

USDA Baseline: Process, Models, and Applications

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Presentation Overview

- **Definition of the baseline**
 - What is the baseline?
 - What does it cover?
- **Process for putting together the baseline**
 - Interagency committees
- **Baseline models**
 - Role of models in the baseline
- **Baseline uses**
 - Where does the baseline fit in?
 - Baseline complementarity with other USDA activities
 - Scenario analysis

What is the Baseline?

- **10 year annual projections for agriculture**
 - Departmental annual baseline publication in February
 - Following budget release
- **Projections, not forecasts**
 - Conditional, long-run scenario
 - Neutral assumptions
- **Prepared through an interagency process**
 - Composite of models & judgment-based analysis

USDA Interagency Process

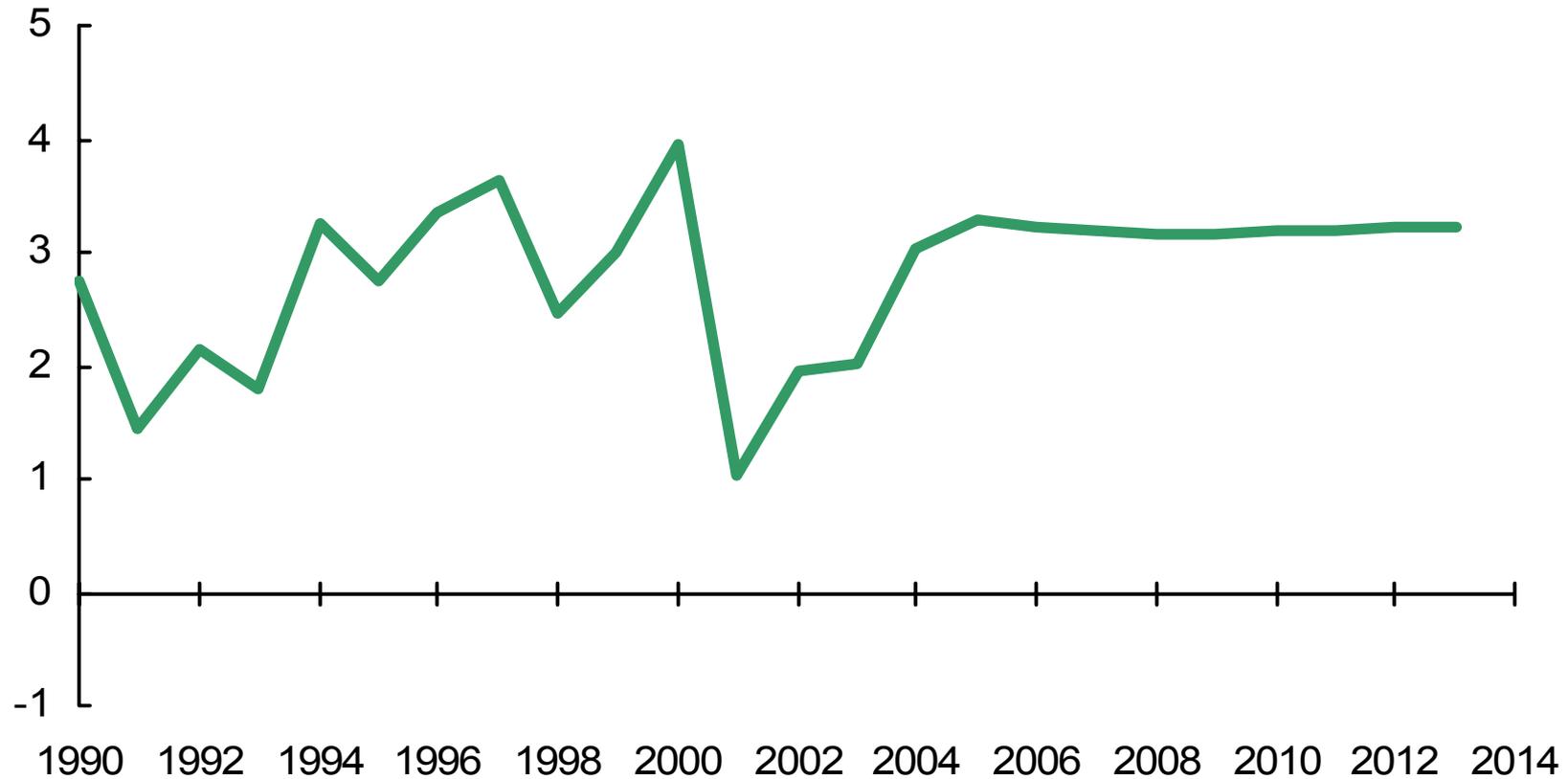
- **12 interagency commodity committees**
 - 4 to 5 agencies on each committee
 - Short-term projections, monthly
 - Long-term baseline projections, annually
 - Meetings to reach consensus projections
 - Chaired by the World Agricultural Outlook Board
- **Much interaction and flow of information between interagency committees**
 - Consistency checks
- **Interagency baseline committee**
 - 10 agencies
 - Coordinates baseline process
 - Assumptions, review, clearance

Baseline Assumptions

- **Neutral assumptions**
 - Macroeconomic conditions
 - No business cycles
 - Agricultural policy
 - Continuation of current farm policies
 - Normal weather

Neutral baseline assumptions: World gross domestic product (GDP) growth

Percent

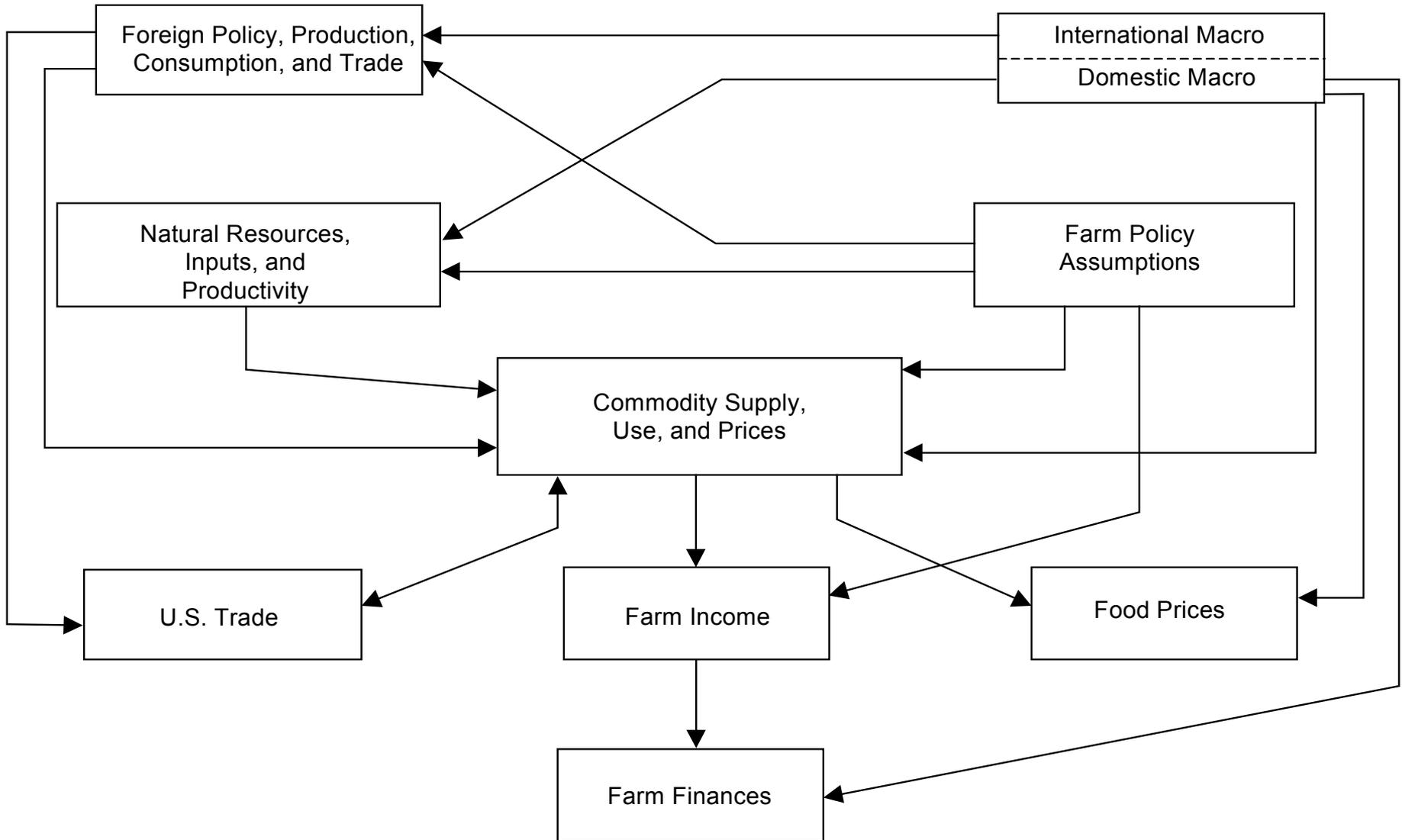


Source: *USDA Agricultural Baseline Projections to 2013*, February 2004.
Economic Research Service, USDA.

Baseline Coverage

- **Covers major agricultural commodities**
 - International and trade
 - Domestic markets
 - Supply, use, and prices
- **Includes aggregate agricultural measures**
 - Food prices
 - Farm income
 - Agricultural trade value

USDA Baseline Framework



Baseline Models

- **Different models for different parts of the process**
 - **Single equation models**
 - Feed demand equations
 - Price equations
 - **Single commodity models**
 - Corn, wheat, soybeans
 - **Cross commodity models**
 - Acreage response models
 - **U.S. agricultural sector model**
 - FAPSIM
 - **Multi-country, international trade model**
 - Country-linked modeling system (“Linker”)

Global Agricultural Trade Model

- **Linked Country Models (“Linker”)**
 - Annual models
 - 42 countries/regions, with FAPSIM as U.S. model
 - 24 commodity markets
 - Solves for prices and trade that clear country models & commodity markets
 - Equilibrates supply and demand
 - Equilibrates global imports and exports
 - Global trade totals
 - U.S. exports
 - U.S. trade market shares

U.S. Agricultural Sector Model

- **Food and Agricultural Policy Simulator (FAPSIM)**
 - Annual model
 - Over 700 equations
 - Covers major U.S. agricultural crop and livestock commodities
 - Models major supply and demand categories
 - Incorporates U.S. agricultural policy provisions
 - Solves for prices that clear markets by equilibrating supply and demand

Baseline Model Design--Crops

- **Interagency process**

- Departmental interagency projections are a composite of models & analysts' judgment
- Analysts need to take models to interagency meetings

- **Implications for model design**

- Stand alone, single-commodity models
- Small spreadsheets
- Commodity supply & demand balance sheets and prices
- Key relationships modeled
- Analyst “hands-on” system
- Linkages with other spreadsheets through macros

Baseline Models--Crops

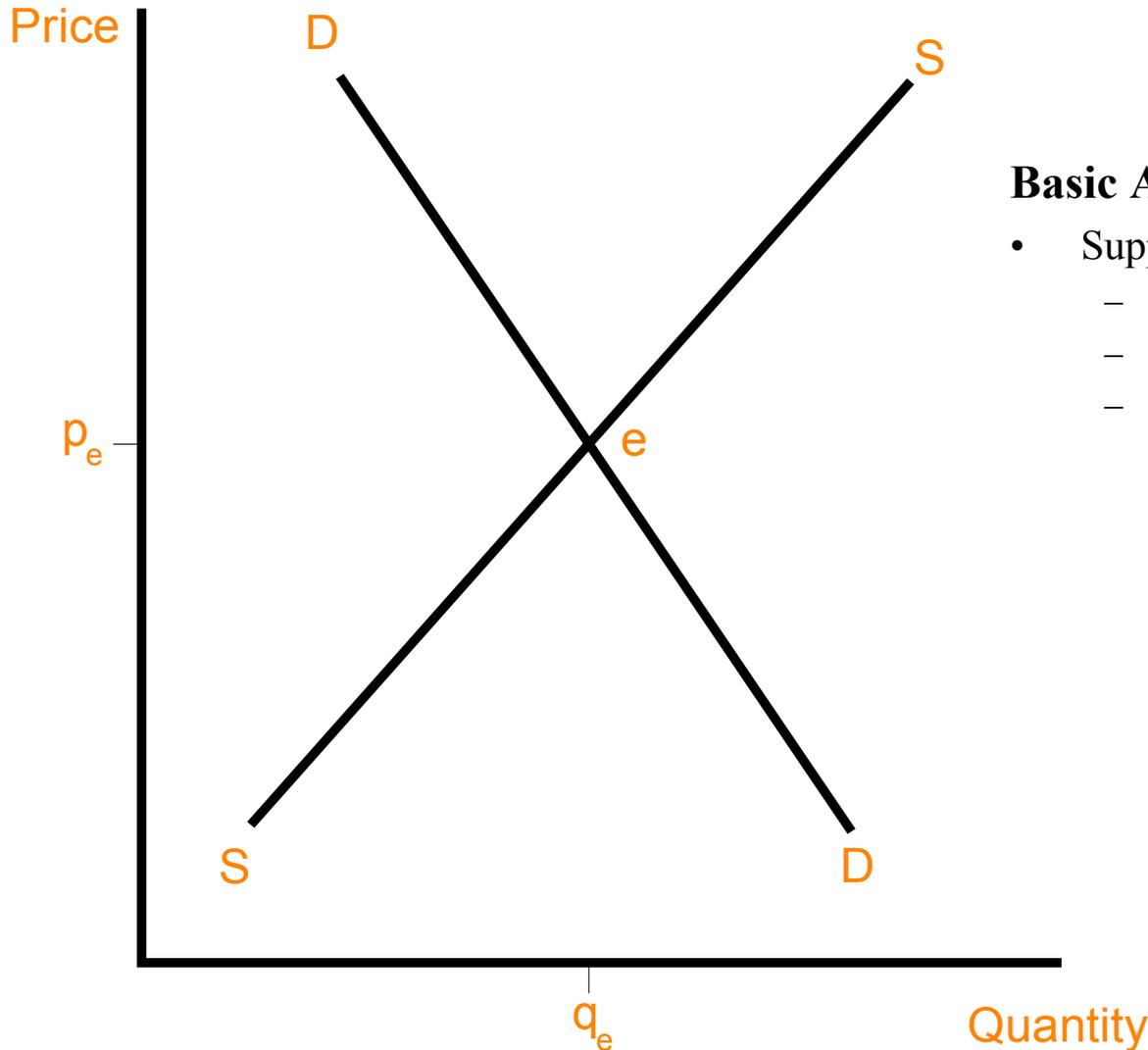
- **Acreage**
 - Based on net returns and farm program provisions
- **Yield equations**
 - Adjusted trends
- **Food, seed, & industrial demand**
 - Interaction with macroeconomic projections; policy assumptions
- **Feed demand**
 - Interaction with livestock projections
- **Export demand**
 - From trade analysis
- **Price equations**
 - Stocks-to-use ratios
- **Net returns**
 - Feedback to acreage equations

Supply & demand balance sheet

U.S. corn baseline

Item	2002/03	2003/04	2004/05	2005/06	2006/07
Planted area (mil. acres)	79.1	79.1	79.5	80.0	80.0
Harvested acres (mil. acres)	69.3	71.8	72.3	72.8	72.8
Yields (bushels per acre):	130.0	143.2	142.3	144.1	145.9
Supply and use (million bushels):					
Beginning stocks	1,596	1,086	1,349	1,289	1,244
Production	9,008	10,278	10,290	10,490	10,620
Imports	14	10	10	10	10
Supply	10,619	11,374	11,649	11,789	11,874
Feed & residual	5,642	5,700	5,700	5,750	5,775
Food, seed, & industrial	2,298	2,450	2,510	2,570	2,600
Fuel alcohol use	953	1,100	1,150	1,200	1,220
Exports	1,592	1,875	2,150	2,225	2,325
Total use	9,533	10,025	10,360	10,545	10,700
Ending stocks	1,086	1,349	1,289	1,244	1,174
Farm prices (dollars per bushel)	2.32	2.10	2.15	2.20	2.25
Net returns (dollars per acre)	159.01	162.50	155.26	164.03	172.86

Baseline Commodity Models



Basic Analytical Tool

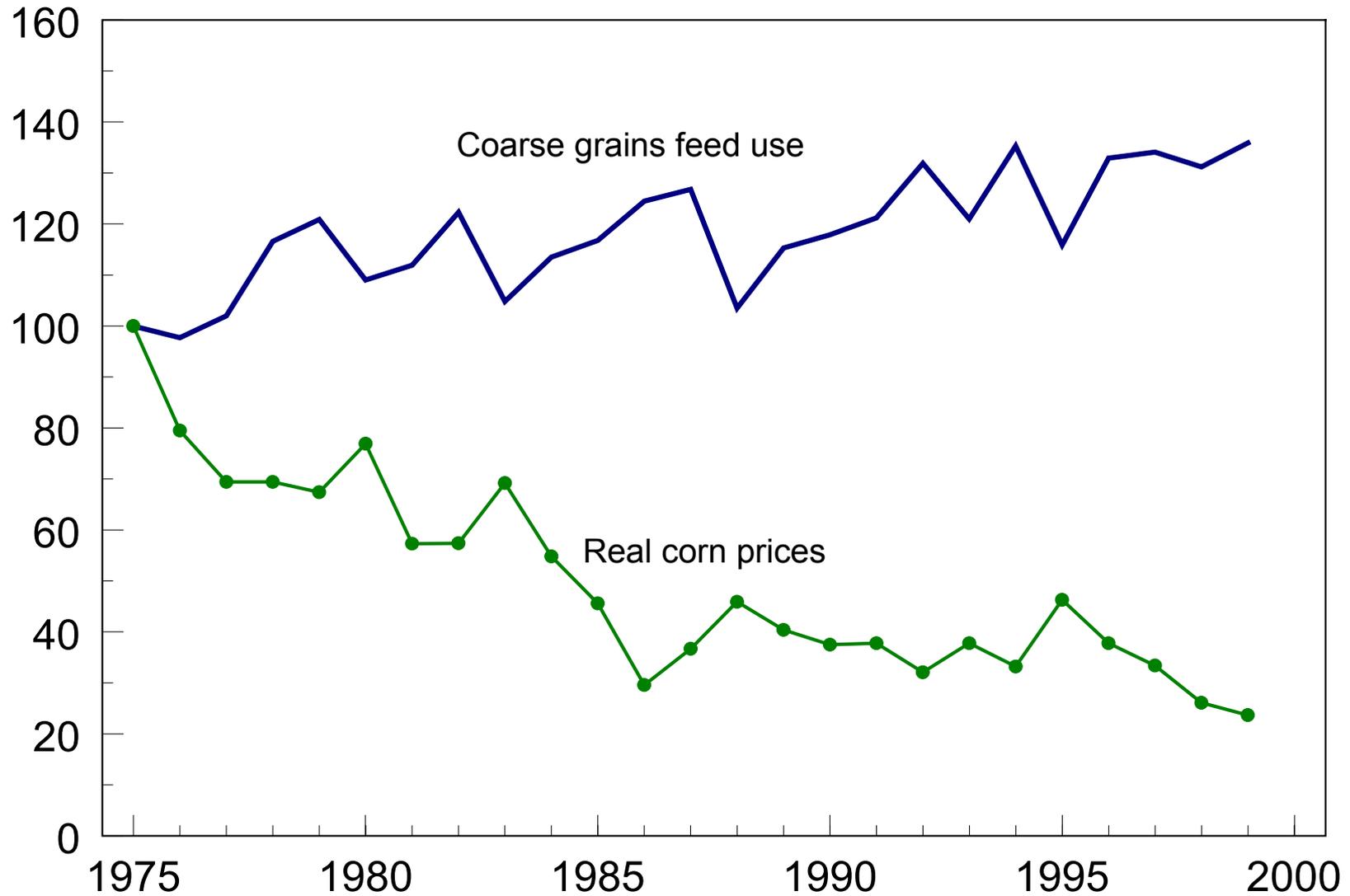
- Supply and Demand Balance Sheet
 - Factors Affecting Supply
 - Factors Affecting Demand
 - Equilibrium Supply, Demand, and Prices

Feed Demand Models

- **Economic factors affecting feed demand**
 - Feed prices
 - Livestock inventories
 - Grain Consuming Animal Units (GCAUs)
 - Aggregation of livestock inventories
 - Weighted by feed requirements
- **Statistical factors and “feed” demand**
 - Residual component
 - Corn yield difference from trend times harvested corn acreage (unplanned supply or shortfall)

Feed demand and determinants

Indexes, 1975 = 100



Grain Consuming Animal Units, 2002/03 feed year

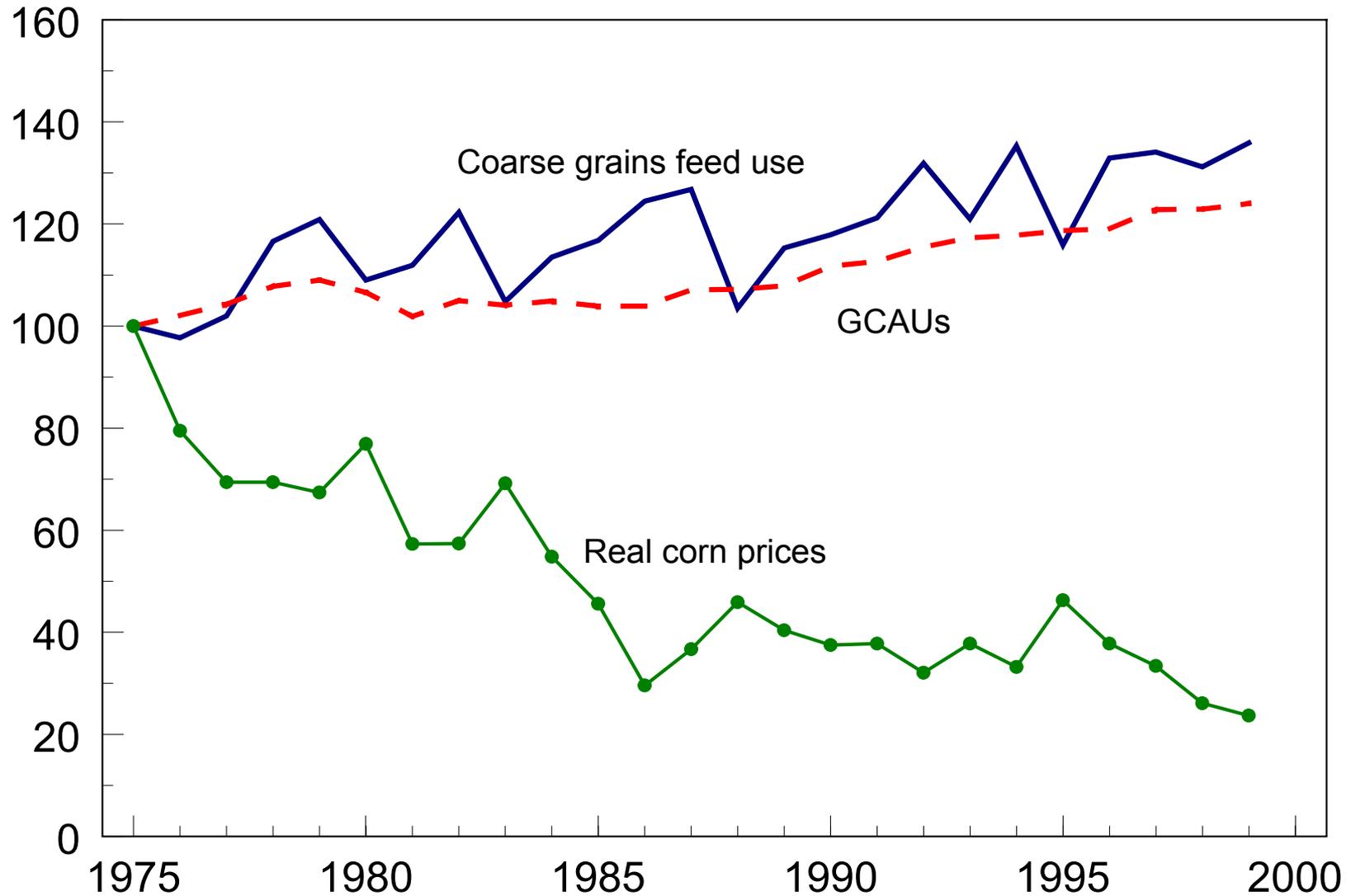
Animal type	GCAU weights	Head	2002/03 GCAUs
		1,000	Million units
Cattle			
Dairy			
Cows	1.0475	9,142	9.576
Heifers	0.1761	4,114	0.724
Beef			
Cattle on feed	1.5323	13,220	20.257
Other	0.0547	69,624	3.808
Hogs	0.2285	100,696	23.009
Poultry			
Layers	0.0217	338,230	7.340
Broilers *	0.0020	8,665,000	17.293
Pullets	0.0054	287,197	1.551
Turkeys *	0.0155	274,348	4.245
Sheep	0.0194	6,300	0.122
Horses and mules	0.2043	2,535	0.518
Total			88.443

* GCAUs for broilers and turkeys reflect weighted averages of current and lagged head numbers.

Updated March 2004.

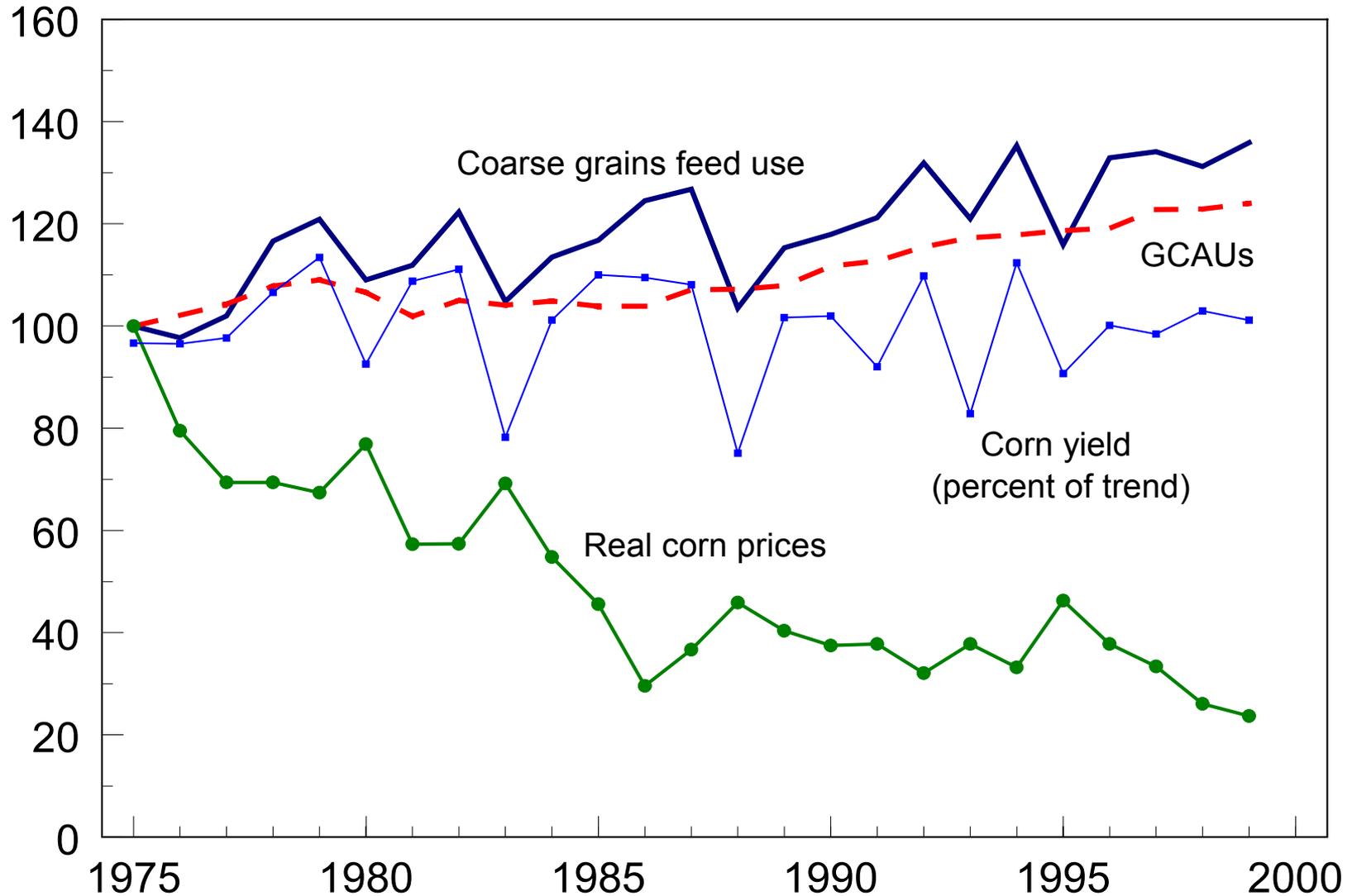
Feed demand and determinants

Indexes, 1975 = 100



Feed demand and determinants

Indexes, 1975 = 100 (except as noted)

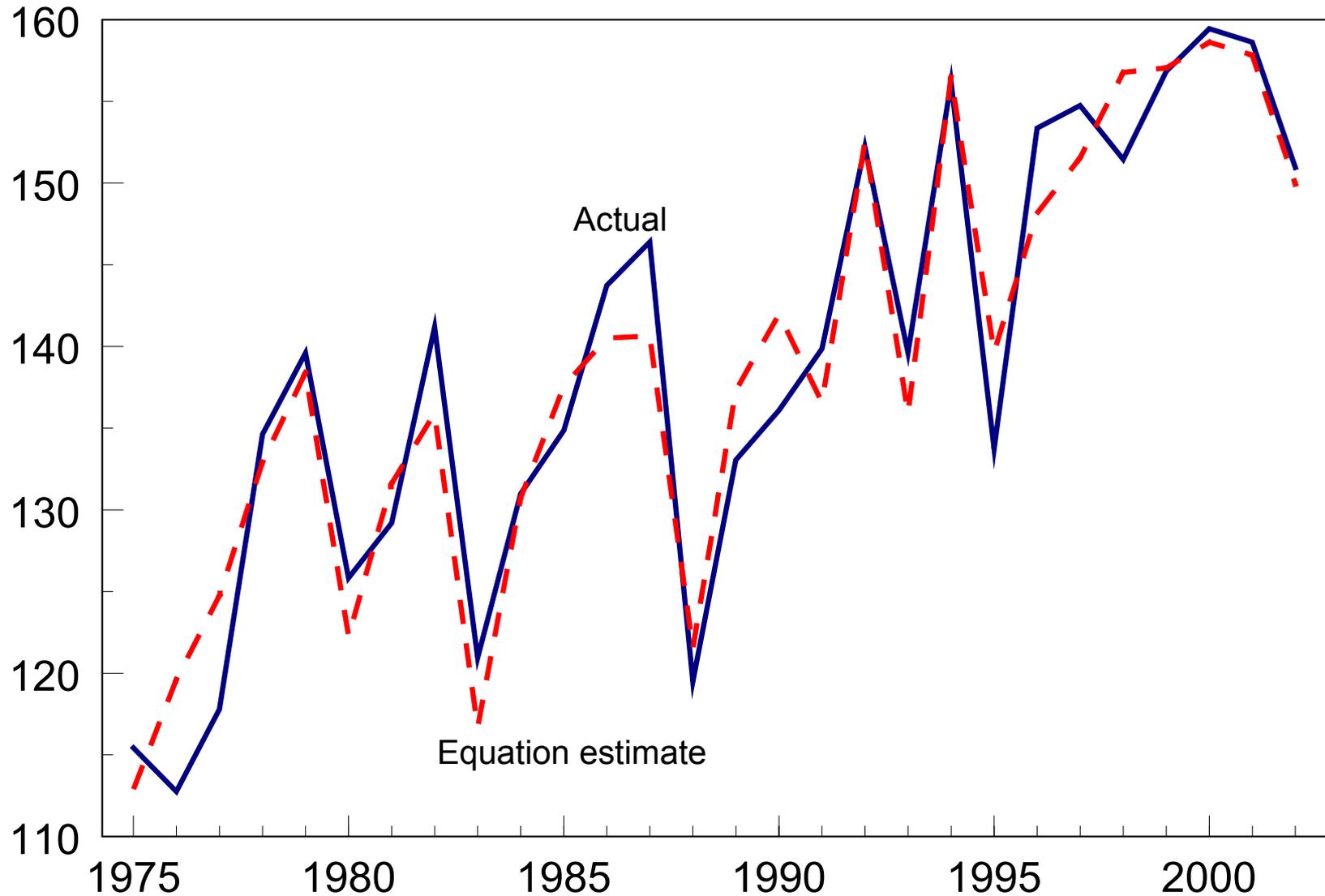


Coarse Grains Feed Demand Regression Equation

Variable	Coefficient	Coefficient standard error	t-statistic
Constant	39.3		
GCAUs	1.4	0.2	5.6
Real corn price	-5.3	1.5	-3.5
Corn yield residual times harvested acreage	0.0078	0.0013	6.2
R-squared			0.904
Estimation period			1975-99

Coarse grains feed demand

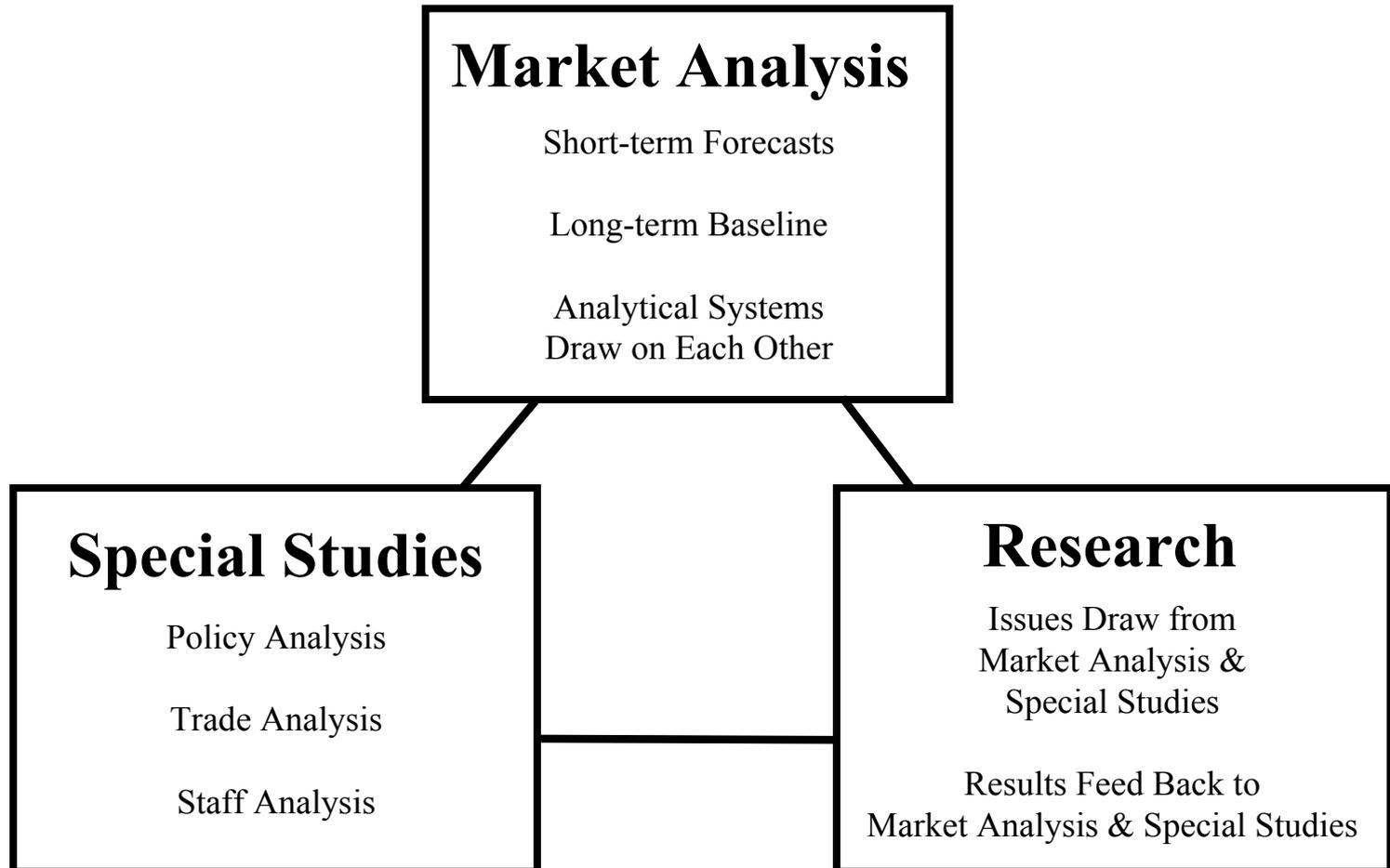
Million metric tons



Baseline Applications

- **Long run agricultural projections**
 - Budget estimates for farm program commodities (FSA)
 - CCC estimates book
 - Baseline reports (ERS)
 - Extend economic analysis to sector
 - Internet site at <http://www.ers.usda.gov/briefing/baseline/>
 - Special requests
- **Common reference point across agencies**
 - Farm program management
 - Agricultural policy analysis
 - Special studies
- **Complementary role with:**
 - Short-term market analysis
 - Special studies
 - Research

Market Economics and Policy Analysis Framework: Where the Baseline Fits In



Baseline Applications--Special Studies

- **Special studies build on the market analysis program**
 - Develop the current baseline
 - Have analytical frameworks used for baseline projections
- **Alternative scenarios**
 - Supply or demand shocks
 - Policy alternatives
 - Compare results to current baseline to derive impacts
- **Role of the supply, demand, and price balance sheet**
 - Primary vehicle for commodity analysis
 - Developing the current baseline
 - Developing alternative scenarios for special studies

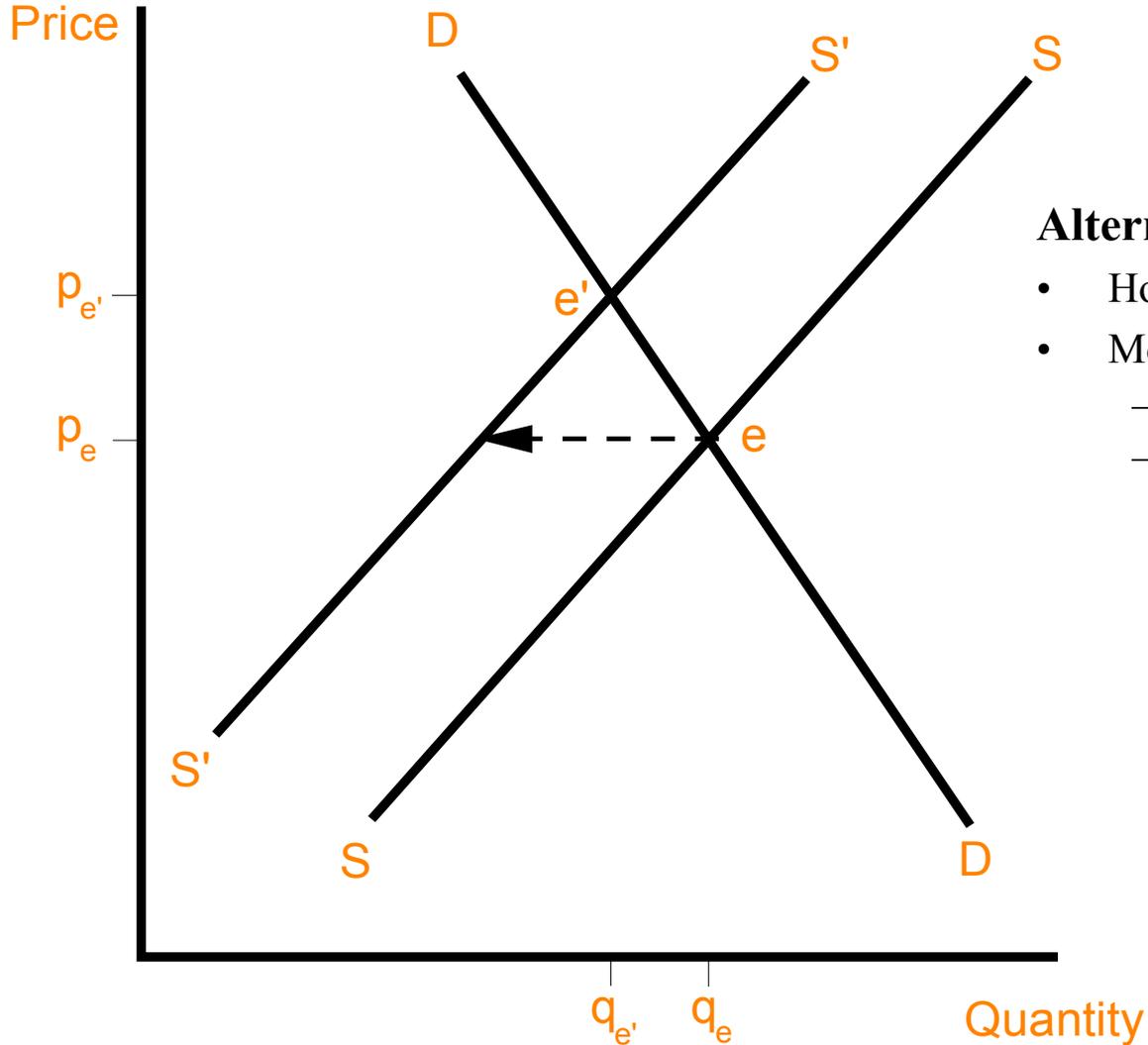
Baseline Models in Scenario Analysis

- **“What if” questions**
 - Alternative assumptions than used for the baseline
- **Choose appropriate baseline model to fit scope of question**
 - **Single equation models** for simple, narrowly defined questions
 - **Single commodity models** for market-specific questions
 - U.S. agricultural sector model (**FAPSIM**) for broader, domestic market questions
 - Full multi-country **“Linker” system** for large-scale, international market and trade questions

Scenario Analysis Steps

- **Analyze scenario dimensions**
 - Break issue down into components
 - Understand behavior to be modeled
- **Implement the scenario in the model**
 - May require modifications of models
- **Evaluate model responses**
 - Any unexpected results?
 - Was scenario implemented correctly and completely?
- **Iterate**
 - Re-analyze and fine-tune implementation

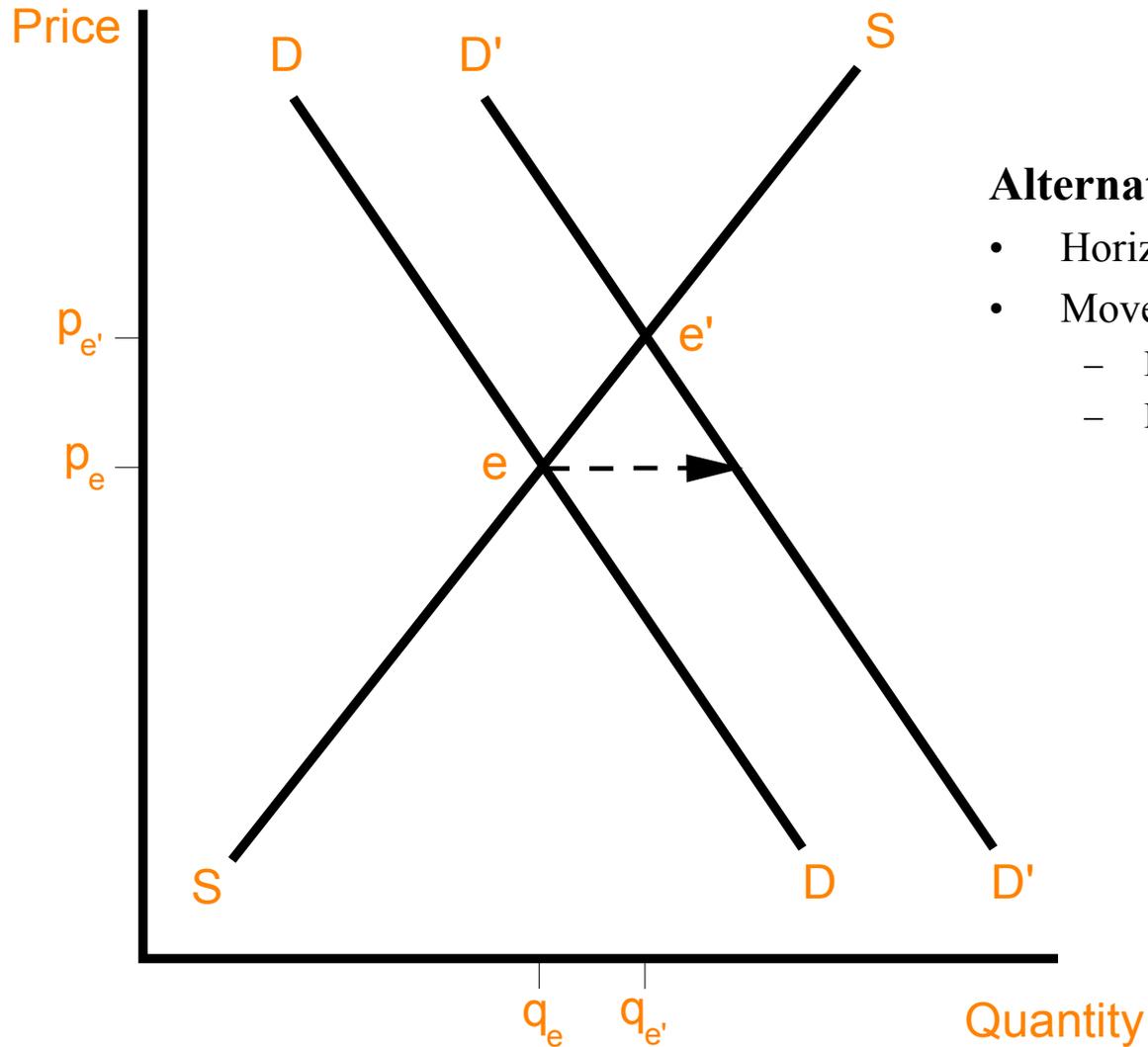
Baseline Commodity Models--Alternative Scenarios



Alternative Scenarios--Supply Shift

- Horizontal shift of supply curve to S'S'
- Move to new equilibrium e'
 - Measure quantity change
 - Measure price change

Baseline Commodity Models--Alternative Scenarios



Alternative Scenarios--Demand Shift

- Horizontal shift of demand curve to D'D'
- Move to new equilibrium e'
 - Measure quantity change
 - Measure price change

Baseline Summary

- **USDA baseline updated annually**
- **Interagency process has implications for model design & the role of models**
- **Multiple models of various sizes and scopes are used**
- **“Baseline” is one scenario from a broader baseline analytical system**
- **Results of alternative scenarios are compared to the baseline**