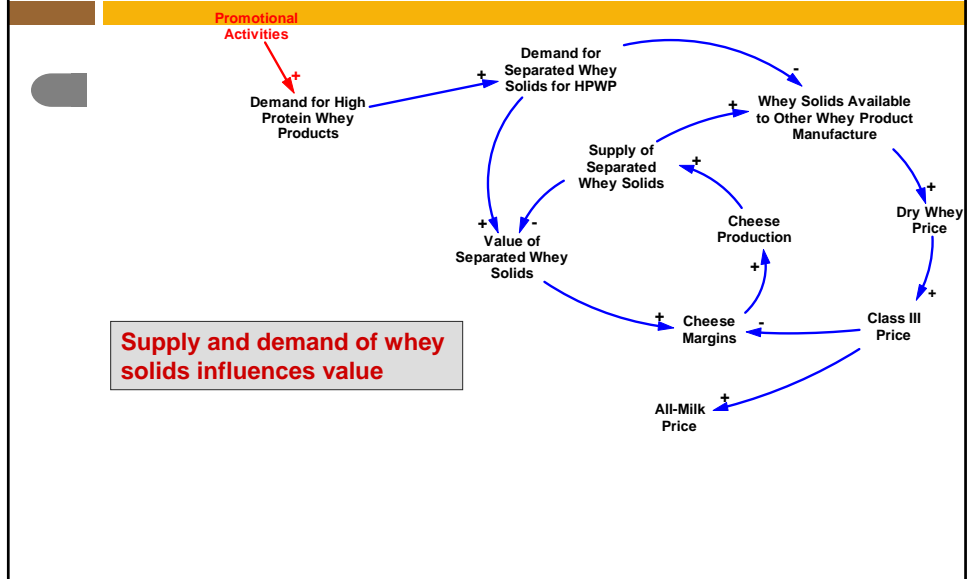
# Example of Market Effects



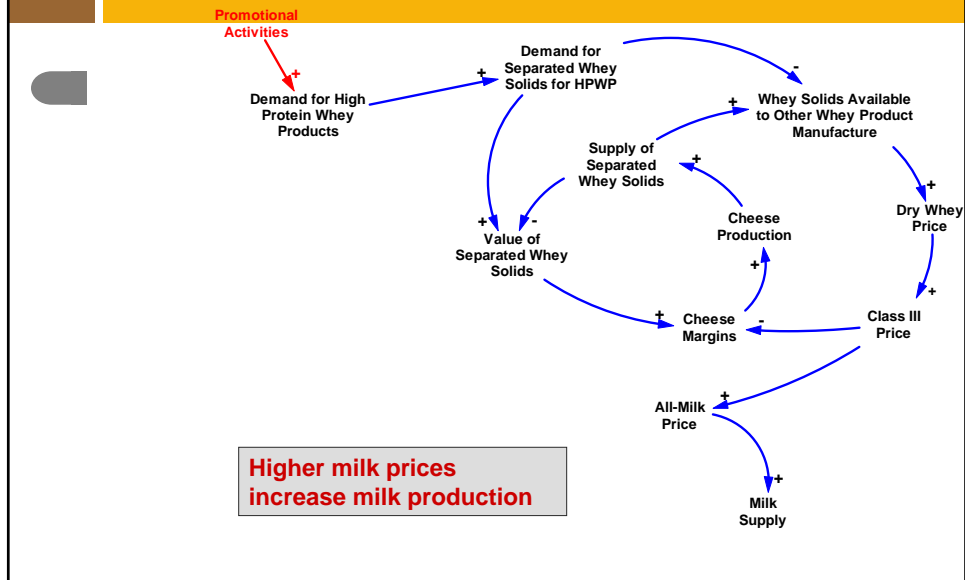
# Example of Market Effects



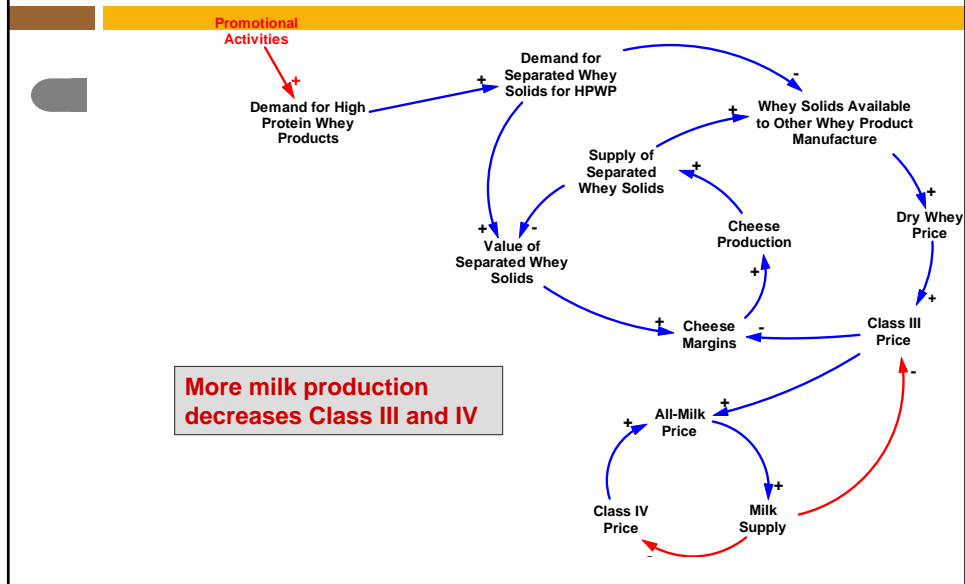
# Example of Market Effects



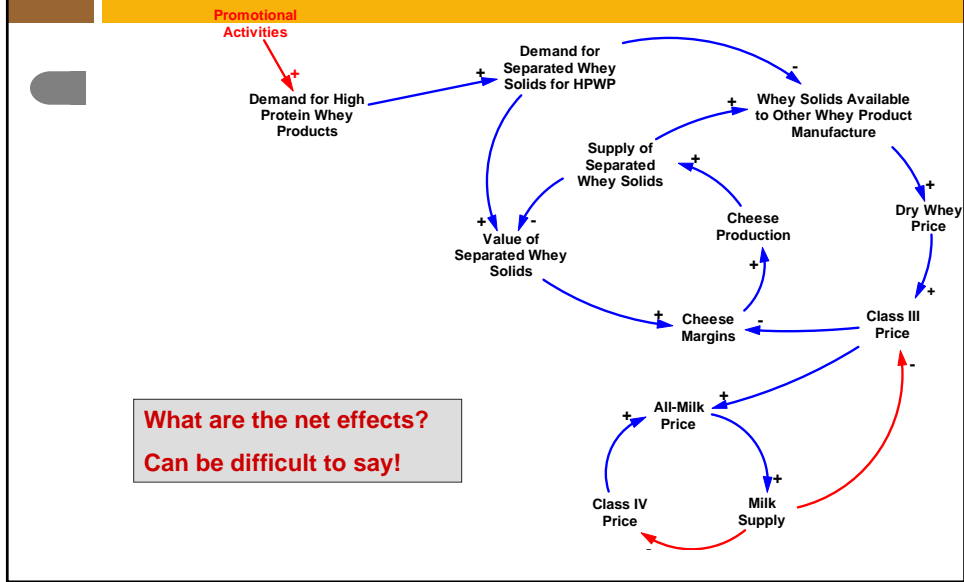
# Example of Market Effects



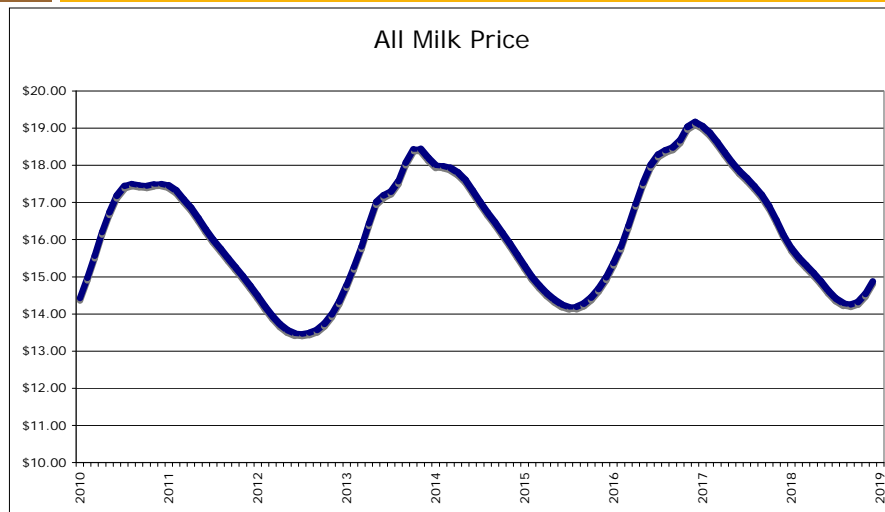
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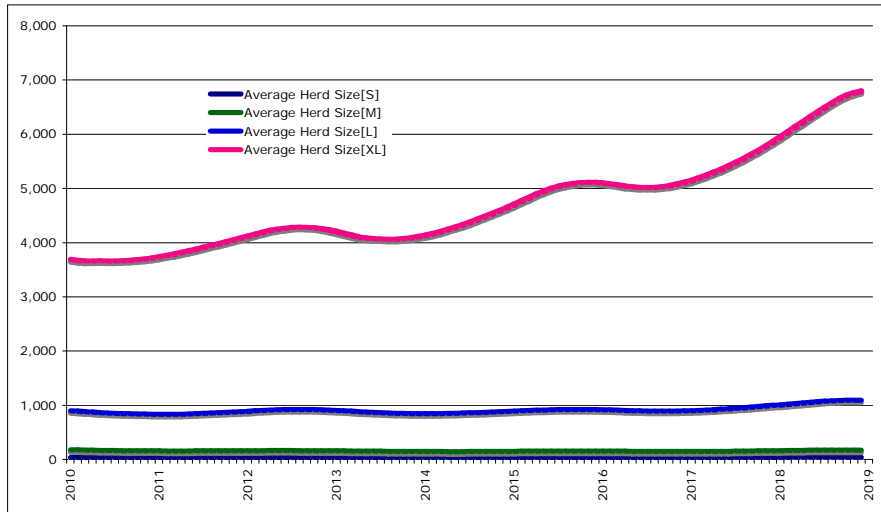
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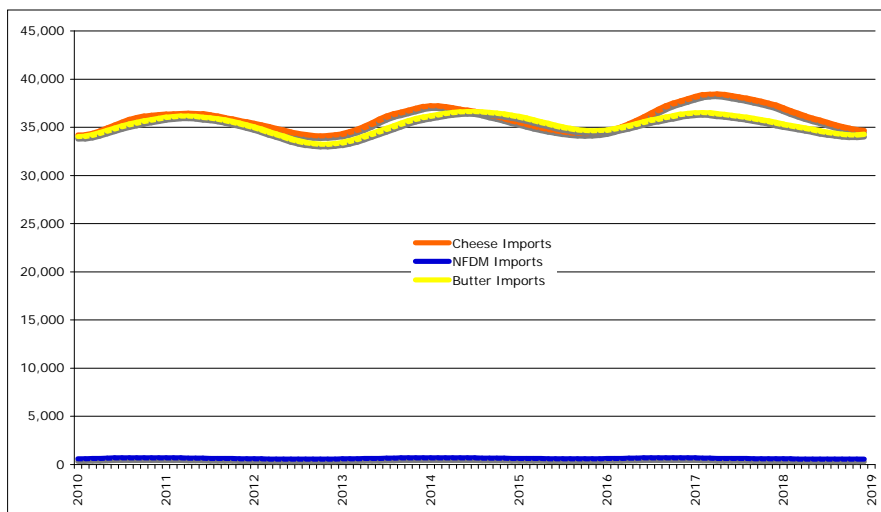
# Baseline—All Milk Price



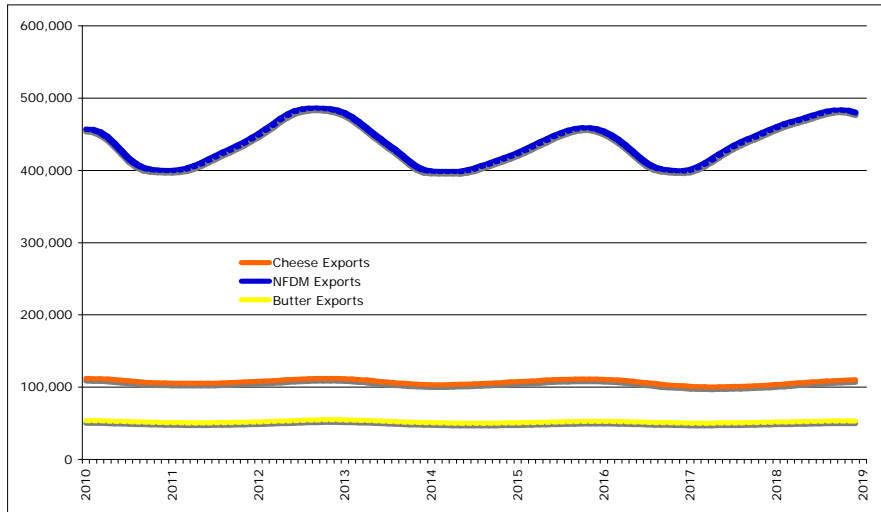
## Baseline—Average Herd Size



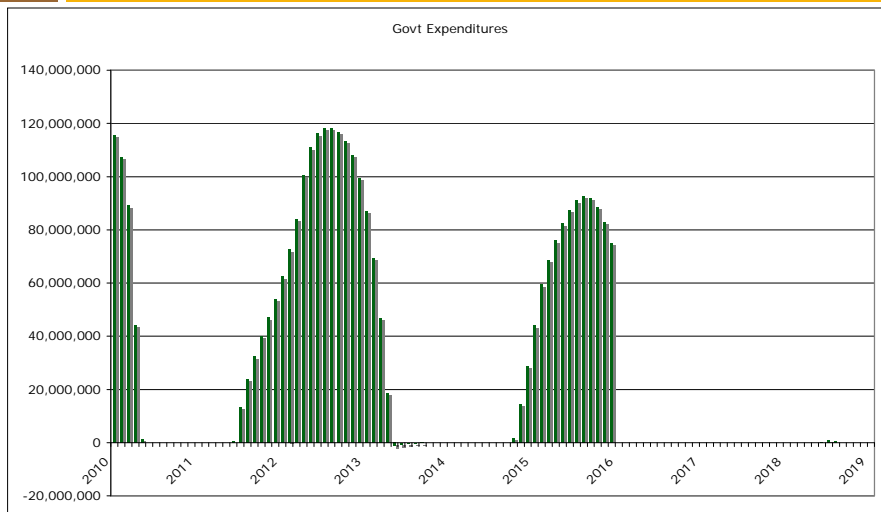
## Baseline—Imports



## Baseline—Exports



## Baseline—Government Expenditures



## What Programs are We Looking At

- Dairy Growth Management Initiative
  - Coalition of cooperatives
- Dairy Price Stabilization Plan
  - Holstein Association USA, Inc.
- Foundation for the Future
  - National Milk Producers Association
- Marginal Milk Pricing
  - Agri•Mark
- Costa Bill (Growth Management Plan)
- Sanders Bill

## DGMI Key Features

- National Milk Marketing Board with broad authority
- 12¢ per cwt. assessment on all milk
  - Suspended if fund reaches \$400 million
- Herd reduction
- Export assistance
- Commodity incentives (casein, etc.)
- Enhance risk management tools
- Manage inventories

## DGMI Key Features, cont.

- Board can impose lower milk price on marginal increases in producer's milk production.
- Milk production history based on average daily production from previous year.
- Pre-determined trigger based on milk and feed prices.
- Continues only with producer referendum.

## DPSP Key Features

- Initial base of milk production
  - Average of 2007, 2008, 2009 marketings
- Base then becomes year earlier production and rolls forward
- Base transferable only under special circumstances
- Administered by US Secretary of Ag.

## DPSP Key Features Cont.

- Market Access Fee on milk produced above base
  - Could be range from \$0 to several dollars
  - Once set is in place for year
  - Collected fees are pooled and returned to producers who haven't increased production.
- 2¢ per cwt. collected on all milk for program administration.

## Foundation for the Future (FFTF)

- Four part program
  - Revise existing safety net programs
  - New margin protection program
  - Reform FMMO
  - Market stabilization program

## FFTF—Revise Safety Net

- Get rid of Dairy Product Price Support Program
- Get rid of MILC Program

## FFTF—Margin Protection Program

- Margin is All Milk price minus feed costs.
- Feed costs are based on pre-specified ration of shelled corn, corn silage, soybean meal and alfalfa hay
- Feed costs are based on needs of milking cows, sick cows, dry cows and heifers.

## FFTF—Margin Protection Program

- Base program is fully subsidized
- Only 90 percent of production is covered
- Base margin determined by CBO projection (imagine \$4)
- Supplemental insurance available at partially subsidized.

## FFTF—FMMO Reform

- Class III is unregulated. Survey of milk prices paid on all cheese plants processing more than 500,000 lbs of milk per day.
- Class I mover based on advanced Class III.
- Class II is advanced Class III plus 30¢

## FFTF—FMMO Reform

- Class IV is current product price formula with indexed energy prices
- Lowest regional Class III is pool draw base
- Establish transportation pools

## FFTF—Market Stabilization Program

- Same Milk-Feed margin
  - When margin is below \$6 for two consecutive months, paid for 98% of milk
  - When margin is below \$5 for two consecutive months, paid for 97% of milk
  - When margin is below \$4 for two consecutive months, paid for 96% of milk
  - All above plus monetary penalty

## Marginal Milk Price (MMP)

- Base production is daily average for peak 3 month period in previous 12 months.
- Program triggers when class III drops below \$14
- Paid class III price on all milk over 99% of base (or 98%, 97%, etc.)
- Collected monies used for demand-increasing programs

## Costa Bill (aka Dairy Price Stabilization Program)

- Based on Growth Management Plan
- Quarterly rolling base
- Allowable growth triggers
  - Milk-Feed Ratio  $\geq 2.0 = 3\%$
  - Milk-Feed Ratio 1.75-1.99 = 0%
  - Milk-Feed Ratio  $\leq 1.74 = -3\%$

## Costa Bill (aka Dairy Price Stabilization Program)

- Standard Market Access Fee
  - Milk-Feed Ratio  $\geq 3.0$  = \$0.03
  - Milk-Feed Ratio 2.5-2.99 = \$0.13
  - Milk-Feed Ratio 2.0-2.49 = \$0.25
  - Milk-Feed Ratio  $\leq 2.99$  = \$0.50
  - Imposed on all milk production
- Alternative Market Access Fee
  - Equals Standard Fee x 5
  - Imposed on over base production
- Collected fees returned to under base producers

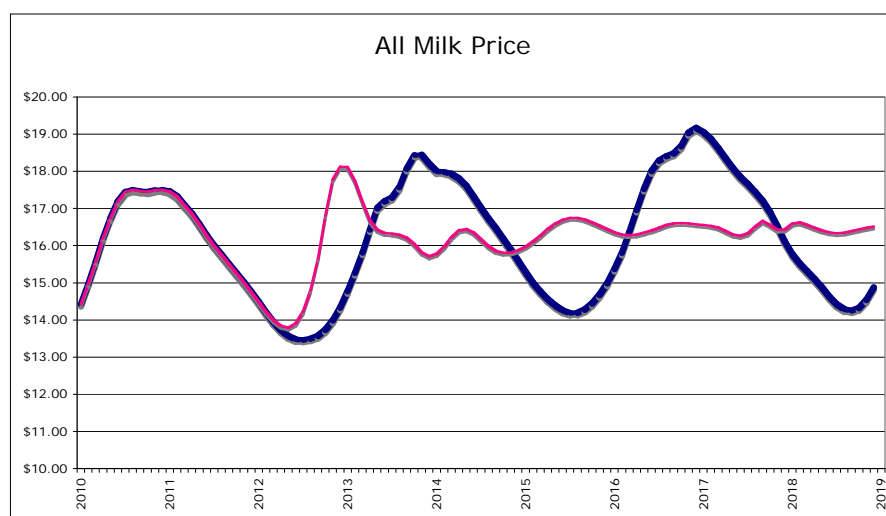
## Sanders Bill

- Difficult to model because not well specified.
- Secretary of Agriculture and Producer Board establish rates and fees based on broad economic considerations
- Quarterly price stabilization payment for milk over allowable base
- Stabilization dividends on milk under allowable base

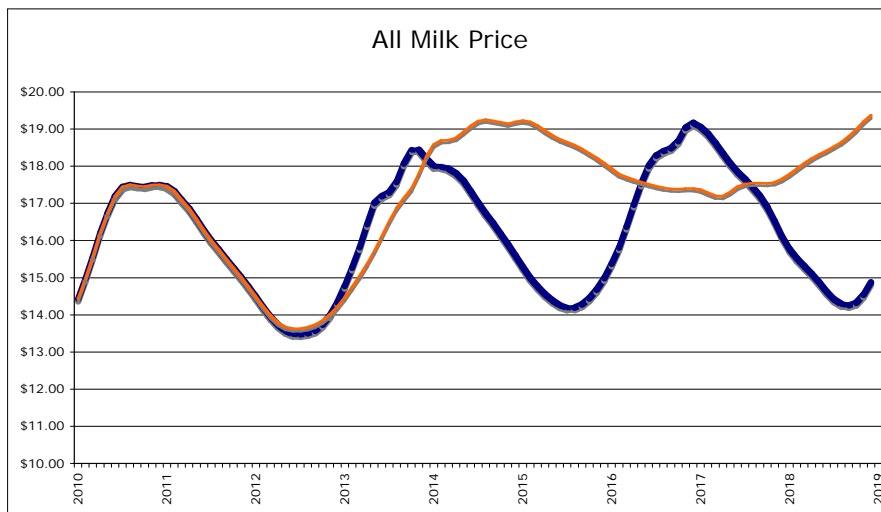
## Some Results...

- Sorry, but we determined that we aren't quite ready to show program results yet.
- Preliminary results probably later this week.
- Look at a couple of earlier programs.

## DFWT Program



## Growth Management Program



## Bottom Line...

- A number of mechanisms can work to stabilize prices.
  - All rely on penalty / rewards
  - Can be price enhancing if milk production is shorted
    - Can affect imports and exports if price enhancing
  - Can impact farm structure
  - Can enhance volatility if implemented poorly.