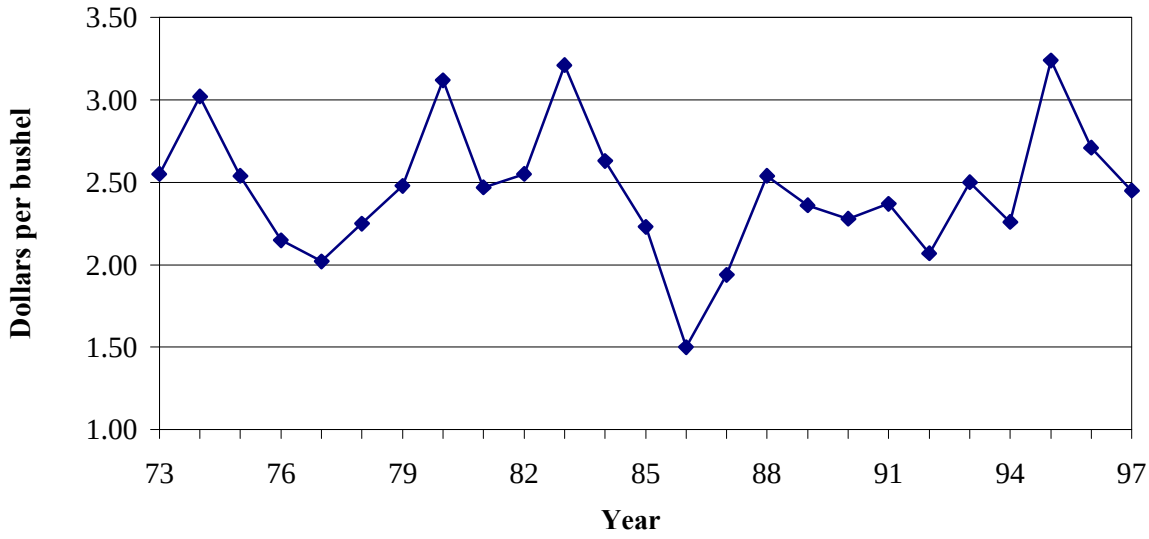
Corn Pricing Guide

David Kenyon and Katie Lucas



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INTRODUCTION

Every spring, corn producers are faced with many marketing and production decisions. These decisions are influenced by the expected price of corn at harvest. The purpose of this publication is to help producers make better pricing decisions. The historical data in Table 1 provide a benchmark against which to evaluate current acreage, production, use, stocks, and price. The forecasting model provides a method to estimate the upcoming season average price under various situations.

This publication is divided into four sections. The first section, Supply & Demand, explains how a supply and demand table is constructed. The second section, Forecasting Model, describes the price model and explains how to forecast United States season average prices using the 1998/99 crop year as an example. The third section, Price Sensitivity Analysis, explains how to use historical information to predict what can happen to corn price under three different scenarios. The fourth section, Developing a Pricing Strategy, contains historical December futures prices and discusses how these prices are related to estimated season average price, forward pricing opportunities, and the development of a pricing strategy.

SUPPLY AND DEMAND

Table 1 is the United States corn supply and demand (S&D) table for the past nine years. The S&D table is divided into four sections: Supply, Demand, Ending Stocks, and Price. Table 1 will be used in the price forecasting model, making it important for producers to understand each of the four sections.

I. Supply

Beginning stocks represent ending stocks from the previous crop year. The crop year for corn starts September 1 and ends August 31 of the next year. For example, the beginning stocks for the 1997/98 crop year are ending stocks from the 1996/97 crop year.

Production is the bushels of corn produced during a crop year. Production depends on the number of acres planted, acres harvested, and the yield per harvested acre. Corn planted in the spring will be harvested and marketed in the upcoming marketing year. For example, corn planted in the spring of 1998 is harvested during the fall of 1998 and sold during the 1998/99 marketing year.

The **Imports** category represents the corn brought into the United States from other countries. Imports are mainly seed corn and represent the smallest portion of total supply.

II. Demand

Total demand is equal to the estimated uses for corn for the next 12 months. Use is divided into three categories: feed and residual; food, seed, and industrial (FSI); and exports. Figure 1 shows the use by category since 1970.

The **Feed and Residual** category is the largest component of demand. Feed use is the amount of corn fed to livestock and poultry. Feed use depends on the number of animals being fed, the cost of feed and feed substitutes, and the profitability of feeding. The residual component is the difference between disappearance attributed to feed use and unknown disappearance.

Table 1. United States corn supply and demand

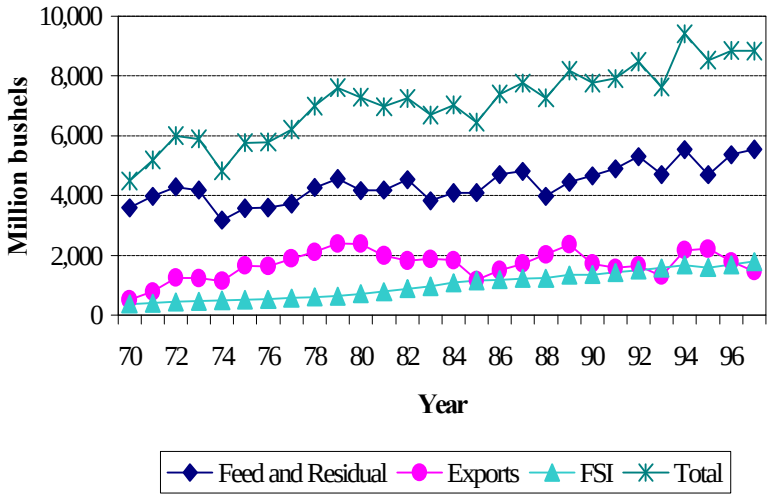
ITEM	UNITS	89/90	90/91	91/92	92/93	93/94	94/95	95/96	96/97	97/98
Planted Acreage	mil ac	72.2	74.2	76.0	79.3	73.3	79.2	71.2	79.5	80.2
Harvested Acreage	mil ac	64.7	67.0	68.8	72.2	63.0	72.9	65.0	73.1	73.7
Yield/Harvested Acre	bu./ac.	116.3	118.5	108.6	131.4	100.7	138.6	113.5	127.1	127.0
SUPPLY										
Beginning Stocks	mil bu	1930	1344	1521	1100	2114	850	1558	426	883
Production	mil bu	7525	7934	7475	9482	6336	10103	7374	9293	9366
Imports	mil bu	3	3	20	7	21	9	16	13	10
Total Supply	mil bu	9458	9281	9016	10589	8471	10962	8948	9733	10259
DEMAND										
Feed & Residual	mil bu	4455	4669	4898	5301	4704	5537	4696	5362	5550
Food, Seed, Industrial	mil bu	1356	1367	1434	1511	1588	1690	1598	1692	1800
Exports	mil bu	2368	1725	1584	1663	1328	2177	2228	1795	1475
Total Demand	mil bu	8179	7761	7916	8475	7620	9404	8522	8849	8825
ENDING STOCKS	mil bu	1344	1520	1100	2114	851	1558	426	883	1434
Days Supply	days	60	71	51	91	40	60	19	36	60
Percent Use	%	16	20	14	25	11	17	5	10	16
PRICE										
Loan Rate	$/bu	1.65	1.57	1.62	1.72	1.72	1.89	1.89	1.89	1.89
Season Average Price	$/bu	2.36	2.28	2.37	2.07	2.50	2.26	3.24	2.71	2.45
Price/Loan	ratio	1.43	1.45	1.51	1.20	1.45	1.20	1.71	1.43	1.30

Source: *Agricultural Outlook*, ERS, USDA; or *WASDE*, WAOB, USDA at *http://www.mannilb.cornell.edu/usda/usda.html*

Exports represent the amount of corn exported to other countries. The quantity of corn exported is increasingly dependent upon events around the world. The amount of corn exported depends on exchange rates, the production of corn in other exporting countries, government programs in the United States and other countries, and world-wide demand for corn.

The F**ood, Seed, and Industrial** (FSI) category is relatively small, comprised primarily of corn used for cereals, high fructose corn syrup, and alcohol. The relatively constant growth rate of this category is in direct proportion to population increases.

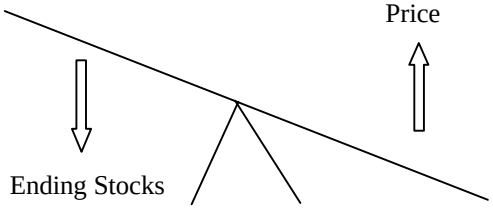
Figure 1. Corn uses



III. Ending Stocks

Ending Stocks represents the bushels of corn left at the end of a crop year when total demand is subtracted from total supply.

Figure 2. Price-ending stocks



If ending stocks increase relative to beginning stocks, supply increases relative to demand, and prices will tend to decrease. If ending stocks are lower than beginning stocks, supply decreases relative to demand, and prices will tend to increase. This relationship between ending stocks and season average price is like a see-saw: when stocks decrease, the price increases.

Ending stocks can also be expressed as days supply or percent use. **Days Supply** represents the number of days the ending stocks would last at the current rate of use. Days supply is equal to ending stocks divided by use per day. Use per day is total demand divided by 365 days.

For example, total demand in 1996/97 was 8,849 million bushels. Use per day was 24.24 million bushels (8,849/365). Ending stocks were 883 million bushels. Days supply is 36 days (883/24.24). In other words, the ending stocks would last only 36 days without any new production.

Percent Use is ending stocks divided by total demand times 100. For example, in 1996/97, percent use equals 10 percent (883/8,849 * 100). As ending stocks as a percent of total demand decrease, the season average price increases.

IV. Season Average Price

The season average price represents the United States average price that producers receive per bushel of corn during a crop year.

Season average price is affected by ending stocks. If ending stocks are large, then supply is large relative to demand, and season average price will decrease. In 1994/95 ending stocks were 1,558 million bushels and season average price was $2.26 per bushel. If ending stocks are small, supply is small relative to demand and season average price will increase. In 1995/96, ending stocks were 426 million bushels, and season average price was $3.24.

The relationship between ending stocks and price can be graphed to create an estimated price curve. Ending stocks is on the horizontal axis and season average price is on the vertical axis (Figure 3). The price curve was obtained statistically by analyzing the historical relationship between the natural logarithm of ending stocks and season average price. The price curve explains 93 percent of the variation in season average price from year to year.

Actual prices deviate from the estimated price curve for several reasons. First, world stocks of corn can have a significant effect on the price that United States producers receive. Second, the price and availability of wheat, soybeans, and other feed grains can affect corn prices. And third, government programs, such as the export enhancement program, can affect price.

The average price of corn for the last 10 years has been about $2.50 per bushel and is associated with ending stocks of about 1,000 million bushels. Ending stocks greater than 1,000 million bushels result in lower prices, while ending stocks less than 1,000 million bushels result in higher prices. When ending stocks drop below 1,000 million bushels, the price curve becomes steeper with prices increasing rapidly as users become concerned about inadequate supplies to meet their needs.

FORECASTING MODEL

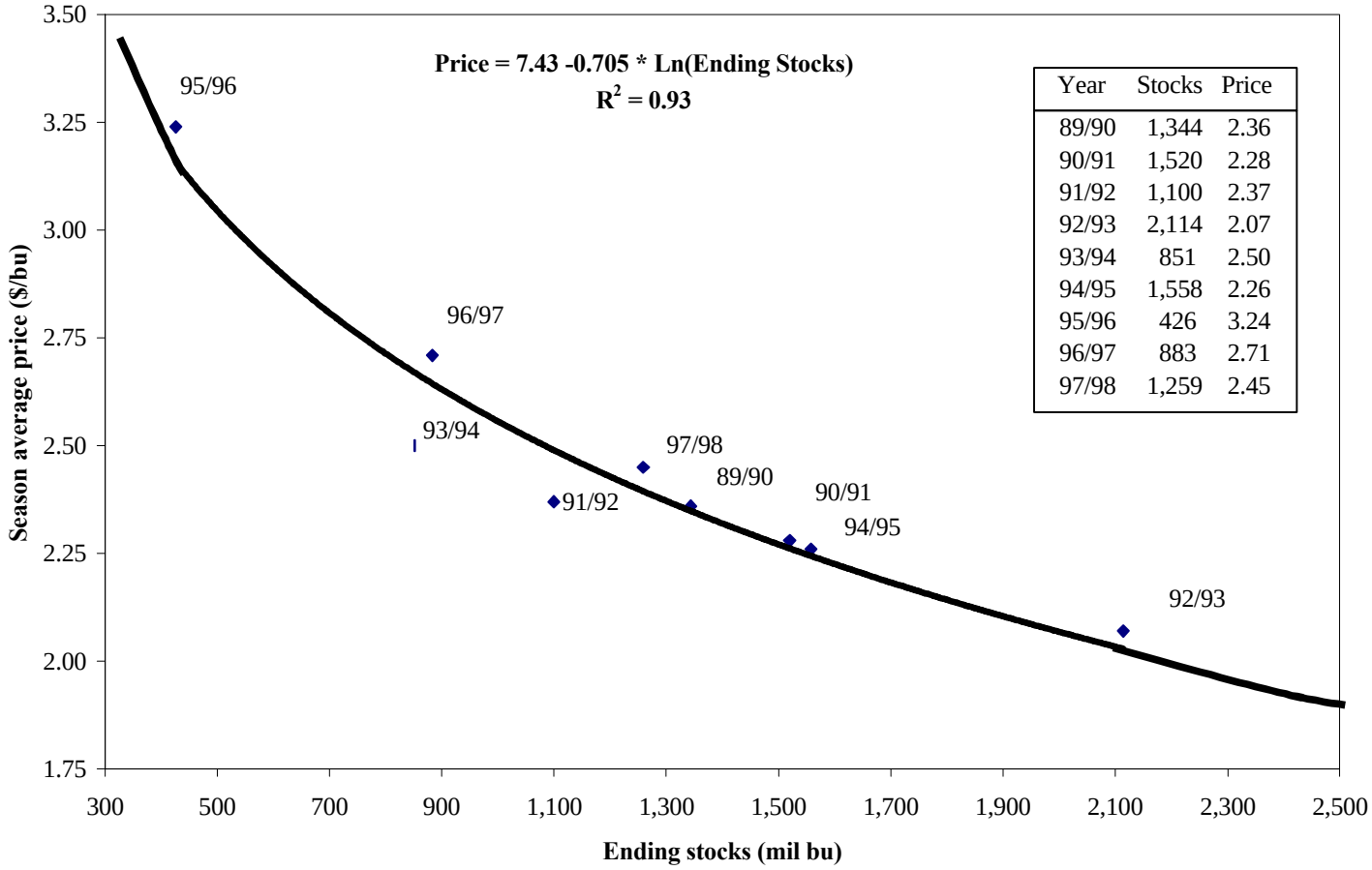
By following the steps in the next four sections a producer can develop an estimate of supply, demand, and ending stocks during the second week in April. The estimated ending stocks can then be used to estimate the season average price. The estimated price can be used to help make planting decisions and to develop forward pricing strategies. Table 2 is used to demonstrate how the price forecasting model can be used in 1998 to estimate season average price for 1998/99.

I. Supply

The first item to consider when estimating supply is **Beginning Stocks**. An estimate can be obtained from the monthly USDA publication, *World Agricultural Supply & Demand Estimates*, (WASDE) at *http://www.usda.gov/nass/*. Beginning stocks for the 1998/99 crop year are the ending stocks from the 1997/98 crop year. The estimated beginning stocks for 1998/99 in April 1998 were 1,209 million bushels. Enter 1,209 in the box for 1998/99 beginning stocks in Table 2.

The next supply item to consider is production. **Production** depends on three items: planted acres, harvested acres, and yield per harvested acre.

Figure 3. United States corn price vs. ending stocks



Year	Stocks	Price
89/90	1,344	2.36
90/91	1,520	2.28
91/92	1,100	2.37
92/93	2,114	2.07
93/94	851	2.50
94/95	1,558	2.26
95/96	426	3.24
96/97	883	2.71
97/98	1,259	2.45

Table 2. Estimated United States corn supply, demand, stocks, and price

Item	Units	95/96	96/97	97/98	98/99
Planted Acreage	mil ac	71.2	79.5	80.2	
Harvested Acreage	mil ac	65.0	73.1	73.7	
Yield	bu/ac	113.5	127.1	127.0	
Supply					
Beginning Stocks	mil bu	1,558	426	883	
Production	mil bu	7,374	9,293	9,366	
Imports	mil bu	16	13	10	
Total Supply	mil bu	8,948	9,773	10,259	
Use					
Feed & Residual	mil bu	4,696	5,362	5,700	
Exports	mil bu	228	1,795	1,525	
Food, Seed & Industrial	mil bu	1,598	1,692	1,825	
Total Use	mil bu	8,522	8,849	9,050	
Ending Stocks	mil bu	426	883	1,209	
Days Supply	days	19	36	48	
Percent Use	%	5	10	13	
Loan Rate	$/bu	1.89	1.89	1.89	
U.S. Season Average Price	$/bu	3.24	2.71	2.50	
Va. Season Average Price	$/bu	3.35	3.20	2.70	

1. Planted Acres

The number of acres a producer will plant is influenced by government programs and by the profitability of corn versus other crops. Before the 1996 Farm Bill, producers had to evaluate the

benefits and costs of participating in a wide range of programs. Since 1996, producers are free to plant as many acres as they want based on the expected profitability of various crops.

Producers' planting intentions are reported by USDA in late March in *Crop Production: Prospective Plantings*. Planted acres for all corn in the spring of 1998 for the 1998/99 crop year is 80.8 million acres. Enter 80.8 in Table 2 for 1998/99 planted acres.

2. Harvested Acres

Producers do not harvest corn for grain from all the acres they plant. Some is harvested for silage, and the rest remains unharvested. Table 3 gives the historical relationship between the USDA June estimate of actual planted acres to the actual acres harvested for corn for grain. The average ratio of harvested to planted from 1994 to 1997 is 91.8 percent. Multiplying the March estimate of 80.8 million acres by 91.8 percent, gives an estimate of 74.2 million acres harvested in 1998. Enter 74.2 in Table 2 in the harvested acres blank.

Table 3. United States intended, planted, and harvested corn acres

Year	February/ March Intentions[a]	Grain June Intentions[b]	Actual Planted[c]	Actual Harvested[c]	Ratio[d]
	----------1,000 acres----------				(%)
1989	73,253	72,790	72,221	64,703	89.6
1990	74,804	74,574	74,171	66,952	90.3
1991	76,124	75,909	75,951	68,842	90.6
1992	79,007	72,218	79,325	72,144	90.9
1993	76,486	78,625	73,235	62,921	85.9
1994	78,767	79,158	79,175	72,887	92.1
1995	75,323	72,008	71,245	64,995	91.2
1996	79,920	80,355	79,507	73,147	92.0
1997	81,416	80,227	80,227	73,720	91.9
1998	80,781	80,798	_____	_____	_____
1999	_____	_____	_____	_____	_____
2000	_____	_____	_____	_____	_____

Sources: http://www.usda.gov/nass/

a. Prospective Plantings, NASS, USDA.

b. Acreage, NASS, USDA.

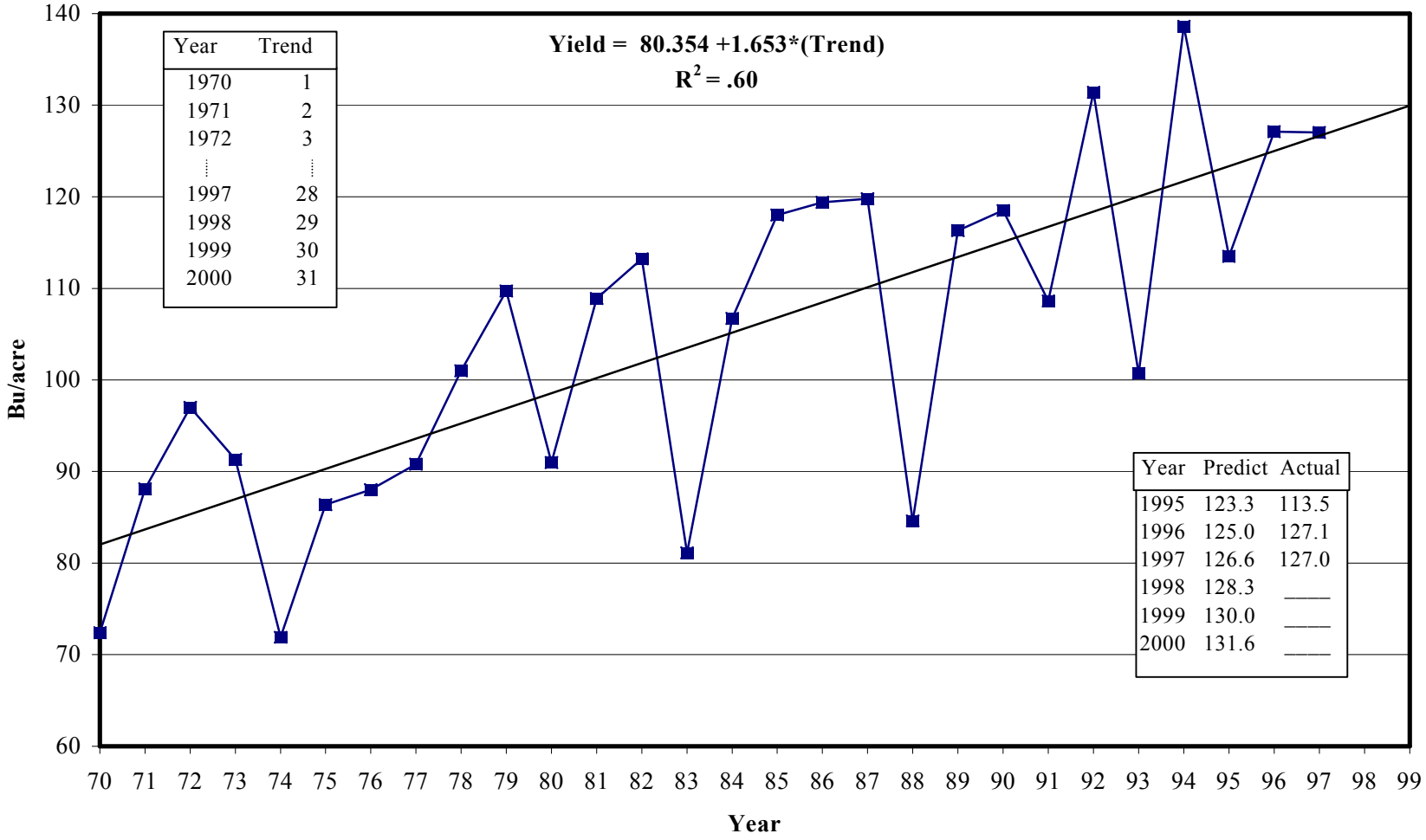
c. Crop Production, NASS, USDA.

d. Ratio is Actual Harvested divided by Actual Planted * 100.

3. Yield

Next, yield per acre must be estimated. The United States average yield per acre varies considerably from year to year, as Figure 4 indicates. Since 1970, United States average corn yields have increased about 1.65 bushels per year.

Figure 4. United States corn yield



The equation in Figure 4 shows that trend line yields are expected to be 128.3. Enter 29 (from box with year and trend, Figure 4) in the equation as the value for "trend" to calculate yield.

$$\textbf{Yield} = 80.354 + 1.653 * (29)$$

$$= 128.3$$

Write 128.3 in the box for 1998/99 yield per harvested acre in Table 2.

With estimates of acres harvested and yield per acre, a producer can estimate total United States production. The estimated production for 1998 is 9,520 million bushels (74.2 * 128.3). Enter 9,520 in the box for 1998/99 production in Table 2.

Imports have averaged about 10 million bushels per crop year over the last 10 years. Estimating imports in early April for a crop year that does not begin until September is hard. The first government estimate is reported in the May WASDE. Until that number is reported, the best estimate available is the historical average of 10 million bushels. Enter 10 million in the blank for 1998/99 imports in Table 2.

Having estimated beginning stocks, production, and imports for 1998/99, total supply can be estimated by adding these three sources of supply. Total supply is 10,739 million bushels. Enter 10,739 in the blank for 1998/99 total supply in Table 2.

The total supply estimate can vary greatly from the original estimate in April until the corn is actually harvested in the fall. Producers may change their March planting intentions, but most of the variability lies in the estimated yield.

II. Demand

To estimate total demand, the three categories that make up demand must be estimated individually.

1. Feed Use

Feed use is the largest component of demand. **Feed use** is primarily a function of the number of animals being fed in the United States. Quarterly animal production numbers can be found in WASDE. In April, WASDE estimates total red-meat and poultry production for the fourth quarter of the current calendar year. The fourth quarter of the current calendar year coincides with the first quarter of the upcoming crop year. By multiplying last year's feed use by the percentage change in fourth quarter animal production last year compared to the estimate of fourth quarter animal production in the current year, an estimate for the upcoming crop year's feed use can be calculated. The estimate is based on the assumption that total red-meat and poultry production in the fourth quarter of the current calendar year represents average animal production levels throughout all four quarters of the crop marketing year.

A producer must understand if corn supply for last year dramatically decreased compared to the demand for the previous year, corn fed last year must decline. This creates a problem since this year's feed use estimate relies on last year's feed use. What if feed use for last year was low due to drought or other poor weather conditions? Using feed use from an abnormal year in the estimate for feed use for next year feed use will create an poor estimate. When supply forces reduce use, a producer needs to look at the historical data in Table 1 and average several recent years instead of just using the previous year.

For example, if an estimate of feed use for the 1996/97 crop year was calculated using feed use from the 1995/96 crop year, an unreliable estimate would be obtained. Feed use in 1995/96 had to decline substantially because of the small crop in 1995. To estimate 1996/97 feed use, an average of the 1994/95 and 1995/96 feed use is used.

Table 4 shows the percentage change in fourth quarter animal production from year to year for the last eight years. The percentage increase from actual fourth quarter 1997 to estimated fourth quarter 1998 is 1.14 percent. The estimated 5,700 million bushels fed to animals during the 1997/98 crop year is multiplied by the 1.14 percent increase to estimate 1998/99 feed use.

The estimated feed use for 1998/99 is $5{,}765\,(5{,}700 * 1.0114)$. Enter 5,765 in the feed and residual use box for 1998/99 in Table 2.

Table 4. Fourth quarter total red-meat and poultry production

Year	Actual	Year	April Estimate	% Change[a]
	(mil. lbs.)		(mil. lbs.)	
1990	15,986	1991	16,626	4.00
1991	16,596	1992	17,015	2.52
1992	17,023	1993	17,463	2.58
1993	17,475	1994	17,629	0.88
1994	18,637	1995	18,973	1.80
1995	18,918	1996	19,439	2.75
1996	18,737	1997	19,280	2.90
1997	19,550	1998	19,773	1.14
1998	____	1999	____	____
1999	____	2000	____	____
2000	____	2001	____	____

Source: April WASDE. *http://mannlib.cornell.edu*

[a] % change is (April Estimate - Actual)/Actual * 100.

2. Exports

Exports are largely determined by United States production, exchange rates, government programs in the United States and other countries, politics, and production in other countries. Many of these factors are hard to forecast in April for a crop year that does not begin until September. In April, a reasonable estimate of exports for the upcoming crop year is the average of the last five years with the lowest and highest numbers eliminated. In some years, major changes in government programs, politics, or exchange rates may indicate the number should be increased or decreased. To estimate 1998/99 exports, average the years 1993/94 to 1997/98. Eliminate the low year (1993/94) and the high year (1995/96). Using the three remaining years, the average exports are

$$\left(\frac{\mathbf{2{,}177 + 1{,}795 + 1{,}475}}{\mathbf{3}}\right) = \mathbf{1{,}816.}$$

Given the economic problems in Southeast Asia during the spring and summer of 1998 and the extremely low exports in 1997/98, this estimate is probably on the high side.

3. Food, Seed, and Industrial

The FSI category has been increasing about 61 million bushels per year since 1975. Expected FSI in 1998 based on the equation calculated from historical data and shown in Figure 5 is 1,873 million bushels.

FSI = 410.6 +60.0 * (Ending stocks)
= 410.6 + 60.9 * (24)
= 1,873

Enter 1,873 in the blank for 1998/99 FSI in Table 2.

Having estimated all three categories of demand, total demand can be estimated. The total demand for 1998/99 is 9,454 million bushels. Enter 9,454 in the box for 1998/99 total demand in Table 2.

III. Ending Stocks

The ending stocks for 1998/99 can be calculated by subtracting total demand from total supply. The 1998/99 estimate is 1,285 million bushels. Days supply is calculated by dividing ending stocks by use per day. Use per day is 25.9 (9,454/365). Days supply equals 50 days (1,285/25.9). Use equals 14 percent (1,285/9,454 * 100). Enter ending stocks, days supply, and percent use in Table 2.

The season average price for 1998/99 can now be estimated by using Figure 6. Locate 1,285 million bushels on the horizontal axis of Figure 6. Draw a vertical line (A) at 1,285 million bushels up to the price curve. Then draw a horizontal line (B) from the price curve to the vertical axis. The horizontal line crosses the vertical price axis at about $2.40 per bushel. According to the price equation, the price should be $2.38. The equation estimate for the season average price is

Price = $7.43 – 0.705 * Ln(Trend)
Natural log (Ln 1,285) = 7.159
Price = $7.43 – 0.705 * Ln(1,285)
= $7.43 – (0.705 * 7.159)
= $7.43 –5.05
= $2.38

Enter $2.38 in the blank for 1998/99 in Table 2.

The estimated price curve explains 93 percent of the variation in the season average price from year to year. In most years, the difference between the predicted and actual price is less than $0.10 a bushel. Over time the relationship between price and ending stocks changes; therefore, this equation needs to be re-estimated every several years.

The United States season average price can be used to estimate the Virginia average price. Table 5 indicates that Virginia prices averaged $0.23 above United States season average prices from 1989 to 1997. If Virginia production is down compared to United States production, the difference is larger and vice versa. Therefore, in the example in Table 2, the estimate of the Virginia price for 1998/99 is $2.61 ($2.38+0.23).

The estimated Virginia season average price can be used as a basis for evaluating forward pricing opportunities using cash contracts, futures, and options.

Figure 5. Food, seed, and industrial use

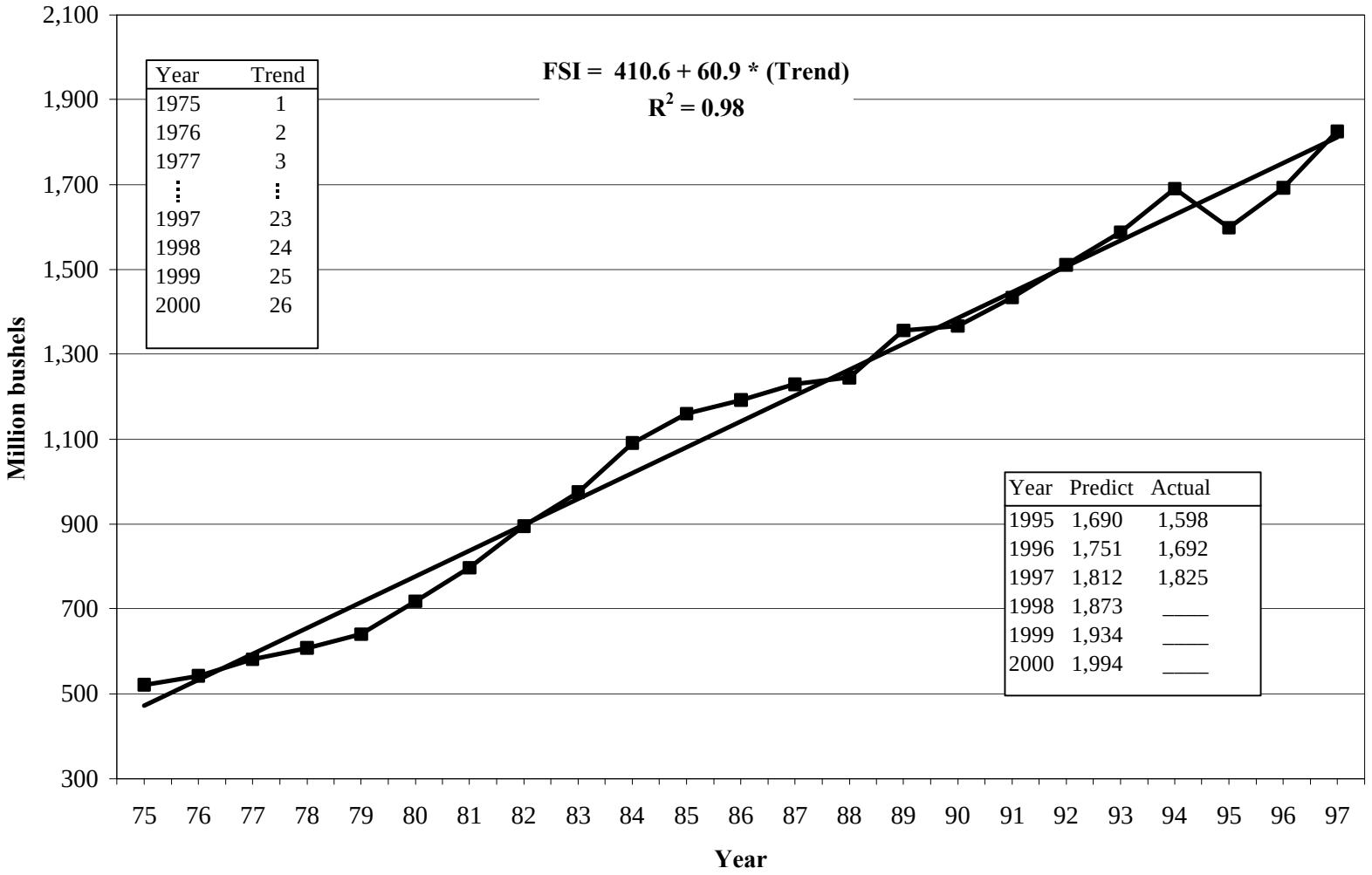


Figure 6. United States corn price vs. ending stocks

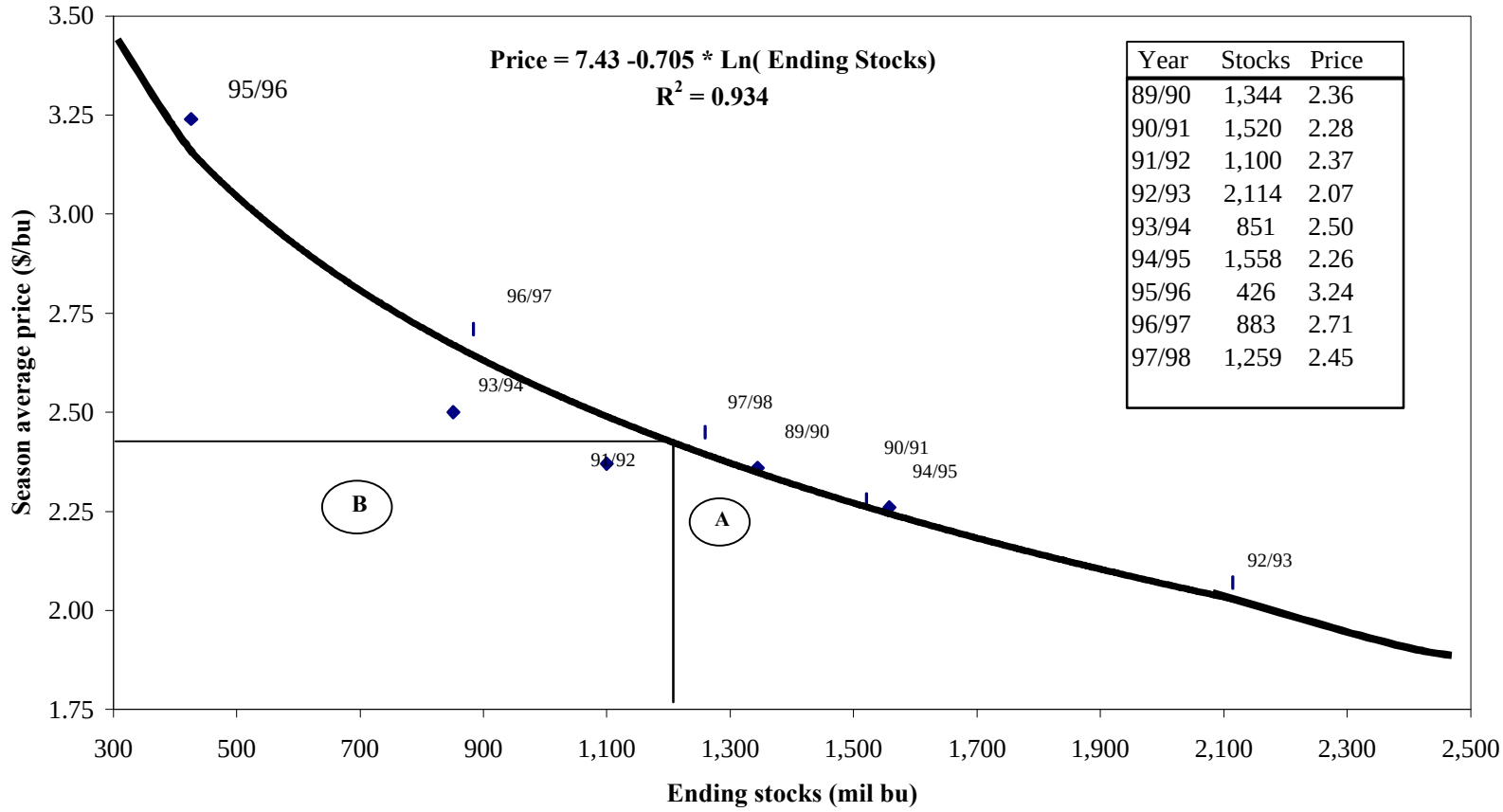


Table 5. United States and Virginia production and price differences

Year	Production		Season Average Price		
	U.S.	Va.	U.S.	Va.	Va. – U.S.
	mil bu		$/bu		
1989/90	7,525	40.2	2.36	2.74	0.38
1990/91	7,934	36.5	2.28	2.51	0.23
1991/92	7,475	28.1	2.37	2.60	0.23
1992/93	9,482	41.8	2.07	2.25	0.18
1993/94	6,336	17.1	2.50	2.65	0.15
1994/95	10,103	34.3	2.26	2.40	0.14
1995/96	7,374	30.5	3.24	3.35	0.11
1996/97	9,293	39.1	2.71	3.20	0.49
1997/98	9,366	30.2	2.45	2.70	0.25

Source: *http://www.usda.gov/nass/*

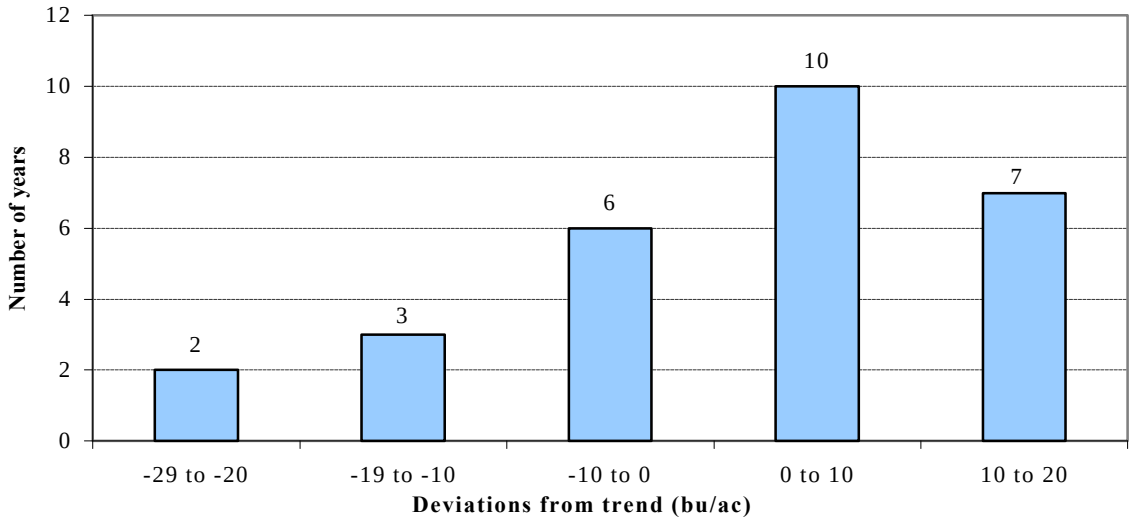
PRICE SENSITIVITY ANALYSIS

The estimated price from the model is based on assumptions about yield, harvested acres, and demand. The actual levels of these variables may change dramatically from April until harvest. The potential impact of these changes on price can be determined by assuming alternative yield and demand levels.

The most variable factor to consider is yield per harvested acre. Survey yield estimates are not available from USDA until August. The 1998 estimate of 128.3 bushels per acre only takes into consideration historical trends. It does not consider the possibility of extremely favorable or unfavorable weather conditions.

Figure 7 illustrates the accuracy of past trend line yield predictions. In 17 of the last 28 years, predicted yields were above the trend line by an average of 7.7 bushels. In 6 of the last 28 years, yields were as much as 10 bushels below the trend line. In 5 of the last 28 years, actual yields were more than 15 bushels below the trend line. In 1983, 1988, and 1993, when corn prices were high, actual yields were 22, 27, and 19 bushels below the trend line respectively.

Figure 7. Actual minus predicted trendline yields



The chances of 1998 being below 128.3 bushels per acre are about 40 percent according to past trends (11 of 28 years). The chances of 1998 yields being above 128.3 are about 60 percent. **A producer needs to keep in mind that yields have a higher probability of being above rather than below the trend line**. However, when yields fall below the trend line they average 12 bushels below compared to 7.7 bushels when they are above the trend line.

If yields are higher than 128.3 in 1998/99, then production will be higher. Total supply and ending stocks will increase if estimated demand does not change. With an increase in ending stocks, the season average price will be lower than the 1998/99 estimated price of $2.38 per bushel.

Ever-changing local and world events can have a significant impact on the amount of corn used during a marketing year. Changes in world supply and demand as well as changes in government programs can dramatically increase or decrease exports. Since changes in the cost of feed substitutes such as soybeans and wheat can impact the amount of corn used as feed, producers need to be aware of substantial changes in soybean and wheat production.

Table 6 is constructed like Table 2. Table 6 is used to estimate season average price when factors such as yield and use fluctuate. Three scenarios have been calculated for Table 6. Scenarios 1 and 2 represent a yield increase and decrease respectively. Scenario 3 indicates a decrease in exports which decreases total use and increases ending stocks.

Scenario #1

In Scenario 1, yields are assumed to be 7.7 bushels above the predicted yield, which historically has happened 60 percent of the time. Actual yields would then be 136 bushels (128.3 + 7.7). Production would increase to 10,091 (136*74.2) million bushels. Total supply will increase to 11,310 million bushels. If use remains constant, ending stocks will increase to 1,856 million bushels. Using the equation in Figure 6, the season average price drops to $2.12.

Scenario #2

Historically, yields will fall below the trend line 40 percent of the time. When they do, the average reduction in yield has been 12 bushels. If yields decline to 116.3 (128.3 – 12.0) bushels, production will decrease to 8,629 million bushels. Holding use constant at 9,454, ending stocks would decrease to 394 million bushels. Ending stocks have not been that low in recent years; consequently, use would probably decline. But with ending stocks of 394, price would be $3.22 (Figure 6). In 1995/96, when ending stocks were 426 million bushels, the season average price was $3.24. But during the spring of 1996, corn prices were over $5.00 per bushel. If ending stocks were 394 million bushels in 1998/99, the season average price would most likely be above $3.22. Prices would have to increase to reduce use, because the industry considers a 15-day supply to be an inadequate reserve.

Scenario #3

If supply remains the same but exports decline to 1,600 million bushels, then total use will decrease to 9,238 million bushels and ending stocks will be 1,501 million bushels. Days supply will be 59, and the season average price would be about $2.27 per bushel (Figure 6).

Comparing the three scenarios gives producers some idea of what kind of prices to expect during the season. These potential outcomes can be compared to pricing opportunities in previous years to help formulate a pricing strategy for the current crop.

Table 6. Estimated United States corn supply, demand, stocks, and price

Item	Units	98/99	98/99	98/99	98/99
		----------Scenario----------			
		Most Likely	Yield Increase	Yield Decrease	Use Decrease
Planted Acreage	mil ac	80.8	80.8	80.8	80.8
Harvested Acreage	mil ac	74.2	74.2	74.2	74.2
Yield	bu/ac	128.3	136.0	116.3	128.3
Supply					
Beginning Stocks	mil bu	1,209	1,209	1,209	1,209
Production	mil bu	9,520	10,091	8,629	9,520
Imports	mil bu	10	10	10	10
Total Supply	mil bu	10,739	11,310	9,848	10,739
Use					
Feed & Residual	mil bu	5,765	5,765	5,765	5,765
Exports	mil bu	1,816	1,816	1,816	1,600
Food, Seed & Industrial	mil bu	1,873	1,873	1,873	1,873
Total Use	mil bu	9,454	9,454	9,454	9,238
Ending Stocks	mil bu	1,285	1,856	394	1,501
Days Supply	days	50	72	15	59
Percent Use	%	14	20	4	16
Loan Rate	$/bu	1.89	1.89	1.89	1.89
U.S. Season Average Price	$/bu	2.38	2.12	3.22	2.27
Va. Season Average Price	$/bu	2.61	2.35	3.45	2.50

DEVELOPING A PRICING STRATEGY

The supply and demand estimates developed for Table 6 give an indication of the expected average price level during the marketing year. Many of the estimates of acres, yield, feed use, and exports may change between April, when the original estimates are made, and fall harvest. But a pricing

strategy must be developed based on the information available in April, although the strategy can be adjusted as the season progresses.
The initial pricing strategy should be developed by making three comparisons with previous years. These comparisons involve ending stock levels, price levels of December corn futures, and historical December corn futures price distribution. The ending stock comparison determines the probable price direction. The December corn futures prices from previous years help establish the high price target, and the historical distribution helps determine the level of aggressiveness in pursuing the pricing strategy.

I. Ending Stock Comparisons

The estimated ending stocks for the upcoming year can be compared to ending stocks in the current marketing year to determine likely price direction. If estimated ending stocks are larger than current year ending stocks, the general direction of prices will be down. If estimated ending stocks are smaller than current year ending stocks, the general direction of prices will be up. If the difference between estimated and current ending stocks is large (300 million or more bushels), the prices should move in the anticipated direction unless some estimates of supply and demand change substantially from the initial April estimates.

The expected price direction helps establish when pricing should occur during the season. If the price direction is down, the better pricing opportunities will generally occur during the spring and early summer. If the price direction is up, the better pricing opportunities will generally occur during the summer and after harvest during the marketing year.

Several examples may help clarify the role of price direction in developing a pricing strategy. In the spring of 1995, the *Prospective Plantings* report indicated producers were going to plant 75.3 million acres of corn, approximately 4.0 million acres less than 1994. Using trend line yields and constant use, the estimated ending stocks in the 1995/96 season were approximately 500 million bushels less than ending stocks in 1994/95. This estimated reduction in ending stocks was a strong indication that prices would go up, and hence, producers should not forward price early in the season. In fact, December 1995 corn futures were about $2.50 during April 1995. By harvest 1995, December futures were over $3.00, and by spring 1996, cash prices increased to over $5.00.

In the spring of 1996, producers planted 8 million more acres than in 1995. Based on these increased acres and typical yields, ending stocks for 1996/97 were estimated to increase by over 400 million bushels. The increase in ending stocks indicated prices would decline during the season if yields were normal. During April 1996, producers had many opportunities to price December corn futures between $3.30 and $3.50 a bushel. By harvest, prices had declined to $2.75 a bushel.

The April 1998 estimate of ending stocks for the 1998/99 marketing season is 1,285 million bushels (Table 2). The ending stocks for 1997/98 are 1,209 million bushels. This small difference in estimated ending stocks indicates a slight downward direction in price for 1998/99 compared to 1997/98. In fact, it indicates a very similar supply and demand situation that will probably produce pricing opportunities very similar to 1997/98.

Many producers are hesitant to price early in the production season, even if the expected price direction is down. If actual yields are poor, total production will decline, ending stocks will decrease, and prices will increase. In fact, between 1982 and 1997, the best pricing opportunities occurred during the June-July-August period in 11 of the 16 years (see December corn futures charts in the Appendix). These pricing opportunities are usually related to weather scares and may only last a few

days. They also tend to come when current pricing opportunities are at a good level compared to historical prices. Producers need to remember that the probability of below-average yields is smaller than the probability of above-average yields. Hence, when the expected price direction is down, producers need to strongly consider forward pricing one-quarter to one-half of expected production. If the potential for higher prices during the summer is of great concern, producers should use options to leave the upside open while establishing a floor under the price.

II. Setting A Price Target

The estimated ending stocks can also be used to help establish a price target by comparing pricing opportunities in years with similar ending stock levels. For example, the estimated ending stocks for 1998/99 are forecast at 1,285 million bushels, a level very similar to 1997/98. Hence, the producer should look at the December 1997 futures contract prices to determine potential upside pricing opportunities. The December 1997 chart (see Appendix) reveals that prices peaked at about $2.95 in both the late spring and early fall. Hence, a reasonable pricing objective for selling a portion of the 1998 crop seems to be $2.95 using the December 1998 futures contract. The only other recent year with ending stocks somewhat similar to 1998/99 was 1991/92 when ending stocks were 1,100 million bushels. Analysis of the December 1991 futures contract indicates the highest prices occurred in July at approximately $2.70. Since the estimated ending stocks for 1998/99 are slightly larger than 1997/98 when prices peaked at $2.95 and since prices only reached $2.70 when ending stocks were smaller in 1991/92, the pricing target for 1998/99 should be set between $2.70 and $2.95 a bushel.

When December 1998 futures reach this range, producers need to seriously consider forward pricing one-quarter to one-third of their expected production. Given the strong probability of higher prices during June through August, producers should not be too aggressive in forward pricing early in the season because no strong price direction is indicated by the estimated ending stocks. If the ending stocks indicate a strong downward trend in price, producers should forward price up to one-half their expected production.

In April 1998, December 1998 corn futures were trading in the $2.65 to $2.75 range. Based on the previous analysis, the producer should seriously consider selling one-quarter of expected production at December futures prices of $2.75. After selling one-quarter of expected production in the spring, the producer should continue to monitor the market and hope for an opportunity to price another one-quarter at $2.90 or better during the June-July-August period.

The 1994/95 season can be used as another example of how previous years with similar ending stocks can be used to help establish a price target. In April 1994, producers reported that they expected to plant 78.8 million acres of corn compared to 73.2 million in 1993. With increased acreage, normal yields, and constant demand, ending stocks in 1994/95 were estimated at approximately 1,500 million bushels: an increase of 649 million bushels compared to the ending stocks in 1993/94 of 851 million bushels. The increase in estimated ending stocks was a strong signal that the general direction in price would be down and that producers should consider pricing aggressively early in the season. But at what price level? Ending stocks in 1990/91 were 1,520 million bushels, very similar to those forecast for 1994/95. The December 1990 corn futures contract should give the producer a good idea of what price levels to expect during 1994. The December 1990 chart indicates that prices traded between $2.60 and $2.90 from April to July 1990. Most of the time they traded between $2.65 and $2.80. They peaked at $2.90 for two days in July, and then rapidly declined to $2.25 by September. Hence, the December 1990 chart indicates the producer should be willing to price in the $2.65 to $2.80 range in the spring, and because ending stocks were expected to increase from 1993/94, up to half of expected production should be priced at this level.

In April 1994, December 1994 futures were trading at $2.60. Since this price was a little below the target of $2.65 to $2.80, the producer could wait and *hope* for better prices later. But this strategy would involve substantial risk, given the large expected increase in ending stocks. By June 1994, prices traded between $2.60 and $2.70 a bushel, and traded above $2.70 for three days. At this point the producer should sell up to half the expected production. Like the 1990 season, prices dropped rapidly in July 1994 and ended at less than $2.20 at harvest.

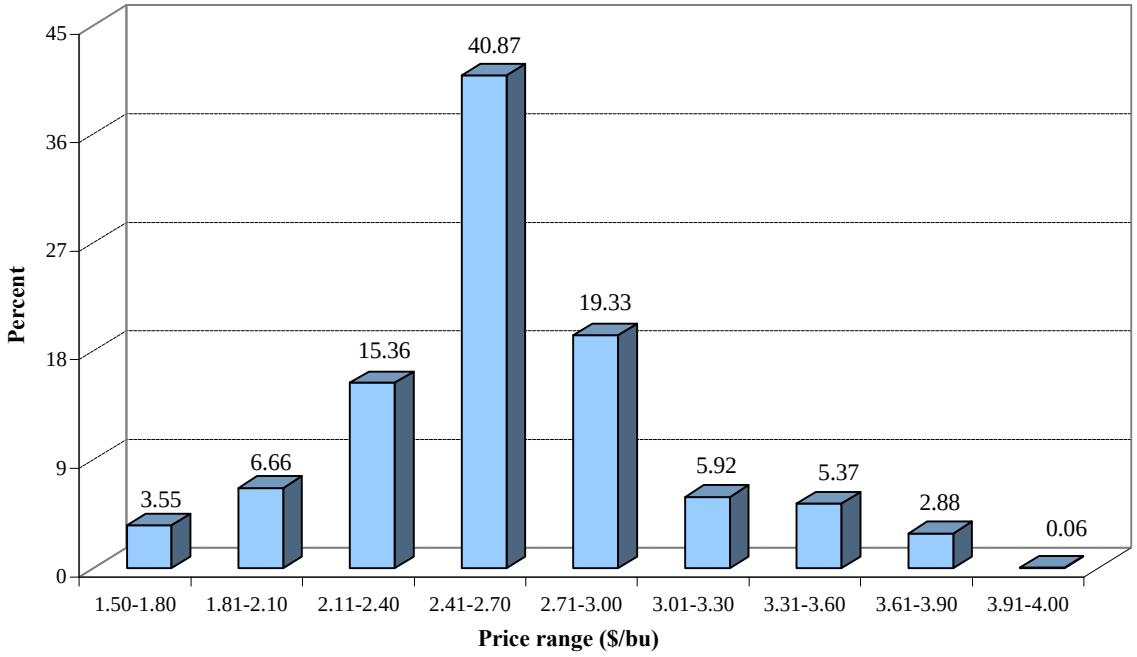
III. Historical Futures Price Distribution

The historical distribution of December Corn Futures Prices from 1980 to 1996 (Figure 8) is based on more than 7,000 daily closing prices. Each vertical bar indicates the percentage of time December futures traded in the price range shown on the horizontal axis. For example, the probability of prices trading between $2.41 and $2.70 is 41.3 percent. The probability of December corn futures closing below $2.10 is 10.21 percent (6.66 + 3.55). The probability of December corn futures trading above $3.31 is only 8.31 percent. This distribution of prices has been very stable for the last 18 years. The price distribution can help producers evaluate current pricing opportunities in an historical context. When producers have an opportunity to price above $3.00 in December corn futures, they should realize the probability of getting prices higher than $3.00 is only about 14 percent (5.92 + 5.37 + 2.88 + .06). Any December futures price greater than $2.70 is in the top third of all historical December futures prices since 1980. All pricing opportunities above $2.70 should be evaluated carefully, because the probability of prices rising substantially higher are not good. Pricing opportunities above this level should not be passed up, unless ending stocks indicate a strong upward trend in price and futures prices in previous years with similar ending stocks indicate a substantially higher price target is justified.

In April 1998, the ending stocks estimate indicates a slight downward trend in price and a December futures price target of $2.70 to $2.95. Hence, in April 1998 when December 1998 futures reached $2.70 per bushel, producers should have sold a portion of their expected production. The price direction is expected to be down. The $2.70 price meets the target price for 1998, and the $2.70 price is in the top third of all historical prices. Based on information available in April, $2.70 was a good price, and producers should have sold at least one-quarter of their expected production at this price.

All pricing strategies must be implemented in an environment of substantial risk. Yields may be considerably higher or lower than anticipated. Exports may increase or decrease. Some of these variables are outside producers' control. In such circumstances, the best the producer can do is make reasonable estimates based on the available information.

Figure 8. Price distribution December corn futures: 1980-1996



The estimates developed in this guide are initially made in April. As the growing season progresses, some of the supply and demand estimates will change. USDA releases a new WASDE around the 10th to the 12th of each month. These are available via the internet at *http://www.usda.gov/nass/*. These reports should be used to update the supply and demand estimates in Table 6. As the estimated ending stock numbers change, producers can make the appropriate adjustments to their pricing strategy.

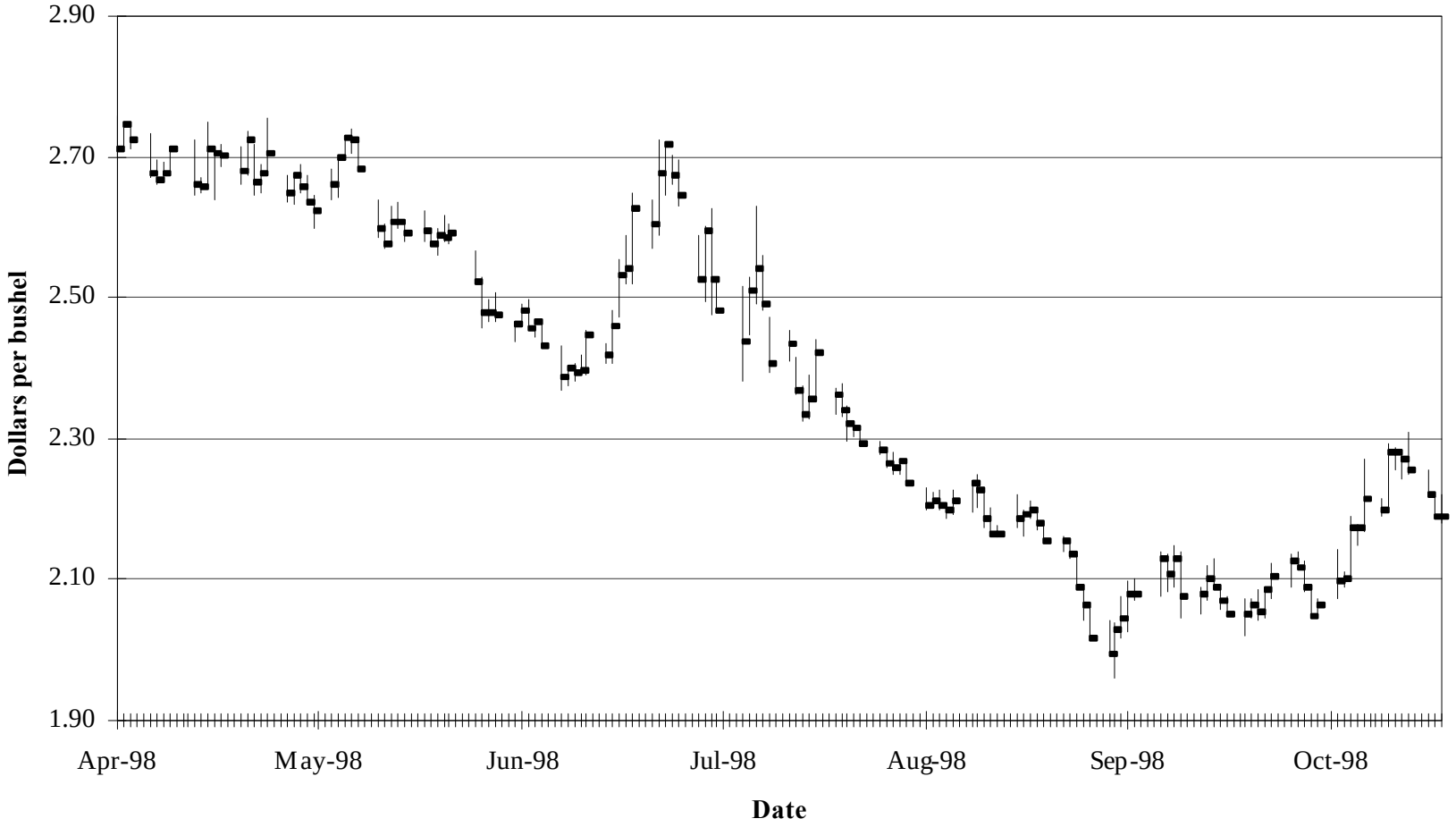
SUMMARY

The supply and demand data in this publication make it possible to put current estimates of supply and demand in their proper prospective. An understanding of the supply and demand tables permits producers to evaluate the likely impact of changing acreage, yields, feed use, and exports on ending stocks. The ending stocks relationship permits producers the opportunity to evaluate the likely impact of these changes on season average price and to improve the probability of getting a good price.

The ending stocks estimate can be used to help establish the price direction for the year. The ending stocks estimate can also be used to establish price targets by comparing previous years with similar ending stock levels. The futures price distribution provides producers with a means to evaluate current pricing opportunities in light of historical prices. Using these three indicators together—price direction, target price, and historical probability—the producer can develop pricing strategies that have a good probability of success under the current supply and demand circumstances.

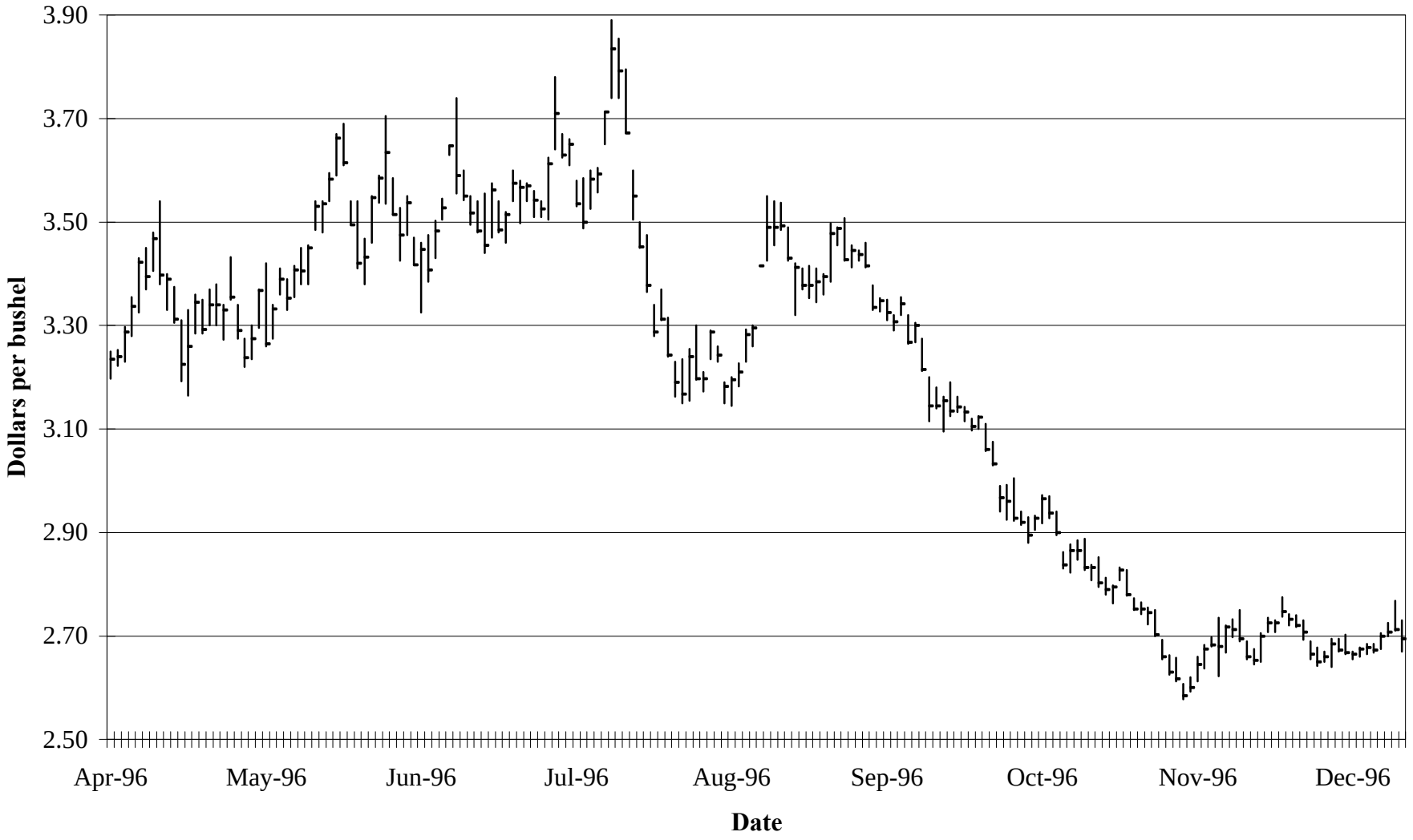
APPENDIX:
DECEMBER
CORN FUTURES
1982-1998

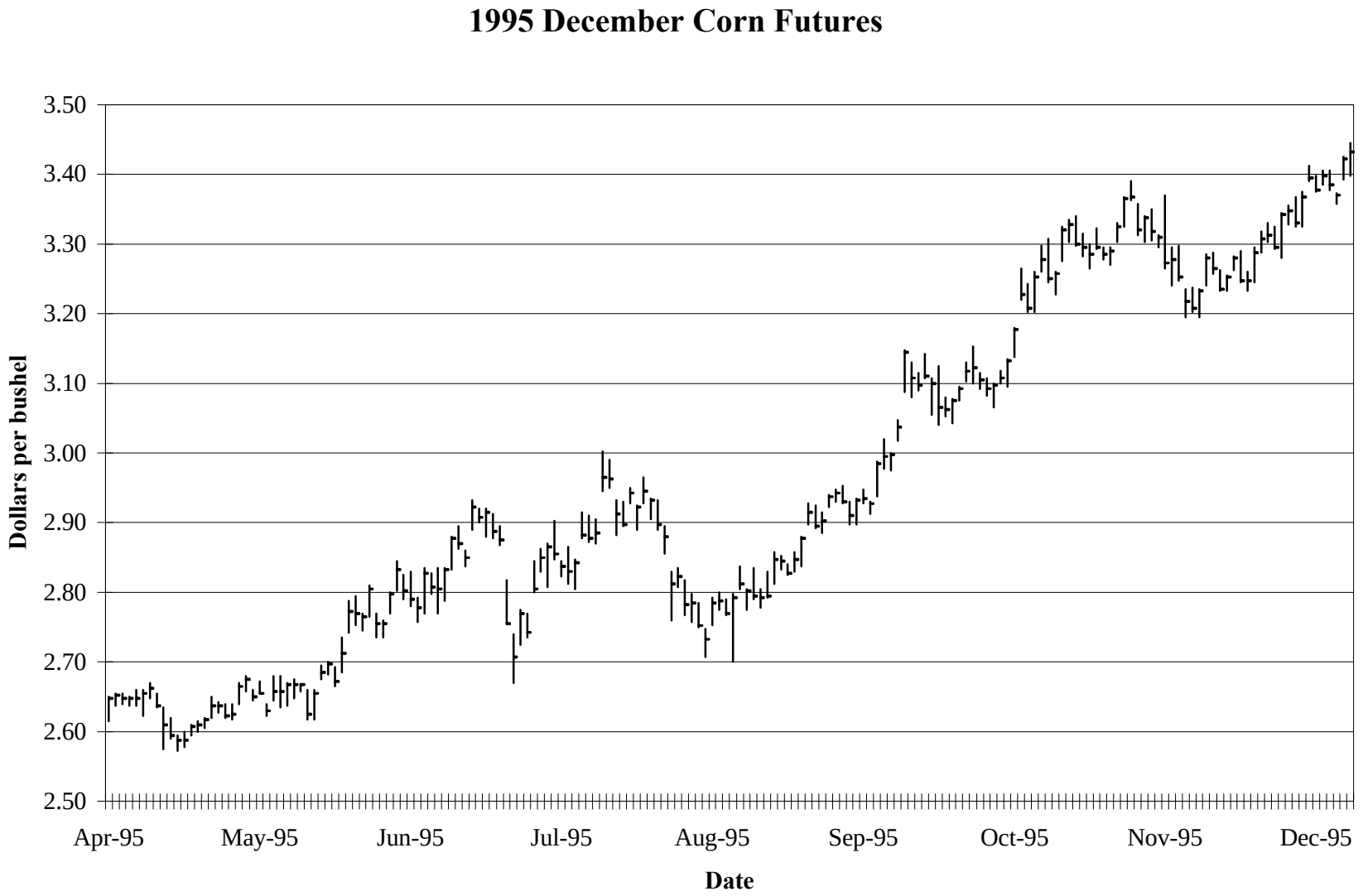
1998 December Corn Futures



1997 December Corn Futures

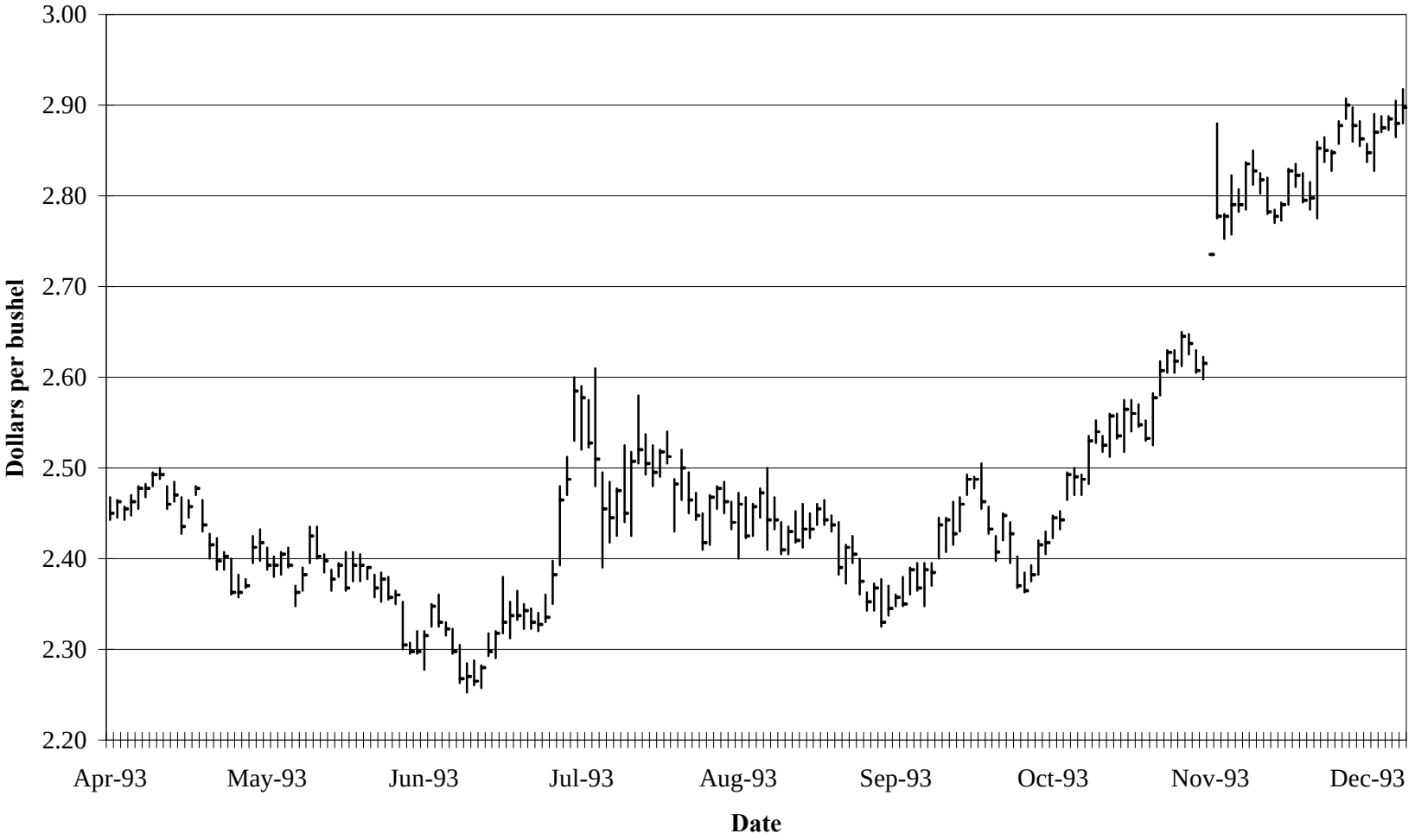
1996 December Corn Futures



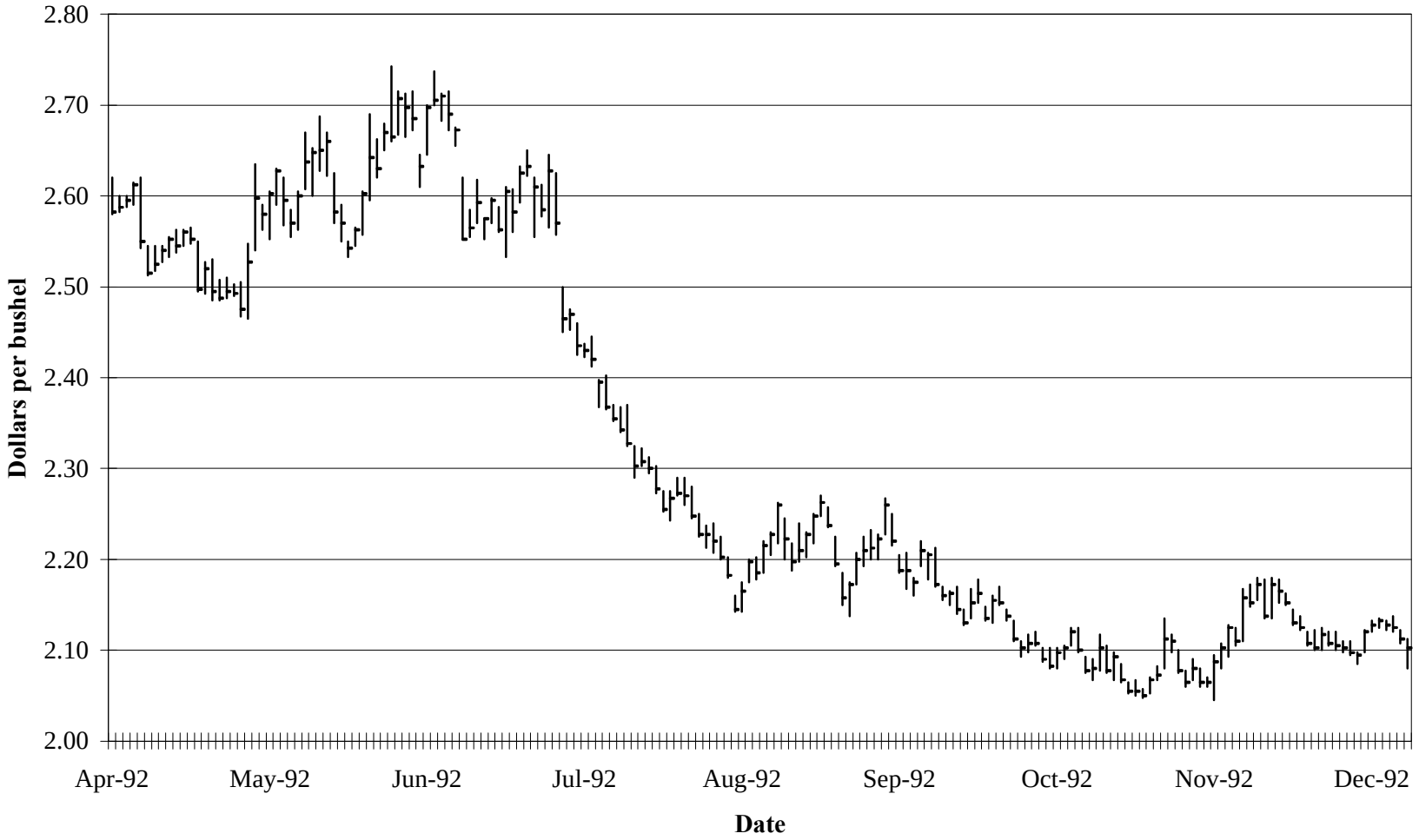

1995 December Corn Futures
Dollars per bushel
3.50
3.40
3.30
3.20
3.10
3.00
2.90
2.80
2.70
2.60
2.50
Apr-95
May-95
Jun-95
Jul-95
Aug-95
Sep-95
Oct-95
Nov-95
Dec-95
Date

1994 December Corn Futures

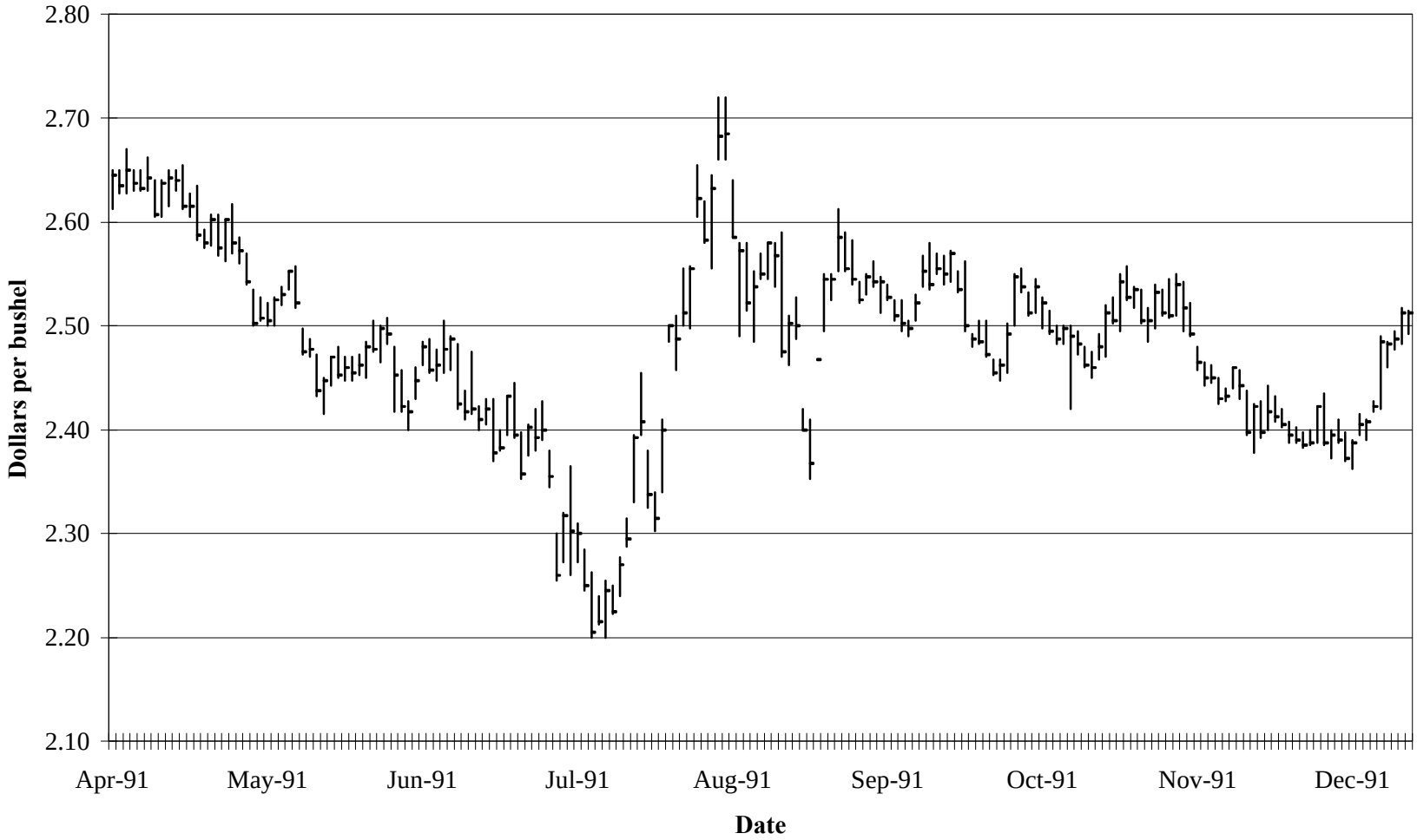
1993 December Corn Futures



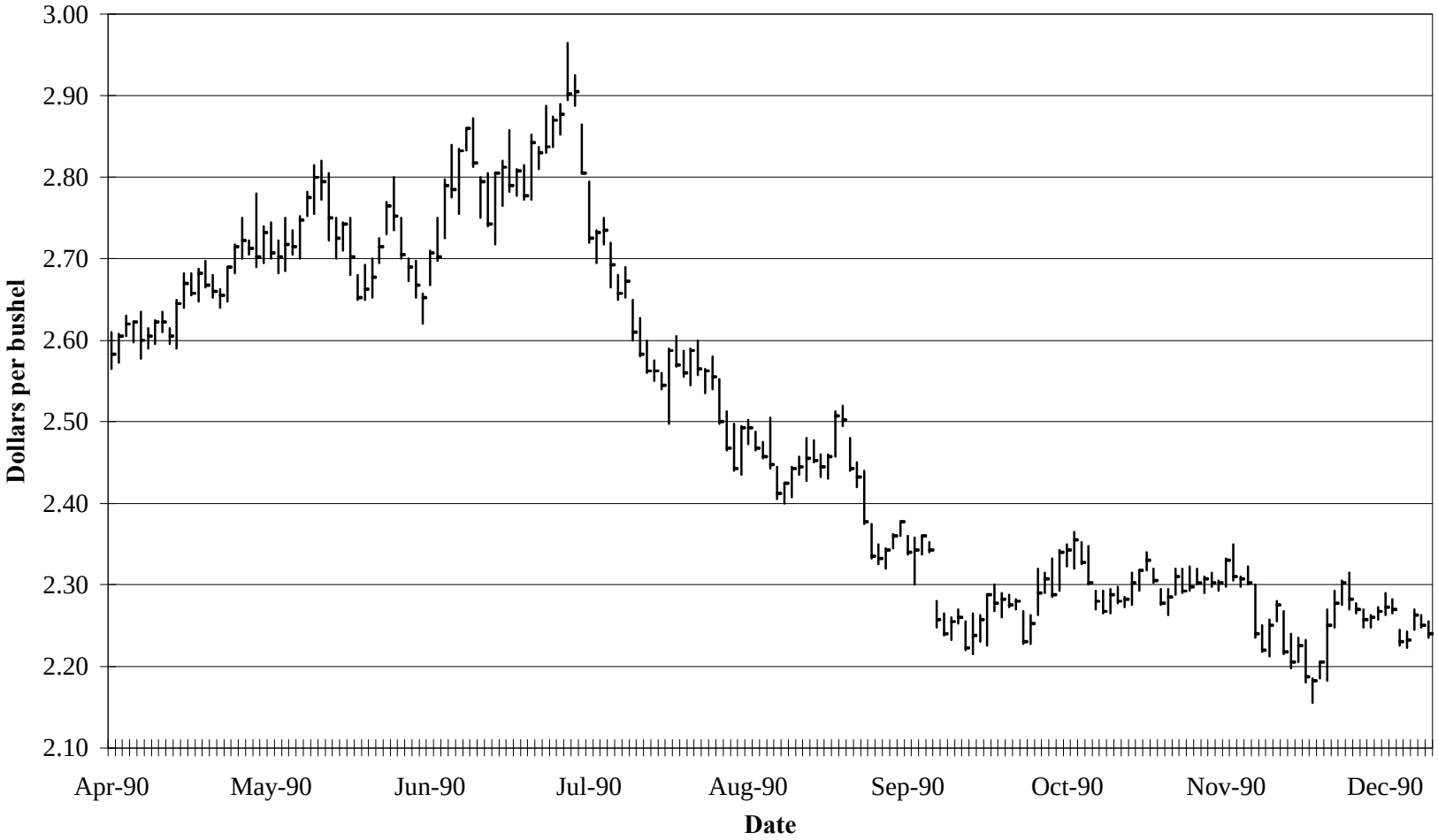
1992 December Corn Futures



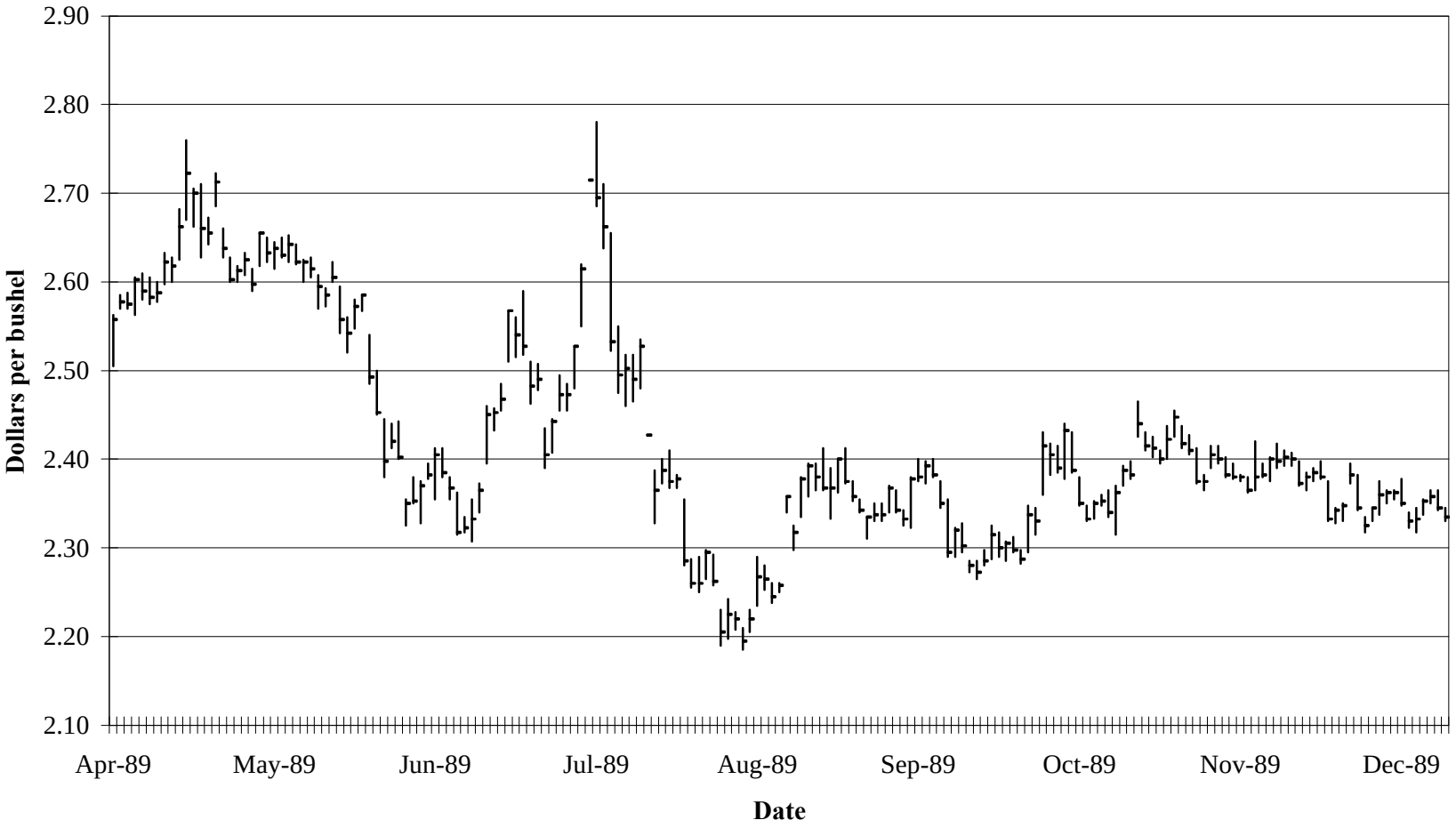
1991 December Corn Futures



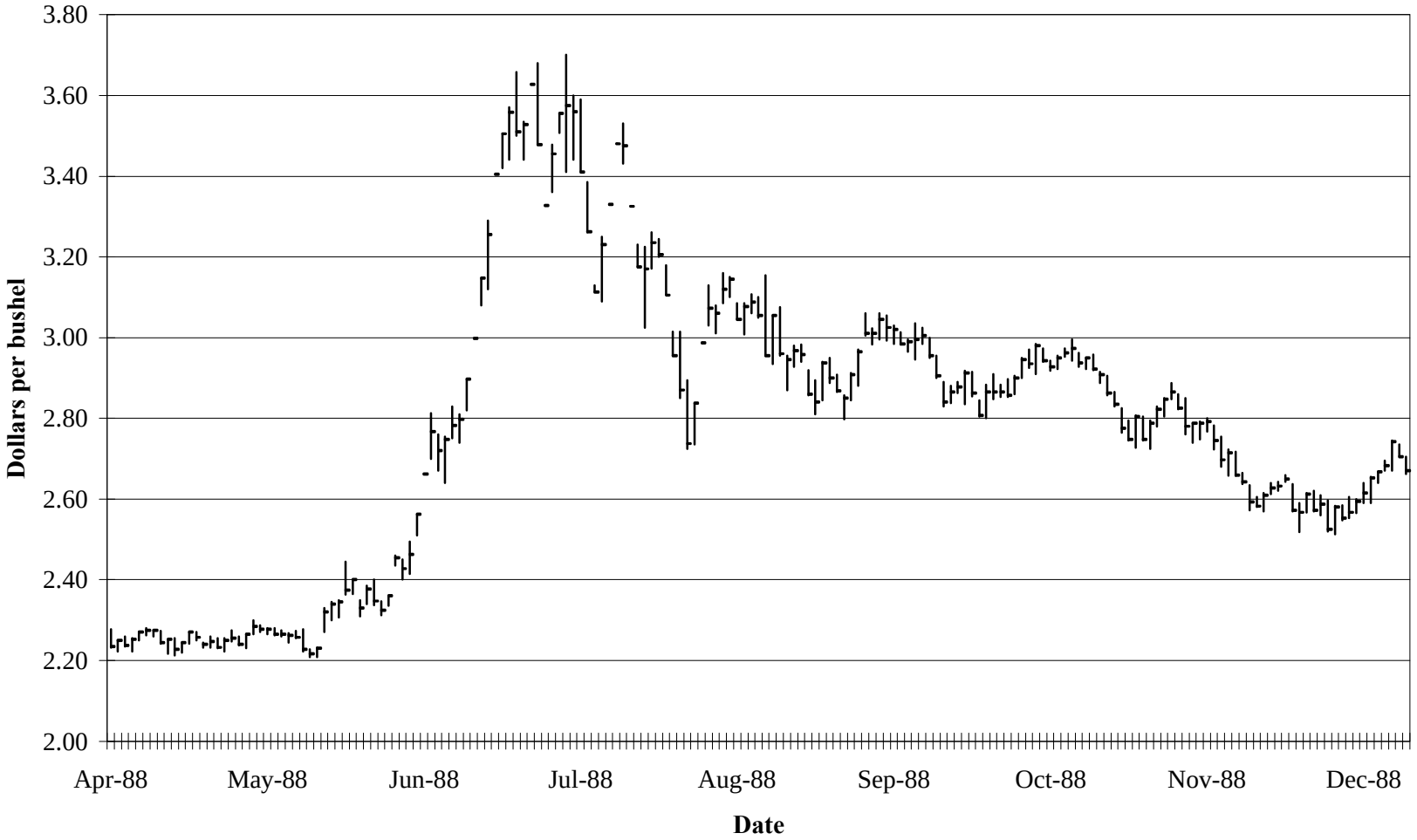
1990 December Corn Futures



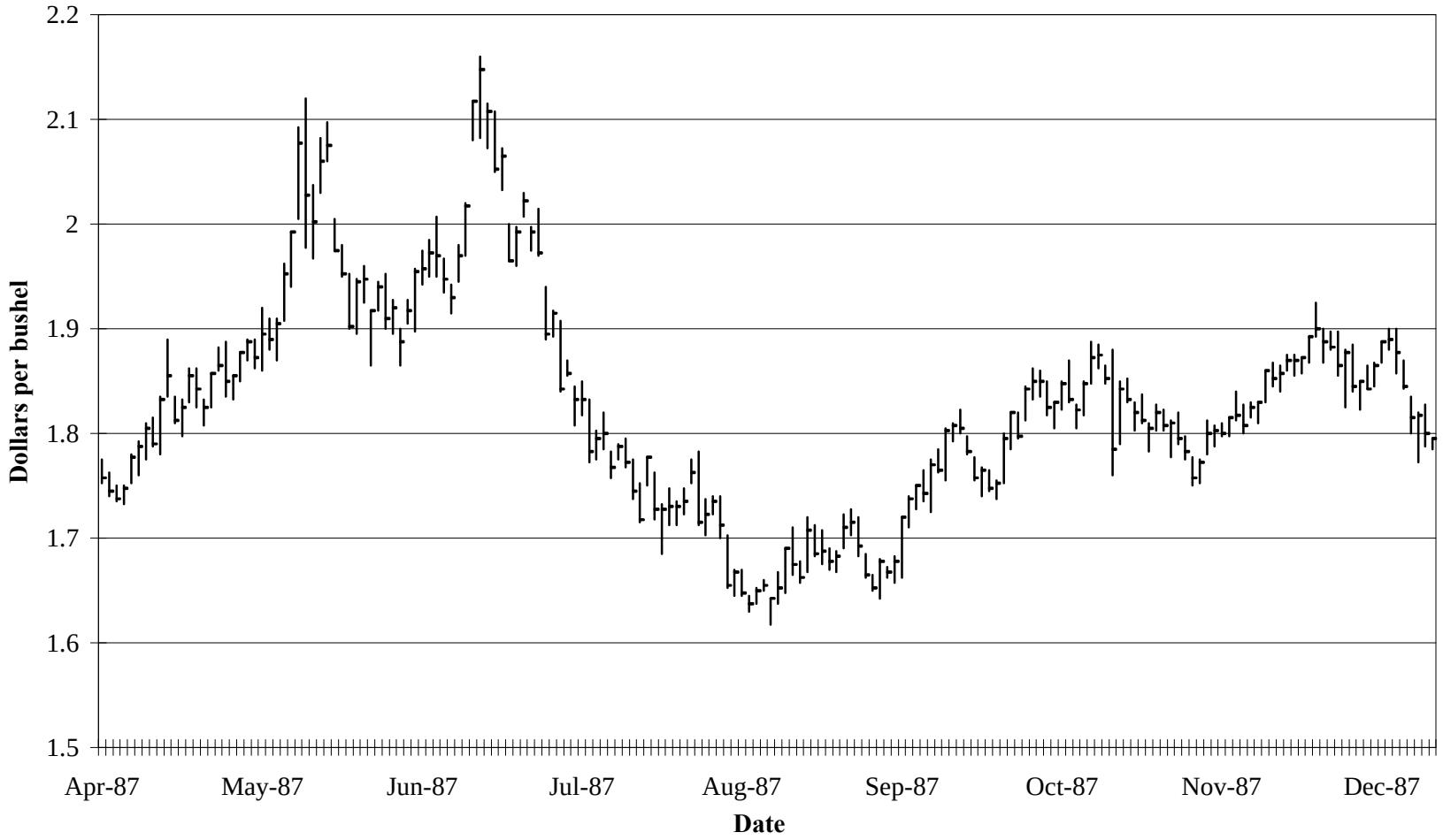
1989 December Corn Futures



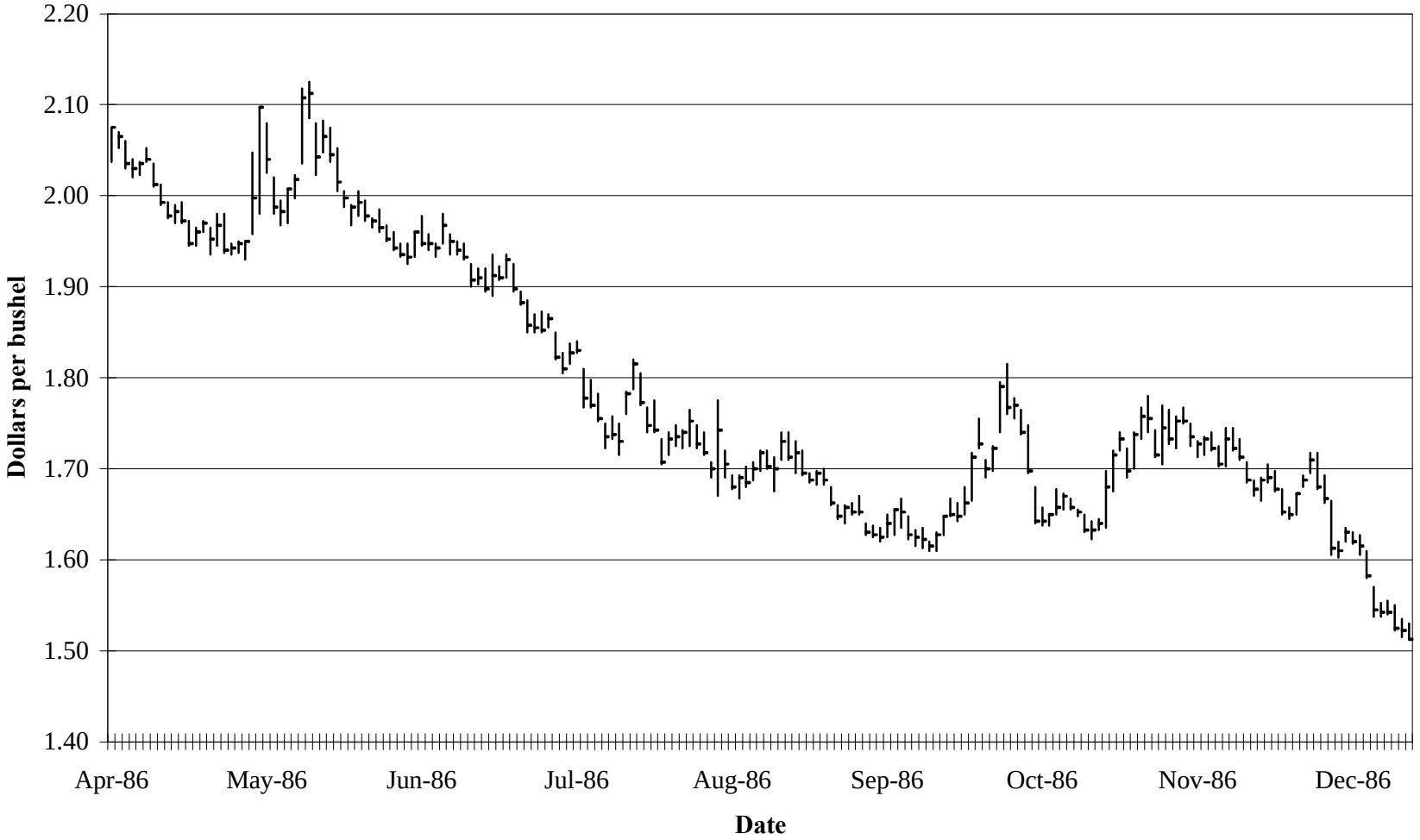
1988 December Corn Futures



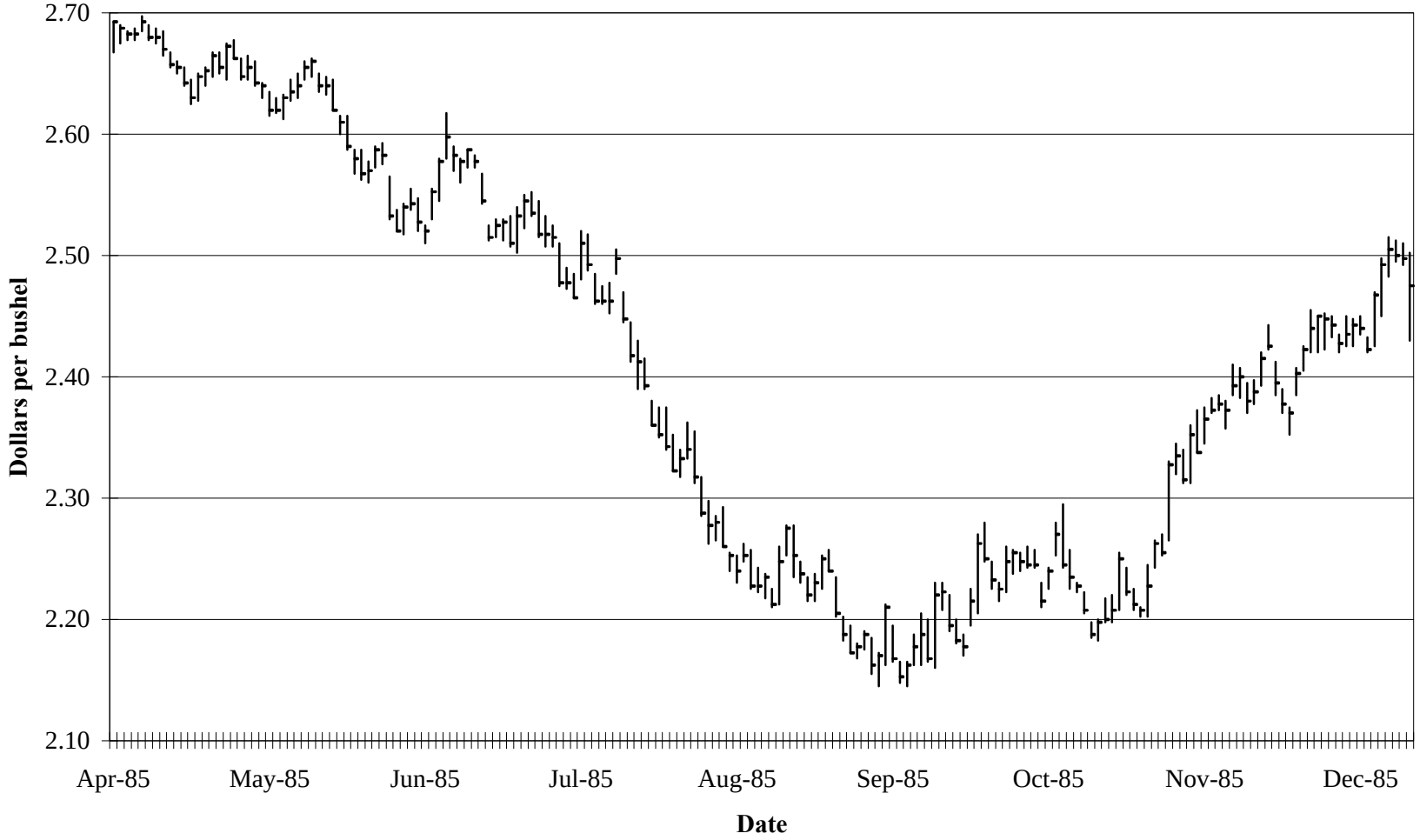
1987 December Corn Futures



1986 December Corn Futures

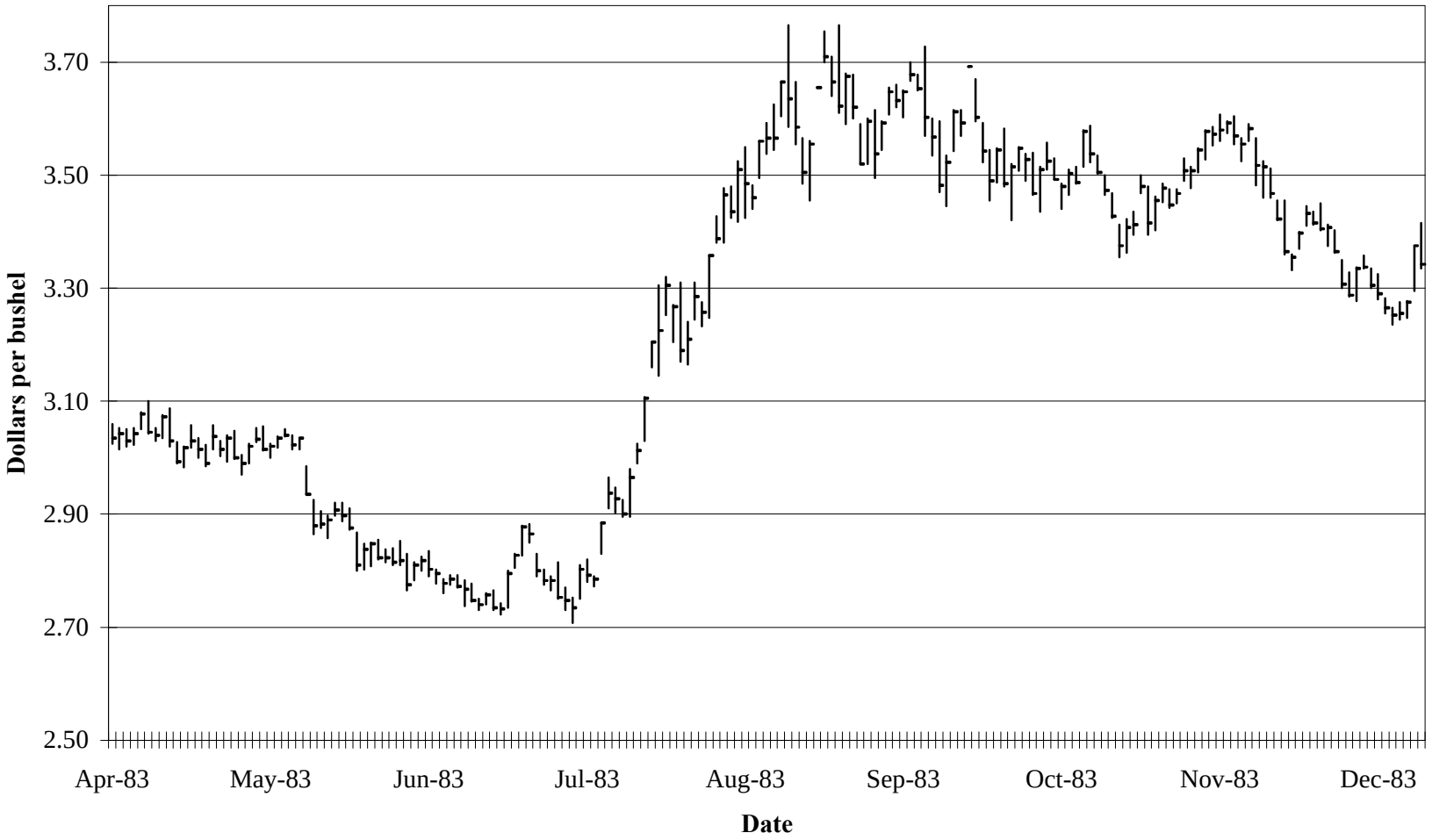


1985 December Corn Futures



1984 December Corn Futures

1983 December Corn Futures



1982 December Corn Futures