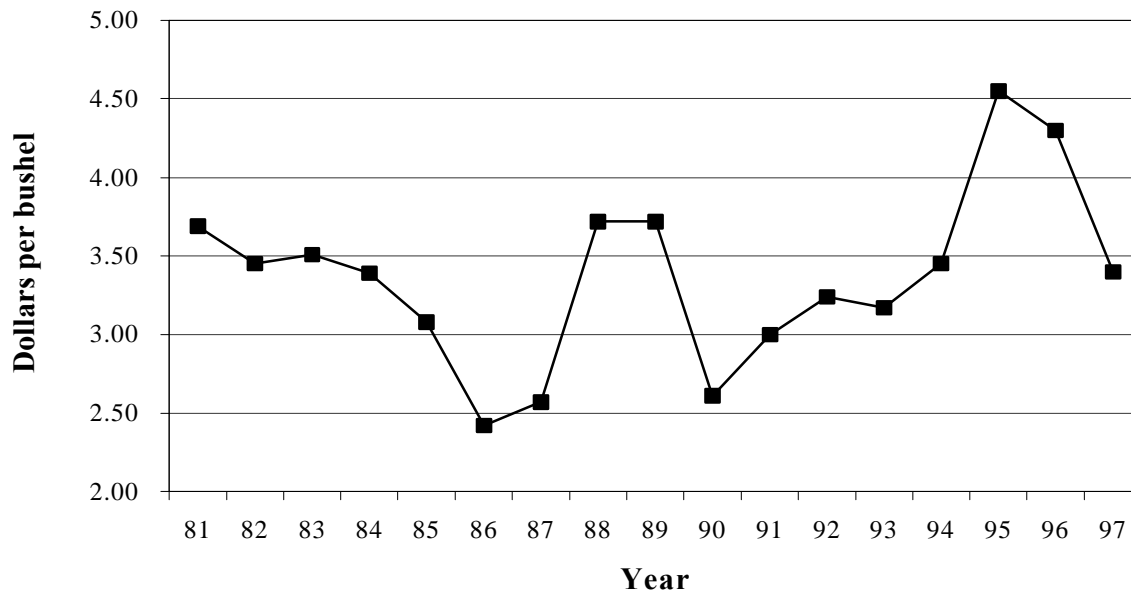# Wheat Pricing Guide

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REAP R039
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INTRODUCTION

During January, wheat producers are faced with production and marketing decisions that require a forecast of season average price. The purpose of this publication is to provide historical data and a price forecasting model that will provide producers with a means to estimate season average price. The historical data in Table 1 provides a benchmark against which to evaluate current acreage, production, use, stocks, and price. The price forecasting model provides a method to estimate the upcoming season average price under various conditions.

The publication is divided into four sections. The first section, Supply and Demand, explains how a supply and demand table is constructed. A producer who understands the basics of a supply and demand table will understand the major factors that influence the price of wheat. The second section, Forecasting Model, describes the price forecasting model and explains how to forecast the United States season average price using the 1998/99 crop year as an example. The third section, Price Sensitivity Analysis, explains the historical accuracy of the price estimates and how to use historical information to predict what can happen to wheat prices 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 ending stocks and season average price, forward pricing opportunities, and the development of a pricing strategy.

SUPPLY AND DEMAND

Table 1 is the United States wheat supply and demand table for the last nine years. The table is divided into four sections: Supply, Demand, Ending Stocks, and Price. Since Table 1 will be used in the price forecasting model, understanding the four sections before using the model is important.

I. Supply

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

Production is the bushels of wheat produced during the crop year. Production depends on the number of acres planted, harvested, and yield per harvested acre. Winter wheat planted in the fall will be harvested and marketed in the upcoming crop year. For example, winter wheat planted in the fall of 1996 is harvested in the summer of 1997 and marketed during the 1997/98 crop year.

The **Imports** category represents the wheat brought into the United States from other countries. Imports depend on the supply of wheat in the United States and the price of substitutes such as corn and barley.

II. Demand

Total demand is equal to the estimated wheat uses for the next 12 months. Use is divided into three categories: feed and residual; food, seed, and industrial; and exports. Level and variability of each use category since 1970 is shown in Figure 1.

Table 1. U.S. Wheat 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	76.6	77.2	69.9	72.3	72.1	70.3	69.1	75.6	71.0
Harvested Acreage	mil ac	62.2	69.3	57.7	62.4	63.0	61.8	60.9	62.9	63.6
Yield/Harvested acre	bu/ac	32.7	39.5	34.3	39.4	38.4	37.6	35.8	36.3	39.7
SUPPLY										
Beginning Stocks	mil bu	702	538	868	475	530	568	507	376	444
Production	mil bu	2037	2730	1980	2467	2396	2321	2183	2285	2527
Imports	mil bu	23	36	41	70	109	92	68	92	93
Total Supply	mil bu	2761	3304	2889	3012	3035	2981	2757	2753	3063
DEMAND										
Feed & Residual	mil bu	139	482	245	194	272	344	152	314	293
Food, Seed, Industrial	mil bu	853	883	887	934	968	942	988	994	1007
Exports	mil bu	1232	1070	1282	1354	1228	1188	1241	1001	1040
Total Demand	mil bu	2224	2435	2414	2482	2467	2474	2381	2309	2340
ENDING STOCKS	mil bu	538	868	475	530	568	507	376	444	723
Days Supply	days	88	130	72	78	84	74	58	70	113
Percent Use	%	24	36	20	21	23	20	16	19	31
PRICE										
Loan Rate	$/bu	2.06	1.95	2.04	2.21	2.45	2.58	2.58	2.58	2.58
Season Average Price	$/bu	3.72	2.61	3.00	3.24	3.17	3.45	4.55	4.30	3.40
Price/Loan	ratio	1.81	1.34	1.47	1.47	1.29	1.34	1.76	1.67	1.32

Source: *Agricultural Outlook*, WASDE, at *http://www.mannlib.cornell.edu/usda/suda.html*

Exports is the largest component of the demand for wheat. More than 40 percent of the wheat produced during the 1997/98 crop year was exported. Wheat exports have averaged 50 percent of the wheat produced over the last 9 years. Wheat exports fluctuate substantially from year to year. The amount of wheat exported depends on exchange rates, production of wheat in other exporting countries, government programs in the United States and other countries, and world-wide demand for wheat.

Figure 1. Wheat uses
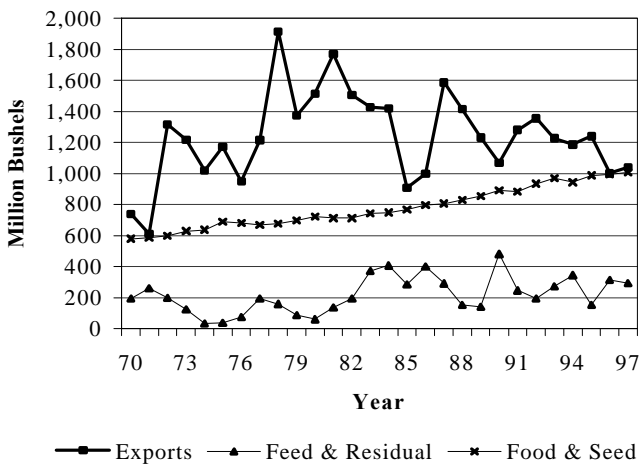
The **Food, Seed, and Industrial** (FSI) category is the second largest component of wheat use and is largely comprised of the demand for flour. The FSI category is not as variable as exports or feed use. It increases at a rate similar to that of the United States population.

Feed and Residual is the smallest component in wheat use. Feed use is the amount of wheat fed to livestock and poultry. The amount of wheat used for feed depends upon the number of animals, the price of corn, and the profitability of feeding livestock and poultry. Most wheat feeding occurs primarily in June, July, and August when wheat prices are within 20 to 40 cents of corn prices. The residual portion of the feed and residual category is the difference between disappearance attributed to feed use and unknown disappearance.

III. Ending Stocks

Ending Stocks represents the bushels of wheat left over at the end of a marketing year when total use is subtracted from total supply. If ending stocks are greater than beginning stocks, supply has increased relative to demand, and prices will decrease. If ending stocks are lower than beginning stocks, supply has decreased relative to demand, and prices will increase.

Ending stocks are measured several ways by industry analysts. Since total use continues to increase over time, the same level of ending stocks over time is actually a smaller reserve compared to increased use. Hence, analysts frequently calculate two measures of ending stocks relative to use: Days Supply and Percent Use.

Days Supply represents the number of days ending stocks would last at the current rate of use. To calculate days supply, first total demand is divided by 365 days. Ending stocks are then divided by use per day to determine days supply.

For example, total demand in 1996/97 was 2,309 million bushels and ending stocks were 444 million bushels. Use per day was 6.326 million bushels (2,309/365). Days Supply was 70 (444/6.326). In other words, the stocks would last 70 days at the current rate of use experienced during 1996/97.

Percent Use is ending stocks divided by total demand expressed as a percent. In 1996/97, percent use was 19 percent (444/2,309 * 100). Like ending stocks, as days supply and percent use decline, prices increase and vice versa. Days supply and percent use are good measures for comparing supply

and demand over long time periods, like 10 to 25 years. Ending stocks expressed in bushels is more appropriate for shorter time periods.

IV. Season Average Price

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

Season average price is affected by ending stocks. If ending stocks are low, supply is short relative to demand, and the season average price will tend to be high. In 1995/96 stocks were 376 million bushels, and price was $4.55 per bushel. In 1990/91, stocks were 868 million bushels and season average price was $2.61 per bushel. If ending stocks are large, supply is abundant relative to demand, and the season average price will be low.

The relationship between ending stocks and price can be graphed to create an estimated price curve. Ending stocks are on the horizontal axis and season average price is on the vertical axis (Figure 2). The price curve was obtained statistically by analyzing the historical relationship between season average price and the natural log of ending stocks. To use the equation in Figure 2, the natural logarithm of ending stocks (Ln[444]=6.096), is multiplied by 1.997 and subtracted from 16.051. For example, the calculation in 1996/97 would be

$$\textbf{Price} = 16.051 - 1.997 * \text{Ln (Ending stocks)}$$
$$= 16.051 - 1.997 * \text{Ln}(444)$$
$$= 16.051 - (1.997 * 6.096)$$
$$= 16.051 - 12.173$$
$$= \$3.88$$

The price equation explains 61 percent of the variation in season average price from one year to the next.

Actual prices deviate from the price curve for several reasons. Since the United States exports 50 percent of the wheat it produces, world stocks of wheat can have a significant effect on the United States price. Second, the price and availability of corn, soybeans, and other feed grains can affect wheat prices. And third, government programs, such as the export enhancement program, can affect price.

FORECASTING MODEL

During January, a producer can develop an estimate of season average price for the upcoming crop year. By following the steps in the next four sections, producers can estimate supply, demand, and ending stocks for the upcoming crop year. Producers can use the estimated ending stocks to estimate season average price with the price equation in Figure 2. The estimated season average price can be used to help develop a pricing strategy for the season.

Table 2 will be used to demonstrate how the price forecasting model could be used to estimate season average price in 1998/99.

Figure 2. Wheat stocks and price

Price = 16.051 -1.997 * Ln(Ending Stocks)

$R^2 = 0.61$

Year	Stock	Price
89-90	536	3.72
90-91	869	2.61
91-92	476	3.00
92/93	531	3.24
93-94	568	3.17
94-95	507	3.45
95-96	376	4.55
96-97	444	4.30
97-98	680	3.40
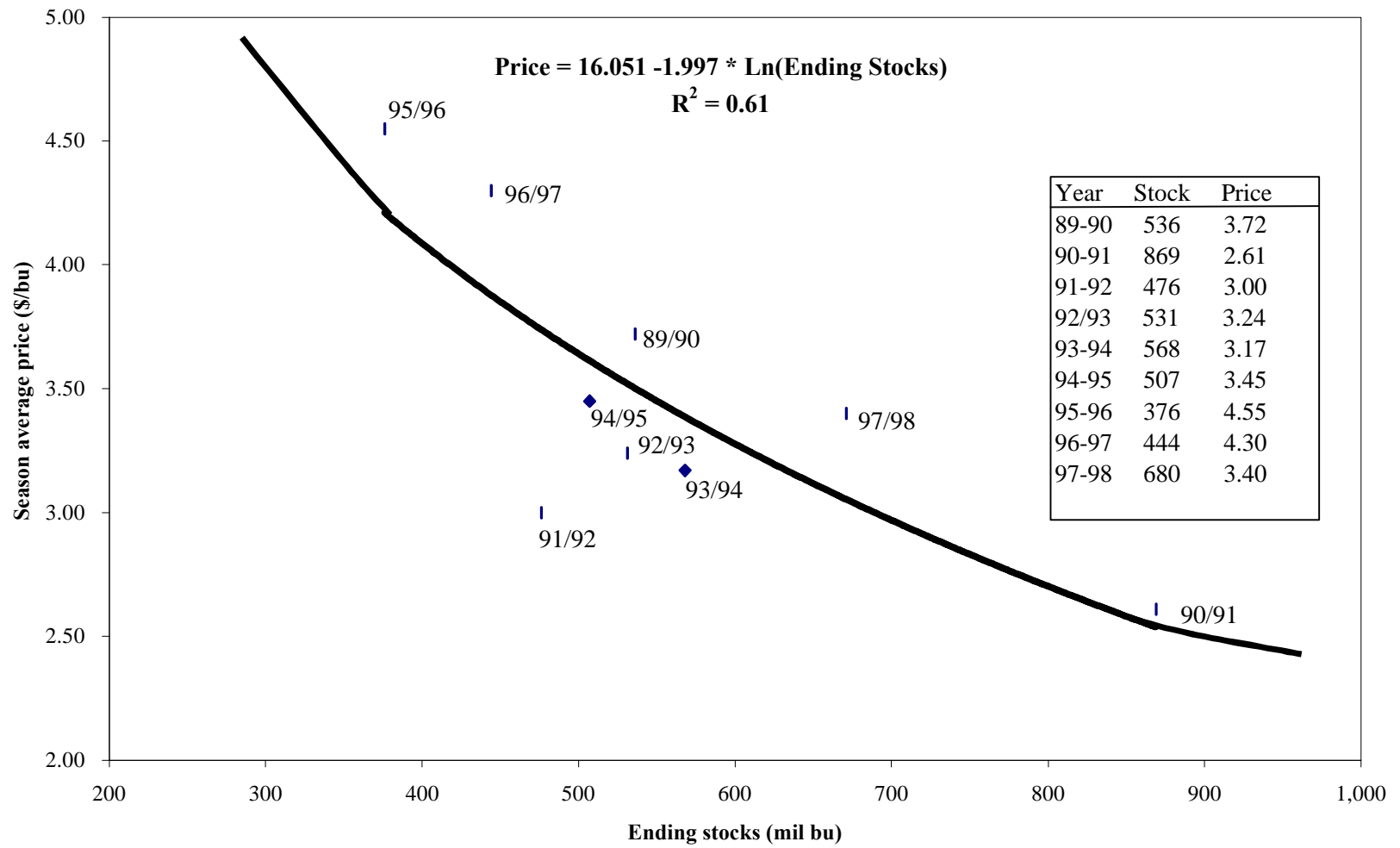
Table 2. Estimated United States wheat supply, demand, stock, and price

ITEMS	UNITS	95/96	96/97	97/98	98/99
Planted Acreage	mil ac	69.1	75.6	71.0	
Harvested Acreage	mil ac	60.9	62.9	63.6	
Yield	bu/ac	35.8	36.3	39.7	
Supply					
Beginning Stocks	mil bu	507	376	444	
Production	mil bu	2,183	2,285	2,527	
Imports	mil bu	68	92	96	
Total Supply	mil bu	2,757	2,753	3,061	
Use					
Feed & Residual	mil bu	153	314	300	
Exports	mil bu	1,241	1,001	1,075	
Food, Seed & Industrial	mil bu	987	994	1,006	
Total Use	mil bu	2,381	2,309	2,381	
Ending Stocks	mil bu	376	444	680	
Days Supply	days	63	70	113	
Percent Use	%	16	19	31	
Loan Rate	$/bu	2.58	2.58	2.58	
U.S. Season Average Price	$/bu	4.55	4.30	3.40	
Va. Season Average Price	$/bu	3.70	4.15	2.90	

I. Supply

Beginning Stocks is the first item to consider when estimating supply. An estimate can be obtained from the monthly USDA publication, *World Agriculture Supply and Demand Estimates* (WASDE). Beginning stocks for the 1998/99 crop year is the ending stocks from the 1997/98 crop year. The estimated beginning stocks for 1998/99 in January 1998 were 680 million bushels. Enter 680 in the box for 98/99 beginning stocks in Table 2.

Production is the second part of supply. It depends on three items: planted acres, harvested acres, and yield per harvested acre.

1. Planted Acres

The number of acres a producer will plant is influenced by profitability of wheat versus other crops, the previous year's season average price, and government programs. 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.

In January, the first USDA estimate of 1998/99 planted acres of winter wheat was reported in *Winter Wheat and Rye Seedings*. The spring wheat estimates are not available until May and are reported in *Crop Production*. Table 3 gives the historical relationship between the USDA January estimate of winter and spring wheat planted acres. The average ratio of winter to spring wheat planted from 1992 to 1997 is 43.2 percent. The January winter wheat estimate of 46,597 thousand acres is multiplied by 43.2 percent to get an estimate of 20,130 thousand acres of spring wheat planted in 1998 for the 1998/99 crop year. Total planted acres is winter wheat (46,597) plus spring wheat (20,130). The total acres planted is written as 66.7 million acres Enter 66.7 in the planted acres box in Table 2.

Table 3. Actual spring and winter wheat planted and harvested acres

Year	Spring	Winter	Ratio[a] Planted	Total Planted	Total Harvested	Ratio[a] Harvested
	------------1,000 acres---------		(%)	---------------1,000 acres----------		(%)
1989	21,524	55,091	39	76,615	62,189	81.2
1990	20,288	56,998	36	77,286	69,103	89.4
1991	18,857	51,064	37	69,921	57,803	82.7
1992	21,297	50,922	42	72,219	62,761	86.9
1993	20,581	51,587	40	72,168	62,712	86.9
1994	21,152	49,197	43	70,349	61,770	87.8
1995	20,446	48,686	42	69,132	60,971	88.2
1996	23,663	51,958	46	75,621	62,850	83.1
1997	22,647	48,342	47	70,989	63,557	89.5

Source: *Crop Production (Annual Summary)*at *http://www.usda.gov/nass/*
[a] Ratio = Spring/Winter * 100.

2. Harvested Acres

Producers do not harvest wheat from all the acres they plant. Table 3 gives the historical relationship of planted acres to the actual acres harvested. The average ratio of harvested to planted from 1989 to

1997 is 86 percent with a range of 81 to 90 percent. Multiplying the estimate of 66.7 million acres by 86 percent gives an estimate of 57.4 million acres to be harvested in 1998. Enter 57.4 in Table 2 in the box for harvested acres.

Table 4. Actual vs. estimated yields

Year	Actual	Estimated	Act-Est
	------(bu/ac)-----		
1970	31.0	30.8	0.2
1971	33.9	31.1	2.8
1972	32.7	31.4	1.3
1973	31.6	31.7	-0.1
1974	27.3	32.0	-4.7
1975	30.6	32.2	-1.6
1976	30.3	32.5	-2.2
1977	30.7	32.8	-2.1
1978	31.4	33.1	-1.7
1979	34.2	33.4	0.8
1980	33.5	33.7	-0.2
1981	34.5	34.0	0.5
1982	35.5	34.3	1.2
1983	39.4	34.6	4.8
1984	38.8	34.9	3.9
1985	37.5	35.2	2.3
1986	34.4	35.5	-1.1
1987	37.7	35.8	1.9
1988	34.1	36.0	-1.9
1989	32.7	36.3	-3.6
1990	39.5	36.6	2.9
1991	34.3	36.9	-2.6
1992	39.3	37.2	2.1
1993	38.2	37.5	0.7
1994	37.6	37.8	-0.2
1995	35.8	38.1	-2.3
1996	36.3	38.4	-2.1
1997	39.7	38.7	1.0
1998	____	39.0	____
1999	____	39.3	____
2000	____	39.6	____
2001	____	39.9	____
2002	____	40.1	____

Source: *Wheat Situation and Outlook Yearbook.* at *http://www.usda.gov/nass*

3. Yield

Estimating the yield per harvested acre is the next step. The United States average yield per acre varies considerably from year to year, as Figure 3 indicates. Since 1970, United States average wheat yields have increased about 0.3 bushels per year.
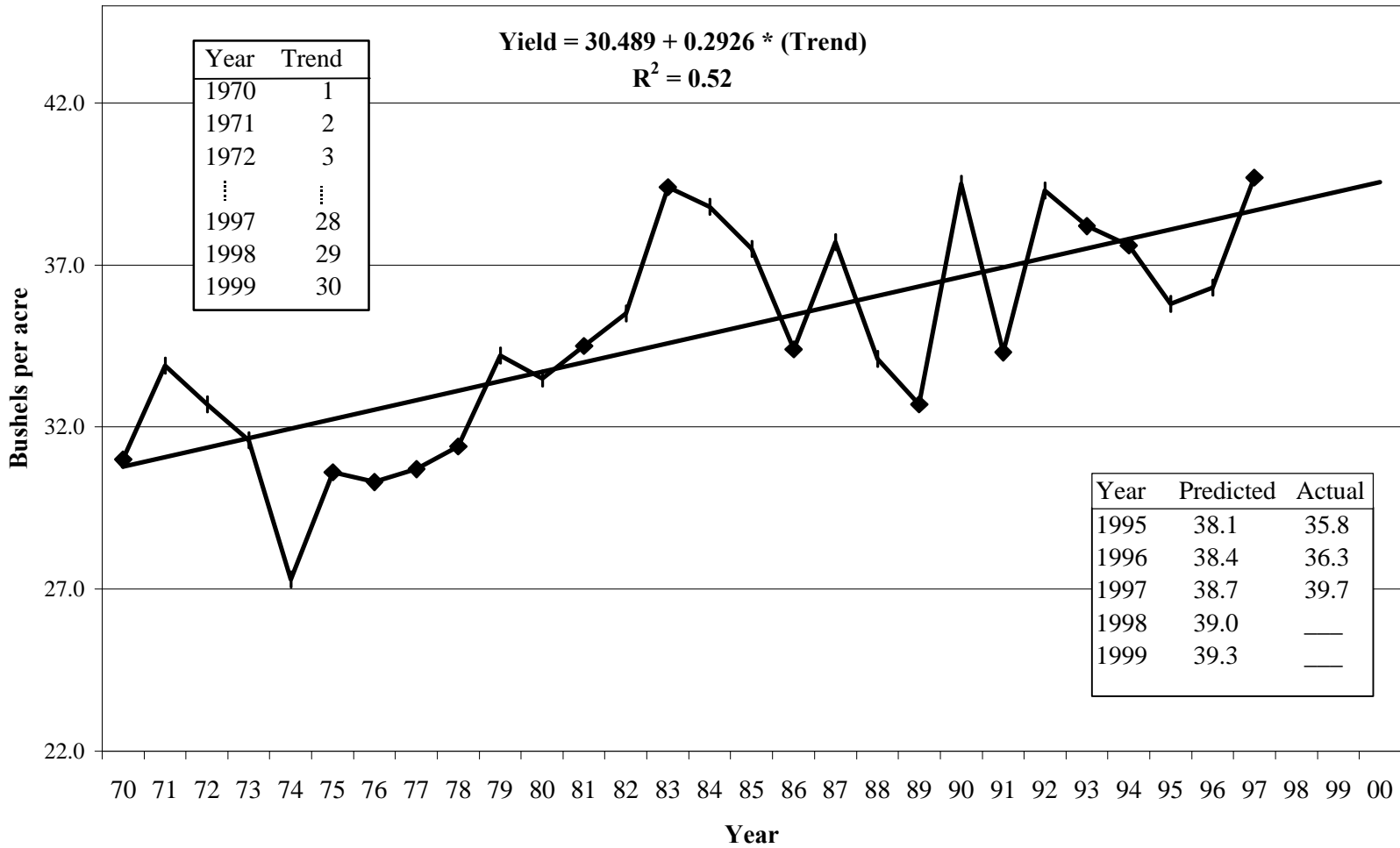
Table 4 contains the historical and estimated wheat yields for the past 28 years and estimates for the next 5 years. Information in Table 4 indicates that yields are expected to be 39.0 bushels per acre in 1998. Enter 39.0 in the box for 1998/99 yield per acre in Table 2.

With estimates of acres harvested and yield per acre, United States production can be estimated. The estimated production for 1998 is 2,239 (57.4 * 39.0) million bushels. Enter 2,239 in the box for 1998/99 production in Table 2.

Estimating **Imports** in January for a crop year that does not begin until June is difficult. The first government estimate is reported in the May WASDE. Until that number is reported, the best estimate available is the historical average of the last five years. The average imports over the last 5 years were 86 million bushels. Enter 86 in the box for 1998/99 imports on Table 2.

Total supply for 1998/99 can be estimated by adding these three sources of supply: beginning stocks, imports, and production. Total supply for 1998/99 is 3,005. Enter 3,005 in the box for 1998/99 total supply in Table 2.

Figure 3. United States wheat yield

Yield = 30.489 + 0.2926 * (Trend)

R^2 = 0.52

Year	Trend
1970	1
1971	2
1972	3
⋮	⋮
1997	28
1998	29
1999	30

Year	Predicted	Actual
1995	38.1	35.8
1996	38.4	36.3
1997	38.7	39.7
1998	39.0	___
1999	39.3	___

Bushels per acre

42.0
37.0
32.0
27.0
22.0

70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 00

Year

The total supply estimate can vary greatly from the time it is made in January until the time the wheat is actually harvested. Producers may change their planting intentions, but most of the variability lies in the percentage harvested and the change in yield. The impact of these changes on production and price will be discussed in the Price Sensitivity section.

II. Demand

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

1. Exports

Exports are largely determined by price, exchange rates, production in other countries, government programs in the United States and other countries, and politics. Many of these factors are hard to forecast in January for a crop year that does not begin until June. In January, a reasonable estimate of exports for the upcoming crop year is the average exports of the last three years. In some years, major changes in government programs, politics, or exchange rates indicate the number should be increased or decreased. To estimate 1998/99 exports, average the year's 1995/96 to 1997/98.

$$\left(\frac{1,241 + 1,001 + 1,040}{3} \right) = 1,106$$

Write 1,106 in the blank for 1998/99 exports in Table 2.

2. Food, Seed, Industrial

The FSI category has been increasing about 16 million bushels per year since 1970. Figure 4 contains the historical quantities and trend in FSI. Based on this trend and the equation (FSI = 614.35 + 16.539*Trend), expected FSI in 1998 is 1,011 million bushels. Enter 1,011 in the box for 1998/99's food, seed, and industrial category in Table 2.

3. Feed and Residual

The feed and residual category approximates the amount of wheat fed in the summer months. Wheat feeding increases substantially when wheat prices are within 20¢ to 40¢ of corn prices. Using the difference between July corn futures and July wheat futures, a producer can estimate the amount of wheat used as feed. On January 15, 1998, July 1998 Chicago wheat futures were trading at $3.51 and July 1998 Chicago corn futures were trading at $2.88. The difference is 63¢. To estimate the amount of wheat fed, replace WC with 63 and TR with 24 in the equation

FdUs = 222.7 + (-1.33 * **WC**) + (9.09 * **TR**)
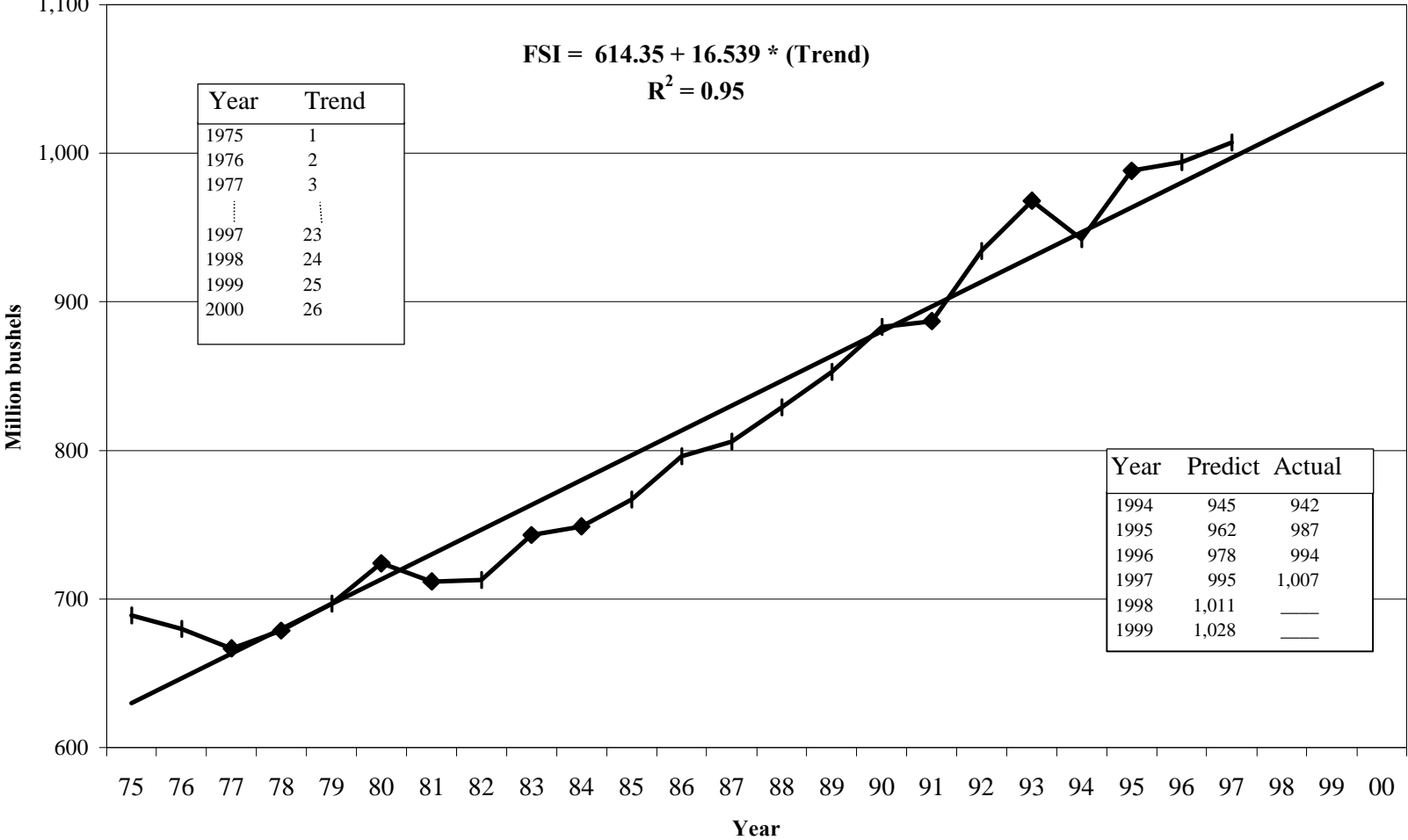where
   FdUs = wheat used as feed
   WC = July wheat price- July corn price
   TR = the time trend which corresponds to year (75=1, 76=2…97=23, 98=24)

The feed use equation explains 42 percent of the variation in feed use from year to year. The estimated feed use for the 1998/99 crop year is 357 million bushels. Enter 357 in the box for Feed and Residual in Table 2.

With all three categories of demand estimated, total demand can be estimated. The total demand for 1998/99 is 2,474 million bushels (357 + 1,011 + 1,106). Enter 2,474 in the box for 1998/99 total demand in Table 2.

Figure 4. United States food, seed, and industrial

FSI = 614.35 + 16.539 * (Trend)

$R^2 = 0.95$

Million bushels

Year	Trend
1975	1
1976	2
1977	3
⋮	⋮
1997	23
1998	24
1999	25
2000	26

Year	Predict	Actual
1994	945	942
1995	962	987
1996	978	994
1997	995	1,007
1998	1,011	___
1999	1,028	___

1,100

1,000

900

800

700

600

75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 00

Year

III. Ending Stocks

The ending stocks for 1998/99 can be calculated by subtracting total demand from total supply. The 1998/99 estimate is 531 million bushels (3,005 – 2,474). Days supply is calculated by dividing ending stocks by use per day. Use per day is 6.78. Days supply is 78 days for 1998/99 (531/6.78). Enter 531 in the box for 1998/99 ending stocks and 78 for 1998/99 days supply in Table 2.

IV. Season Average Price

The season average price for 1998/99 can now be estimated using Figure 5. Locate 531 million bushels on the horizontal axis of Figure 5. Draw a vertical line (A) at 531 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 $3.55 per bushel. According to the price equation, the price should be $16.051 – 1.997 * Ln(531)$. The natural log (Ln) of 531 is 6.27. Hence, the equations estimate of the season average price is $3.52. Enter $3.52 in the blank for 1998/99 in Table 2.

The equation for the estimated price curve in Figure 5 explains 61 percent of the variation in season average price from year to year. In some years, the difference between the predicted and actual price is as large as 74 cents. Since 1989/90, these January price estimates have averaged about 28 cents per bushel from the actual price. Over time the relationship between price and ending stocks changes; consequently, 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 have averaged 31 cents below the United States season average prices from 1989-1997. If Virginia production is down compared to United States production, the difference is larger and vice versa. Therefore, in the example used, the estimate of the Virginia price for 1998/99 would be $3. 21 per bushel.

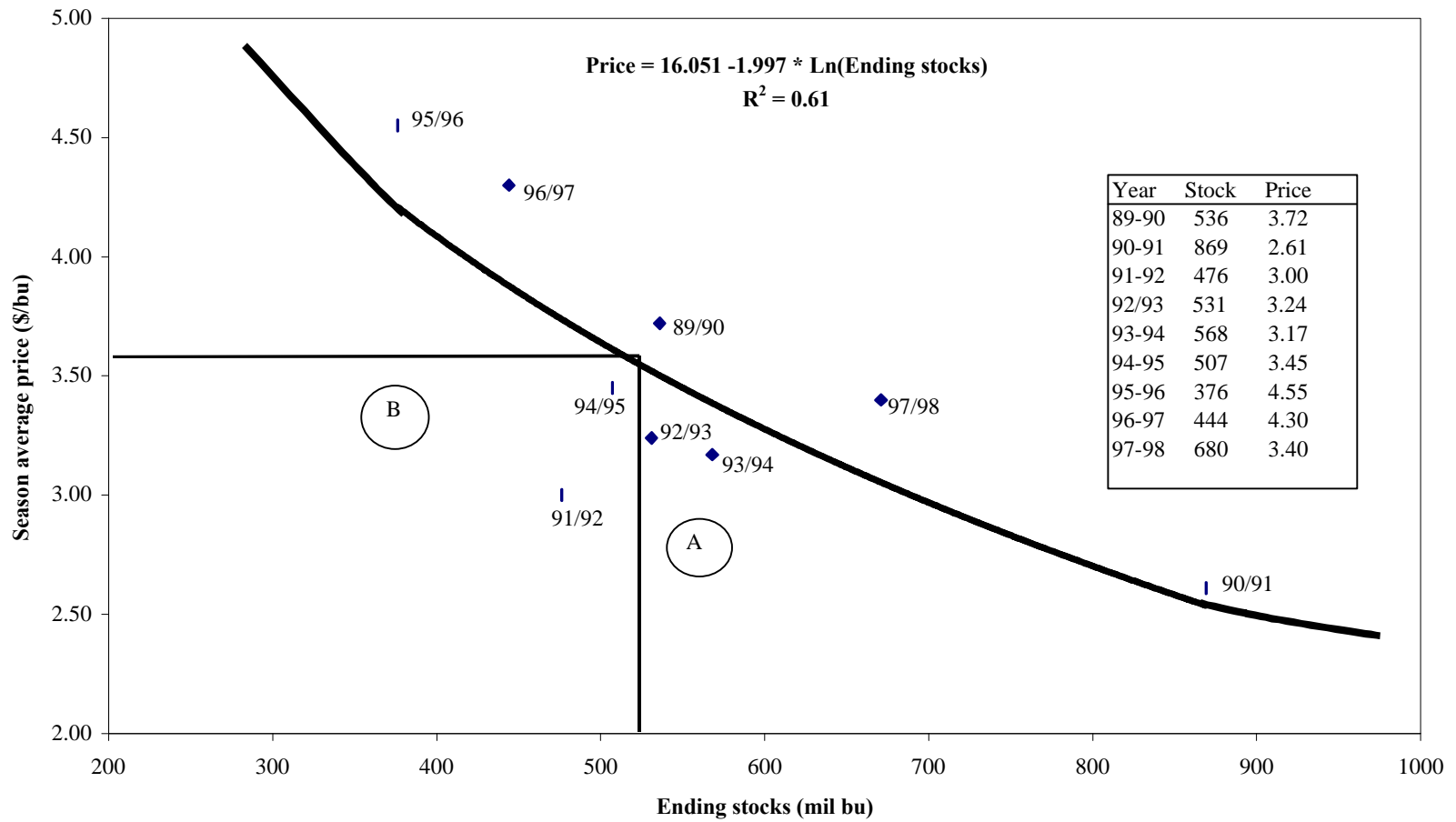**Table 5. U.S. and Va. production and price differences**

Year	Production		Season Average Price		Difference
	U.S.	Va.	U.S.	Va.	Va.-U.S.
	-----------mil bu-----------		--------------$/bu----------		$/bu
1989/90	2037	12.65	3.72	3.45	-0.27
1990/91	2730	12.22	2.61	2.95	0.34
1991/92	1980	12.25	3.00	2.70	-0.30
1992/93	2467	15.11	3.24	3.10	-0.14
1993/94	2396	13.52	3.17	2.70	-0.47
1994/95	2321	14.00	3.45	2.85	-0.60
1995/96	2183	17.60	4.55	3.70	-0.85
1996/97	2285	14.58	4.30	4.15	-0.15
1997/98	2527	17.00	3.40	3.05	-0.35

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 January until harvest. The potential impact of these changes on price can be determined by assuming alternative yield and demand levels.

Figure 5. Wheat stocks and price

Price = 16.051 -1.997 * Ln(Ending stocks)

$R^2 = 0.61$

Year	Stock	Price
89-90	536	3.72
90-91	869	2.61
91-92	476	3.00
92/93	531	3.24
93-94	568	3.17
94-95	507	3.45
95-96	376	4.55
96-97	444	4.30
97-98	680	3.40

The most variable factor to consider is yield per harvested acre. USDA does not estimate yield using field surveys until May. The 1998 estimate of 39.0 bushels per acre only takes into consideration historical trends. It does not consider the possibility of extremely favorable or unfavorable weather conditions.

Figure 6 indicates the accuracy of past trendline yield predictions. In 8 of the last 28 years, actual yields were 0 to 2 bushels above the trendline with the average being 0.86 bushels. In 7 of the last 28 years, actual yields were 0 to 2 bushels below the trendline with the average being 1.24 bushels. In 9 of the last 28 years, yields averaged 2.38 bushels above or below the trendline. In 4 out of the last 28 years, actual yields were more than 3 bushels above or below the trendline.

Figure 6. Yield Deviations from Trend
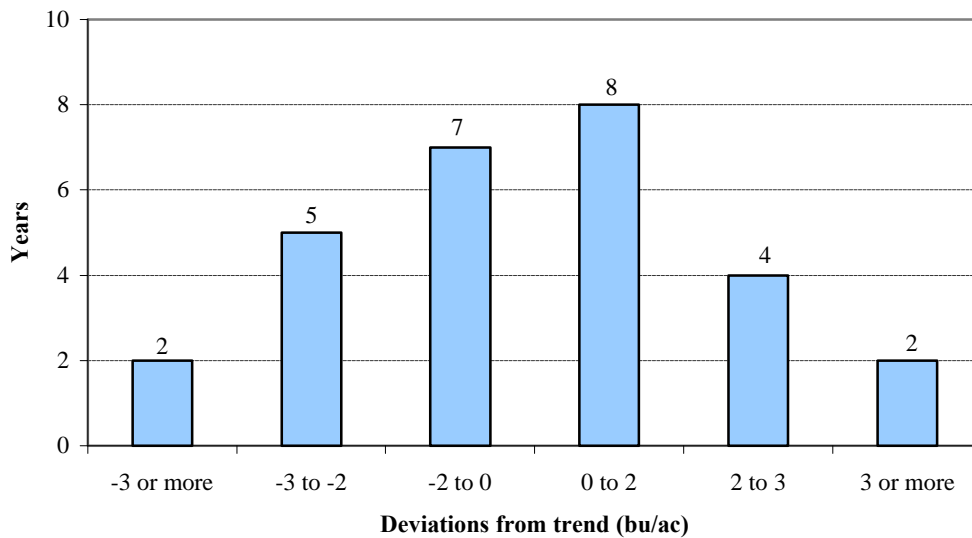
The chances of 1998 yields being above or below 39.0 are 50 percent. However, when yield falls below the trendline, it averages 1.24 bushels below compared to 0.86 bushels when it is above the trendline. The equation explains only 61 percent of the variation in yield from year to year, making it necessary to monitor expected wheat yields as the growing season progresses.

Historically, when yields are greater than trendline yields, a larger percentage of planted acres are harvested and vice versa. The relationship between differences in actual yield from estimated trendline yields and the percent of planted acres harvested are shown in Figure 7. When yields are 3 bushels more than expected, the percentage harvested increases to about 90 percent. When actual yields are three bushels below the trendline estimate, the percentage of acres harvested declines to about 83.5 percent. The equation explaining the relationship between yield variation and percent harvested is

$$\textbf{\% HARVEST} = 86.75 + 1.028 \textbf{ YLDDEV}$$

where
% HARVEST = percent of planted acres harvested, and
YLDEV = difference between actual and estimated yield.

For example, using Table 6 as a reference, if 1998 yields increase to 40.5 bushels, the YLDDEV will be 1.5 bushels (40.5-39.0). The % HARVEST will be 88.3 percent (86.75 + 1.028 * 1.5). With planted acres of 66.7 million, the harvested acres equal 59.0 million acres (66.7 * 0.883). If yields decline to 37.5 bushels (Table 6), the % HARVEST equals 85.2 percent (86.75 + 1.028 * (-1.5)) and harvested acres equals 56.9 (66.8 * .852).

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Figure 7. Percent acres harvested vs. wheat yield deviation from trend: 1989-1997

% Harvest = 86.747 + 1.028 YLDDEV

$R^2 = 0.56$

Percent harvested

Yield deviations (bu/ac)
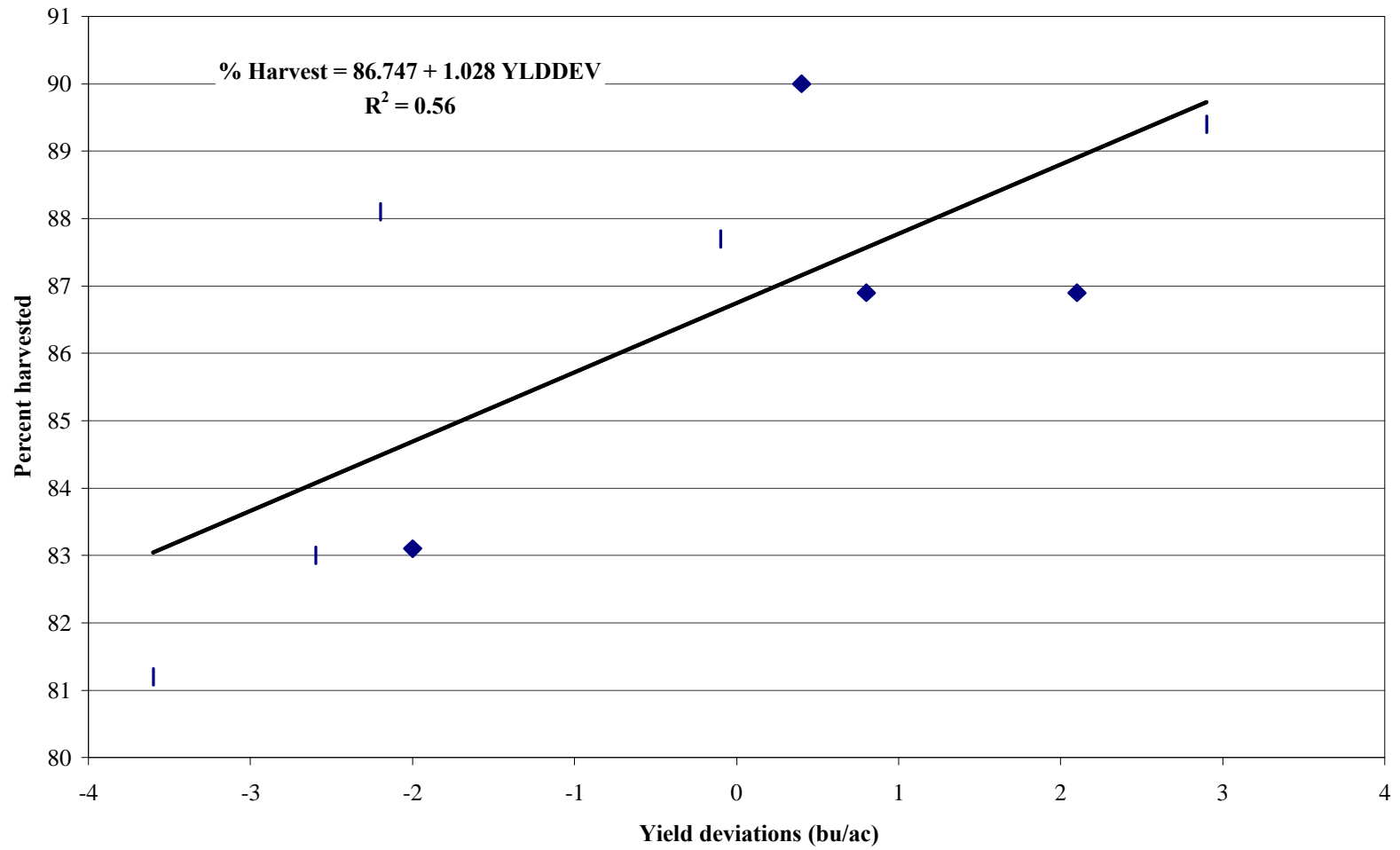
If yields are higher than 39.0 bushels per acre in 1998/99, then production will be higher. Total supply and ending stocks will increase if estimated demand does not change. If ending stocks are above the estimated 531 million bushels, the season average price will be lower than the 1998/99 estimated price of $3.52 per bushel.

Table 6. Estimated United States wheat supply, demand, stocks, and price					
Item	Units	98/99	98/99	98/99	98/99
		------------------------Scenario------------------------			
		Most Likely	Yield Increase	Yield Decrease	Export Decrease
Planted Acreage	mil ac	66.7	66.7	66.7	66.7
Harvested Acreage	mil ac	57.4	59.0	56.9	57.4
Yield	bu/ac	39.0	40.5	37.5	39.0
Supply					
Beginning Stocks	mil bu	680	680	680	680
Production	mil bu	2,239	2,390	2,134	2,239
Imports	mil bu	86	86	86	86
Total Supply	mil bu	3,005	3,156	2,900	3,005
Use					
Feed & Residual	mil bu	357	357	357	357
Exports	mil bu	1,106	1,106	1,106	1,006
Food, Seed & Industrial	mil bu	1,011	1,011	1,011	1,011
Total Use	mil bu	2,474	2,474	2,474	2,374
Ending Stocks	mil bu	531	682	426	631
Days Supply	days	78	101	63	97
Percent Use	%	21	28	17	27
Loan Rate	$/bu	2.58	2.58	2.58	2.58
U.S. Season Average Price	$/bu	3.52	3.02	3.96	3.18
Va. Season Average Price	$/bu	3.21	2.71	3.65	2.87

Ever-changing local and world events can have a significant impact on the amount of wheat used during a marketing year. Changes in world supply and demand as well as in government programs can dramatically increase or decrease exports. Changes in the cost of feed substitutes, such as corn,

can have an impact on the amount of wheat used as feed. A producer needs to be aware of substantial changes in corn production and price.

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 7. Scenarios 1 and 2 represent a yield increase and decrease respectively. Scenario 3 indicates a decrease in exports which decreases total use. A decrease in total use means an increase in ending stocks and a decrease in season average price.

Scenario #1

If yields are 1.5 bushels above the trendline, which has historically happened 43 percent (12/28 years) of the time (Figure 6), actual yields would then be 40.5 (39.0 + 1.5) bushels. Production would increase to 2,390 (59.0 * 40.5) million bushels. Total supply will increase to 3,156 (2,390 + 680) million bushels. If use remains constant, ending stocks will increase to 682 million bushels. Using the equation in Figure 5, the season average price will decrease to $3.02 per bushel.

Scenario #2

Historically, a 43 percent chance exists that (12/28 years) yields will be below the trendline by an average of 1.5 bushels. If yields decrease to 37.5 (39.0 - 1.5) bushels, production will decrease to 2,134 million bushels. Holding use constant at 2,474, ending stocks would decrease to 426 million bushels. At 426 million bushels, season average price would be $3.96 per bushel.

Scenario #3

If supply remains unchanged but exports decrease by 100 million bushels, then total use will decrease to 2,374 million bushels and ending stocks to 631 million bushels. The season average price would then be $3.18 per bushel.

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

DEVELOPING A PRICING STRATEGY

The supply and demand estimates developed in Table 6 give an indication of the expected average price level during the marketing year. Many of the estimates of acres, yield, exports, and feed use may change between January, when the original estimates are made, and harvest in the summer. The strategy can be adjusted as the season progresses, but an initial strategy should be developed as soon as the first estimates of planted acres are available from USDA.

The initial pricing strategy should be developed by making three comparisons: ending stock levels, price levels of July wheat futures, and the historical futures price distribution. The ending stocks comparison determines the likely price direction, the July wheat futures prices from previous years help establish price level targets, 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 the likely price direction. If estimated ending stocks are larger than current year ending stocks, the general direction of prices will be down. If the 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 (100 million bushels or more), prices should move in the anticipated direction unless some estimates of supply and demand change substantially from the initial January estimates. In developing a pricing strategy, if prices are expected to trend down, producers should be more aggressive in pricing early in the production season. If prices are expected to trend up, producers should forward price none or only a small percentage of expected production early in the season.

The January estimate of ending stocks (531 million bushels) for 1998/99 is down slightly from 1997/98. This ending stocks number is about the average since 1989/90 and is very similar to 1992/93 when season average price was $3.24. Given the price estimate of $3.52, and the potential for lower ending stocks, the directional indicator would suggest little forward pricing early in the season. But the high yield and export decrease scenarios produce ending stocks very similar to 1997/98. Given adequate rainfall and the Southeast Asia financial crisis, the combination of higher yields and lower exports could produce a substantial increase in stocks. Hence, these developments will have to be monitored closely during the growing season.

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. When employing this method, producers must be careful to give the most weight to more recent years. The world wheat market has changed considerably in the last two decades. For example, wheat exports peaked in 1981/82 at 1,771 million bushels and have been declining ever since. For the last 10 years, exports have been below 1,200 million bushels. Producers need to be aware that the more distant the year from the time of the estimate, the more carefully factors in addition to ending stocks must be considered.

In 1998/99 the estimated ending stocks are forecast at 531 million bushels, a level very similar to 1992/93 (530 mil. bu.) and 1989/90 (538 mil. bu.). The July futures contracts for 1989 and 1992 should be analyzed to determine what price levels were reached in those two years. The July 1982 through July 1998 price charts are included in the Appendix for this purpose.

The July 1992 chart reveals that prices peaked near $4.30 in January, declined to $3.57 in April, and ended the season between $3.30 and $3.50. The July 1989 contract peaked at $4.22 in early March and finished the season around $3.90. These two contracts suggest that the target price level should be between $3.57 and $4.30. However, these prices are six to ten years old, so more weight should be given to more recent years if any recent years have comparable ending stock levels.

In 1993/94 and 1994/95, actual ending stocks were within 35 million bushels of estimated ending stocks for 1998/99. During these two years, July futures traded between $3.20 and $3.40 in January. They traded at lower prices the rest of the growing season. In developing the pricing strategy, the 1989/90 year should be given less weight than the 1992/93 and 1994/95 seasons because it is almost ten years old. These historical charts suggest that July futures have the possibility of reaching $4.30 with estimated ending stocks of 531 million bushels, but that in the 2 most recent years prices in January traded between $3.20 and 3.40. In January 1998, July futures were trading between $3.30

and $3.50, consistent with the 1993-94 and 1994-95 seasons. In both those seasons, prices were 30¢ to 40¢ per bushel lower in June at the peak of harvest.

III. Historical Futures Price Distribution

Figure 8 shows the historical distribution of July wheat futures based on the 1980 to 1996 contracts. The distribution is based on over 7,000 daily closing prices since 1980. Each vertical bar indicates the percentage of time July futures traded in the price range on the horizontal axis. For example, the probability of prices trading between $3.50 and $3.99 is 24.61 percent. Prices trade between $3.00 and $3.49 per bushel 39.46 percent of the time. The probability of prices trading above $4.00 is 18.10 percent (9.54 + 6.46 + 1.56 + 0.51).

Figure 8. Price distribution July wheat futures: 1980-1996
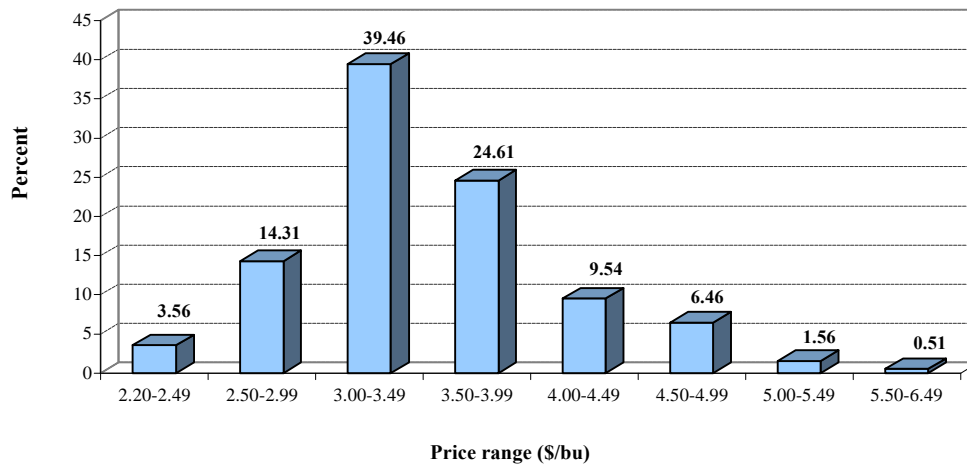
The ending stocks comparison, the target prices, and the historical futures price information need to be combined to develop a pricing strategy for 1998. The ending stocks estimate suggests a small decline compared to 1997/98. This decline suggests some probability of higher prices than in 1997. In January 1997, the July 1997 contract was trading around $3.50. Since the July 1998 contract was trading near the same level in January 1998, this indicator suggests the possibility of some more upside price potential given that in 1992 July futures reached $4.22 under a similar ending stocks situation. Hence, the ending stocks comparison would indicate the producer should hold back on forward pricing in January 1998.

The price target based on comparing futures prices in years with similar ending stocks suggests some possibility of prices above $4.00, but the 2 most recent years with similar ending stock levels (1993/94 and 1994/95), ended with prices of $2.80 to $3.10 per bushel in June. July 1998 futures were trading around $3.50 in January 1998. Given that the 1998 crop was in excellent condition in January and given that export demand was extremely weak as a result of the financial crisis in Southeast Asia, the lower price scenarios in Table 7 seem to have the greatest probability of occurring. Since futures prices in January 1998 were 40¢ to 50¢ per bushel above harvest prices in 1993 and 1994, the target price indicator would suggest forward pricing one fourth to one third of expected production in January.

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The historical futures price distribution indicates January 1998 futures prices are in the top 40 percent of historical futures prices. Given that estimated ending stocks are near average historical levels, the $3.50 July 1998 futures contract price is attractive. With any increase in yields and/or reduction in exports, the price could easily drop into the lower half of the historical distribution. Hence, this indicator suggests forward pricing at current price levels.

Overall, the ending stocks comparison says hold off on forward pricing, but the target price and historical distribution suggest some forward pricing is desirable in January. Given these mixed signals, the producer should forward price only a relatively small percent of expected production (maybe 20 to 25 percent) and then monitor the market closely. If weather conditions remain favorable and exports decline, the producer will need to quickly forward price up to 50 percent of production in the $3.20 to $3.40 price range. If crop conditions deteriorate substantially and exports increase, no further forward pricing should be initiated.

SUMMARY

The supply and demand data in this publication make it possible to put current estimates of supply and demand in their proper perspective. 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 provides producers the opportunity to evaluate the likely impact of these changes on season average price.

The ending stocks estimate can be used to help develop a pricing strategy for the year. The ending stocks estimate is used to establish price targets by comparing the current levels to previous years with similar 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—producers can develop pricing strategies that have a good probability of success given current supply and demand circumstances.
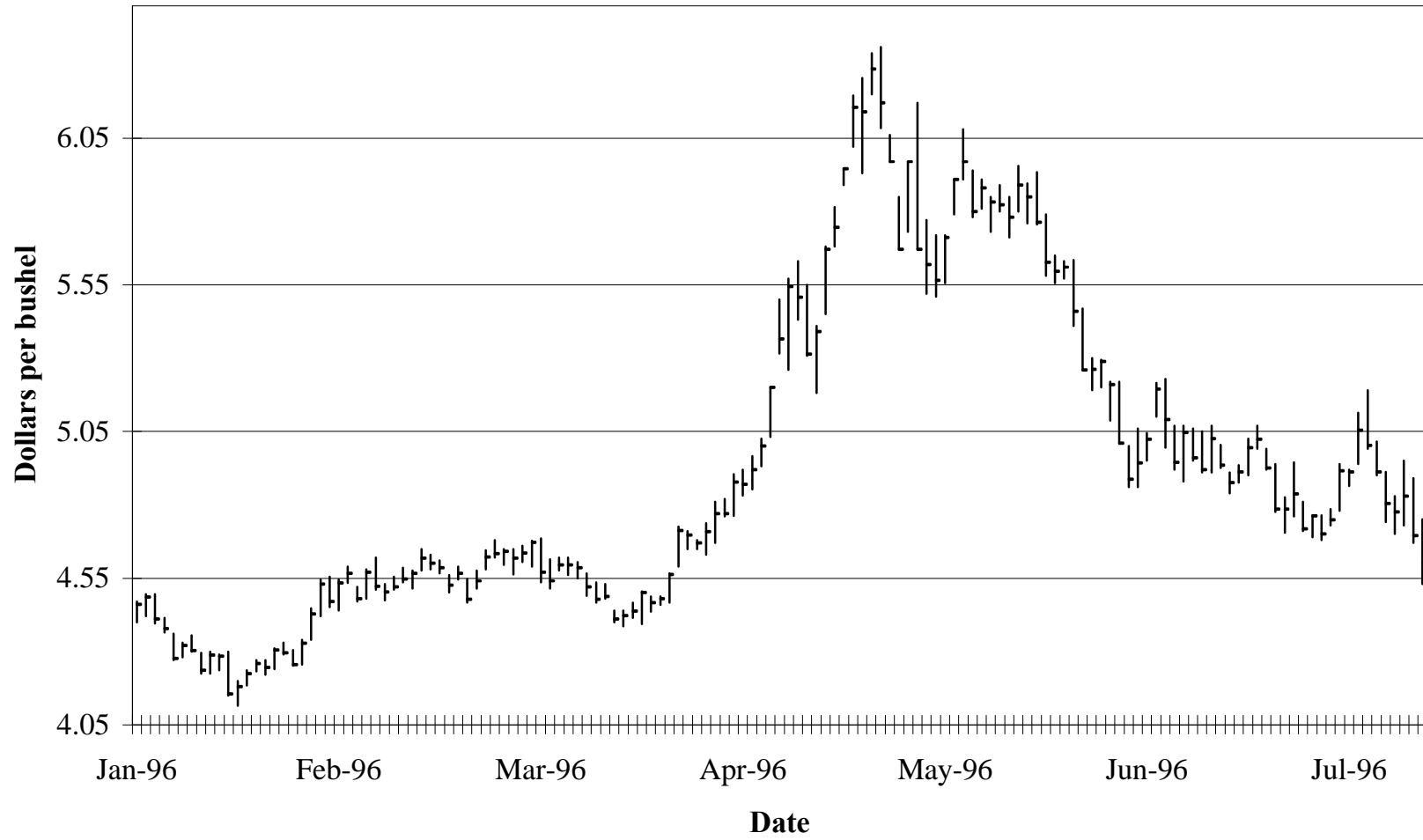
APPENDIX:
JULY WHEAT
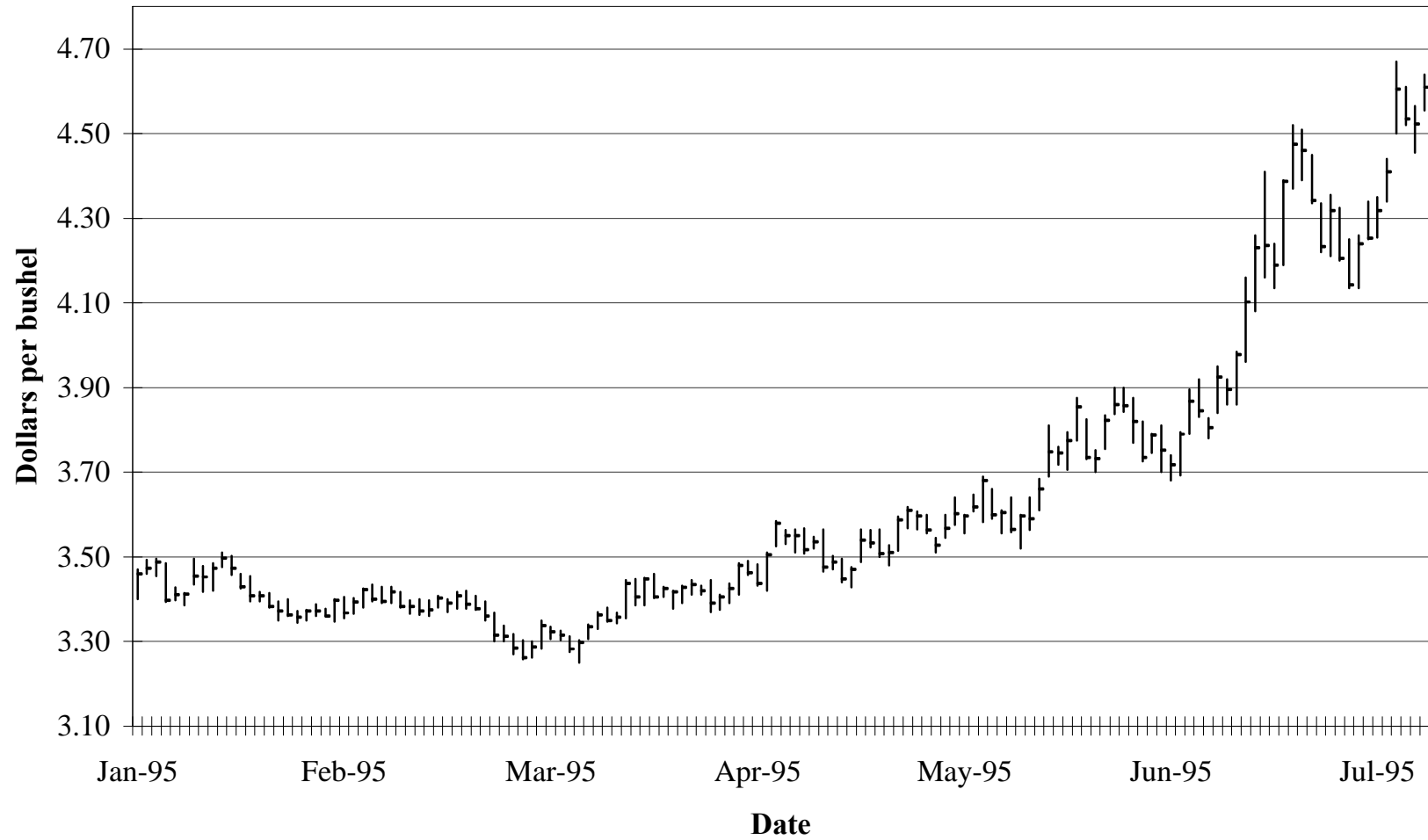# FUTURES 1982-1998

1998 July Wheat Futures, Chicago
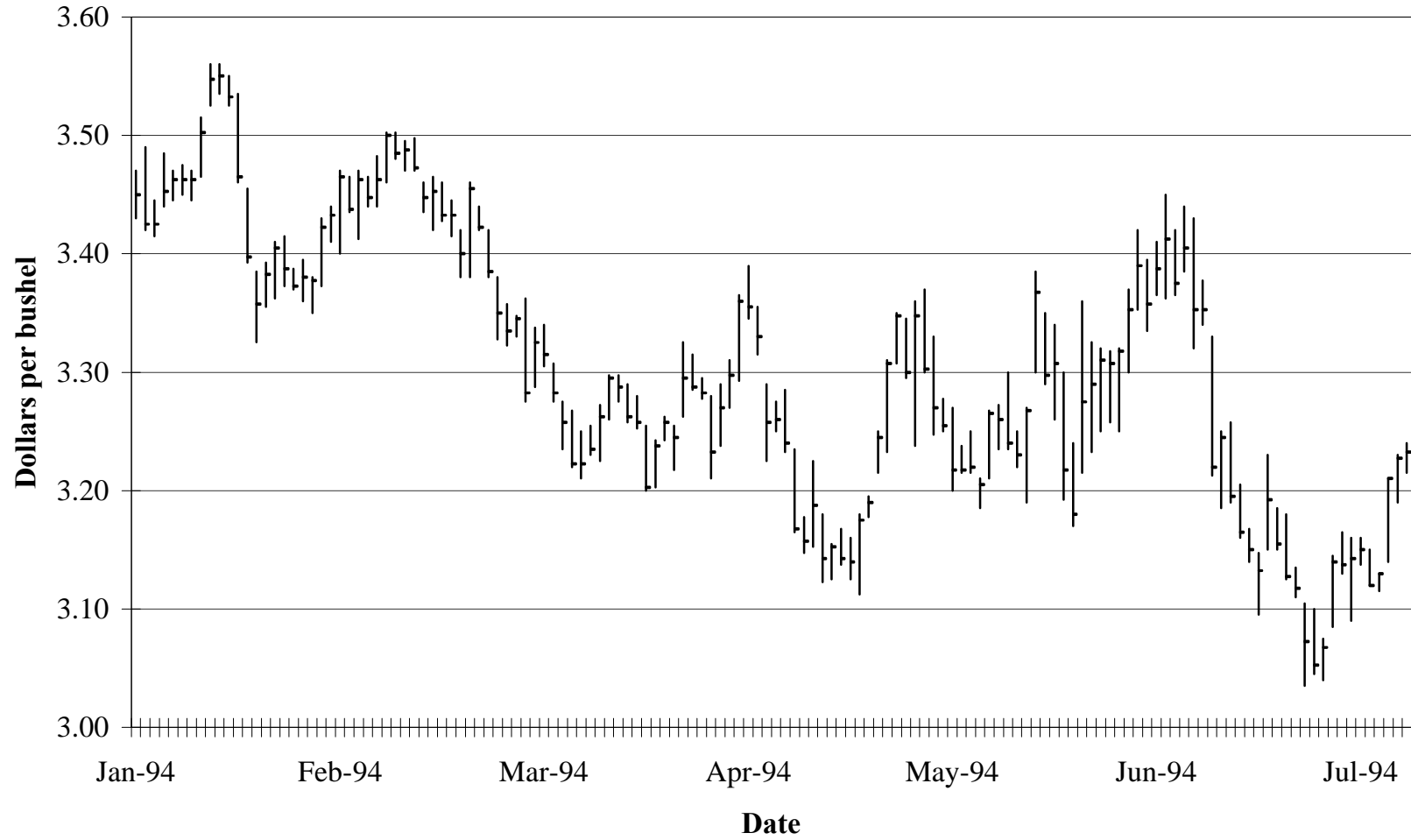
1997 July Wheat Futures, Chicago

Y-axis: **Dollars per bushel** (4.50, 4.30, 4.10, 3.90, 3.70, 3.50, 3.30, 3.10, 2.90)

X-axis: **Date** (Jan-97, Feb-97, Mar-97, Apr-97, May-97, Jun-97, Jul-97)
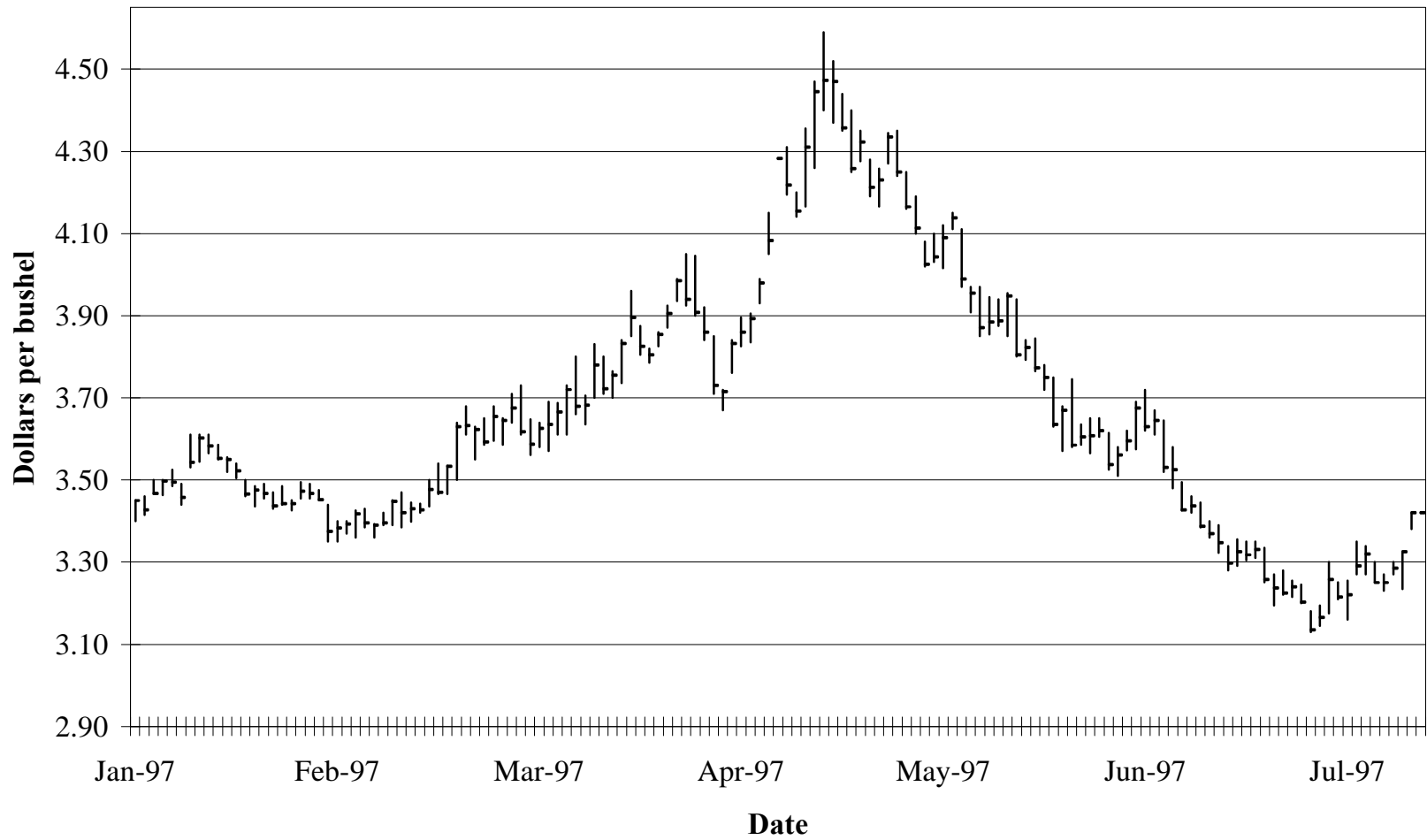
1996 July Wheat Futures, Chicago

1995 July Wheat Futures, Chicago Wheat

Dollars per bushel (y-axis)

Date (x-axis)

1994 July Wheat Futures, Chicago

1993 July Wheat Futures, Chicago

Dollars per bushel

Date

1992 July Wheat Futures, Chicago

(Bar chart. Y-axis: "Dollars per bushel" ranging from 3.30 to 4.30 in increments of 0.10. X-axis: "Date" with labels Jan-92, Feb-92, Mar-92, Apr-92, May-92, Jun-92, Jul-92.)

1991 July Wheat Futures, Chicago

Dollars per bushel (y-axis)

Date (x-axis)
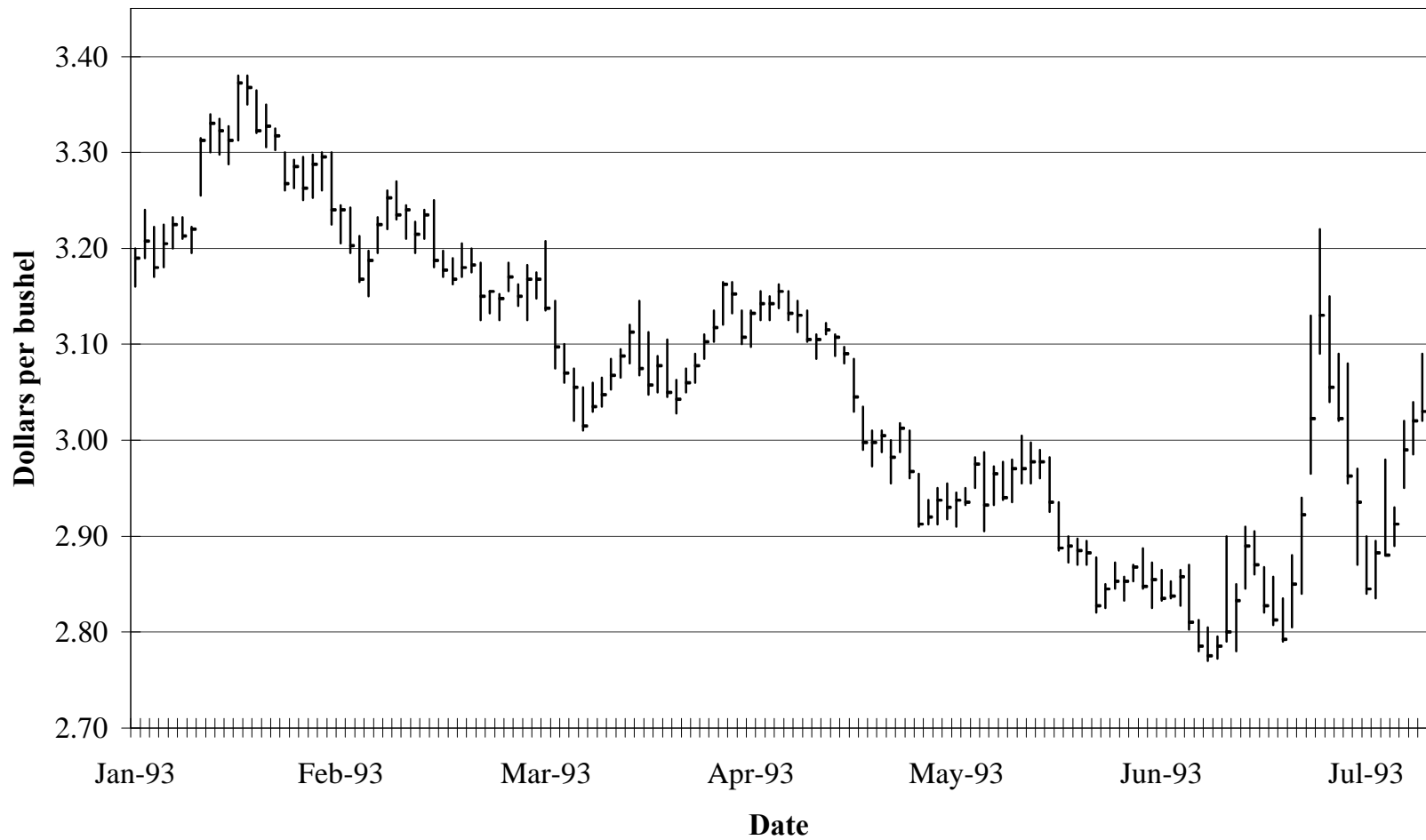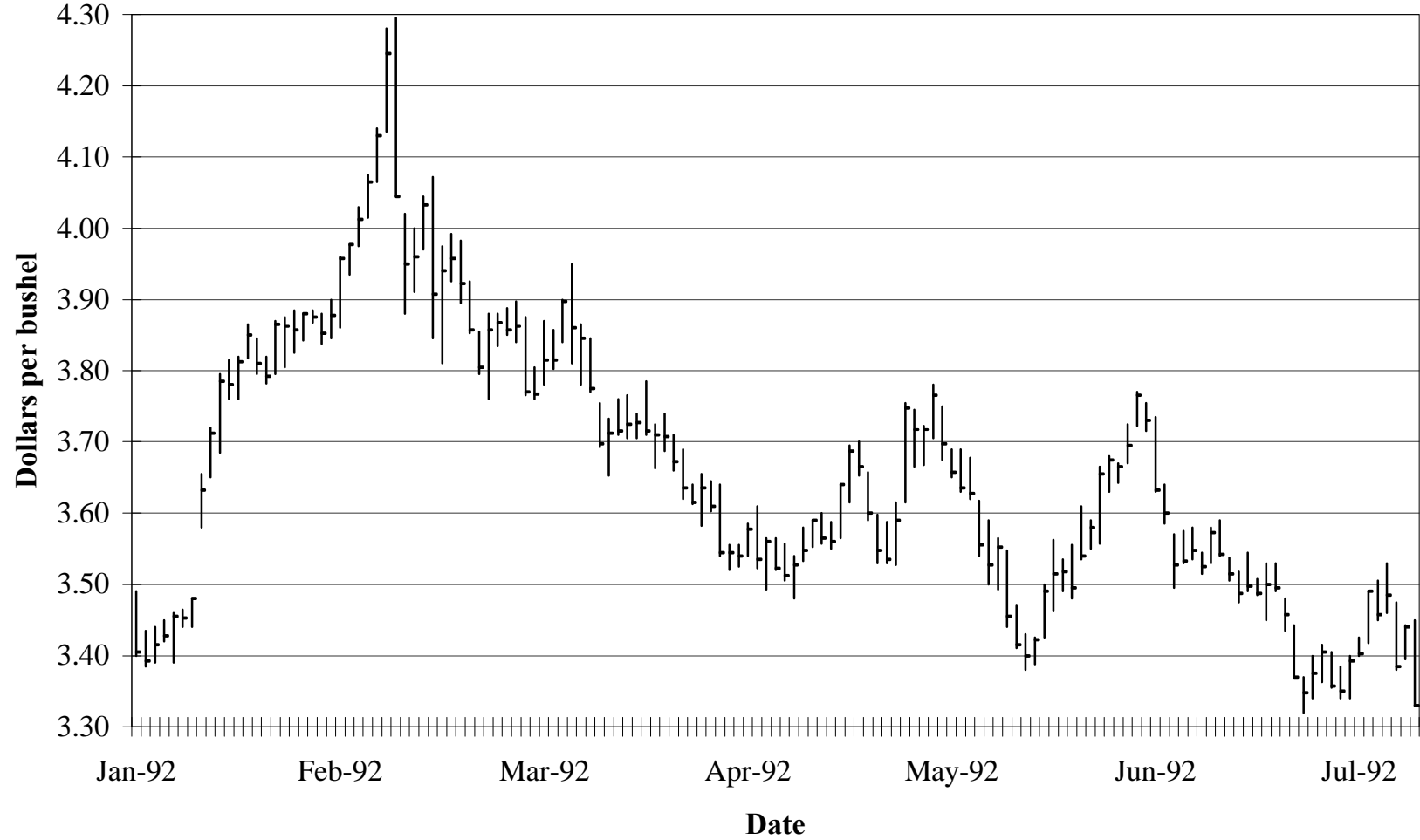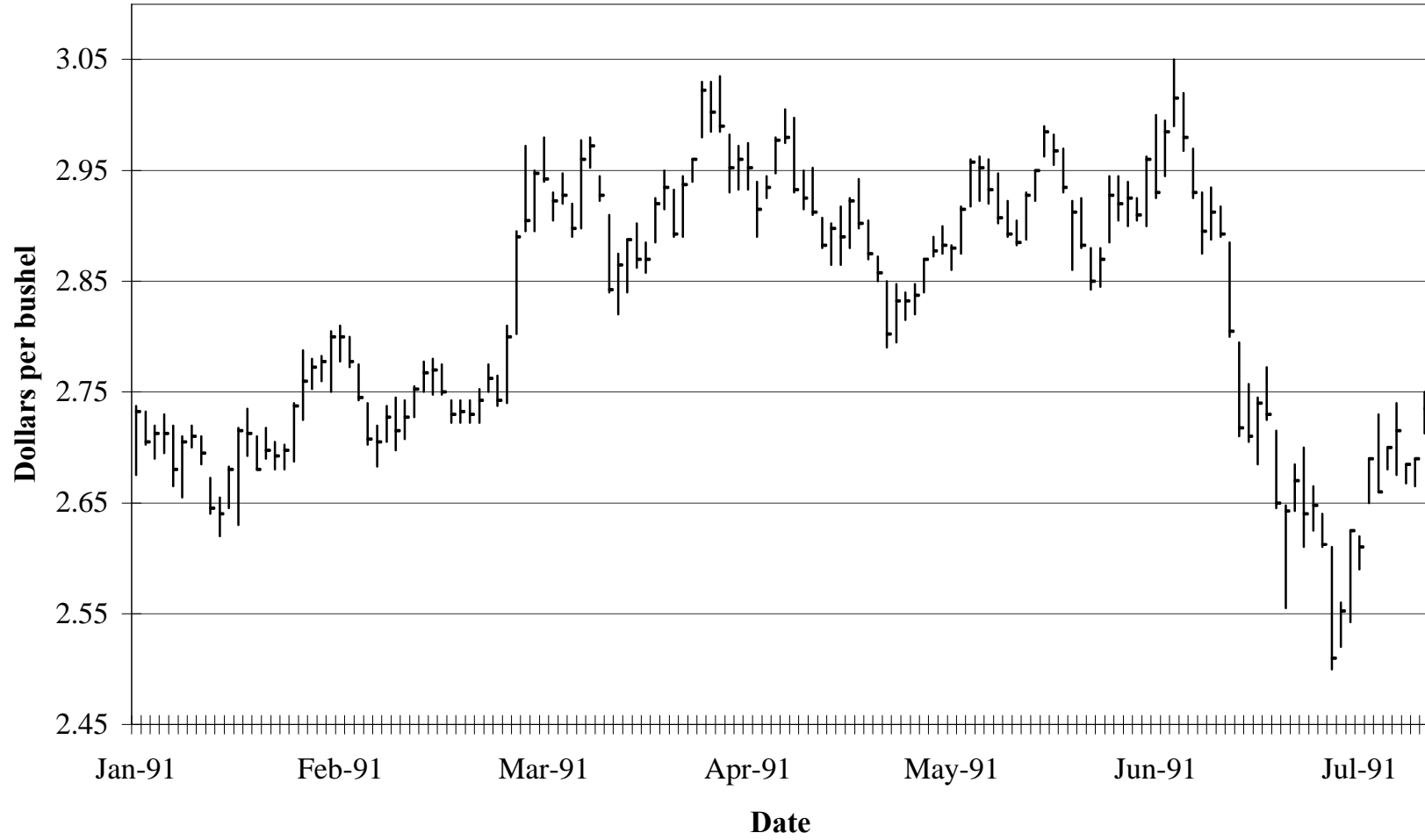
1990 July Wheat Futures, Chicago

1989 July Wheat Futures, Chicago

Dollars per bushel

4.25

4.15

4.05

3.95

3.85

3.75

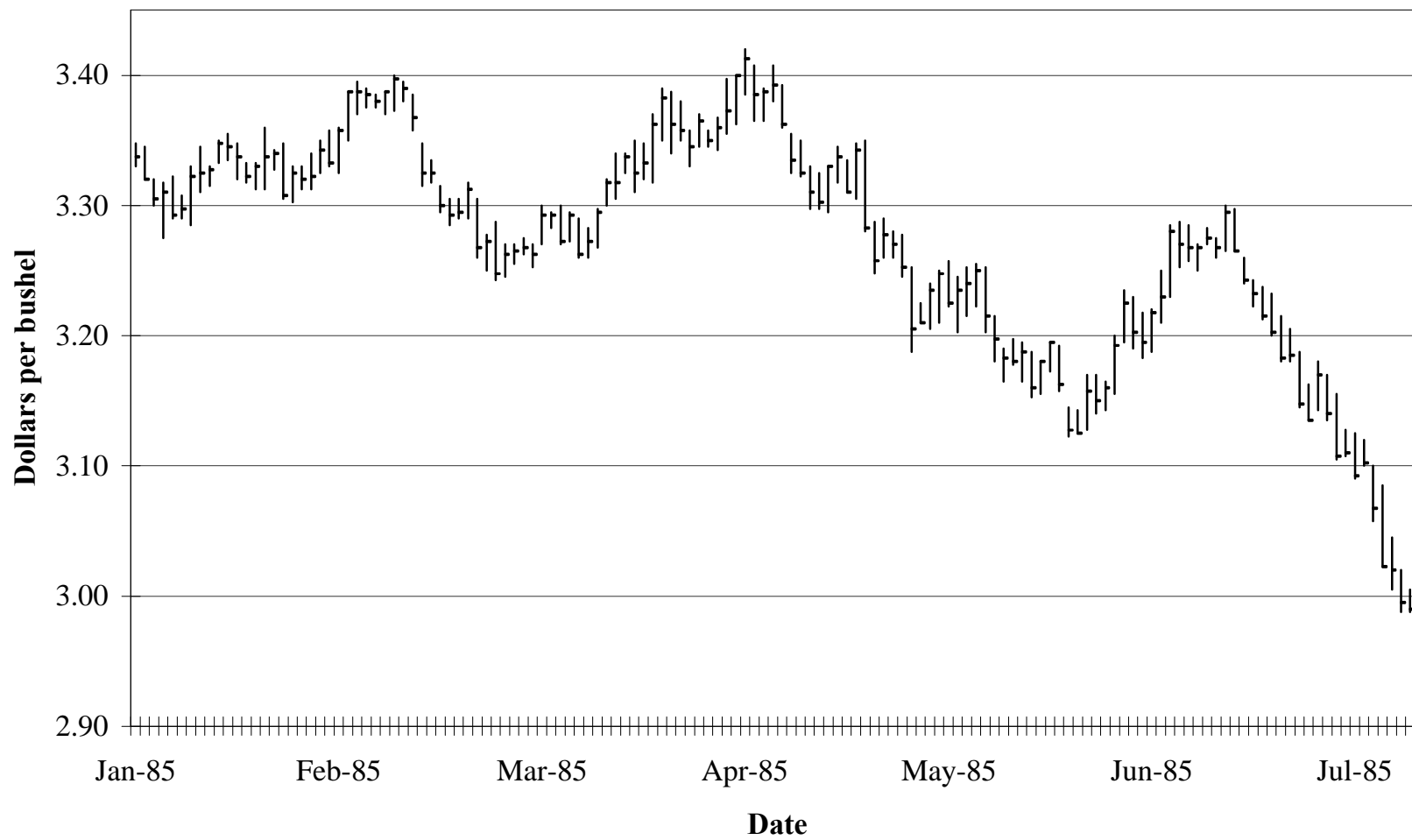Jan-89   Feb-89   Mar-89   Apr-89   May-89   Jun-89   Jul-89
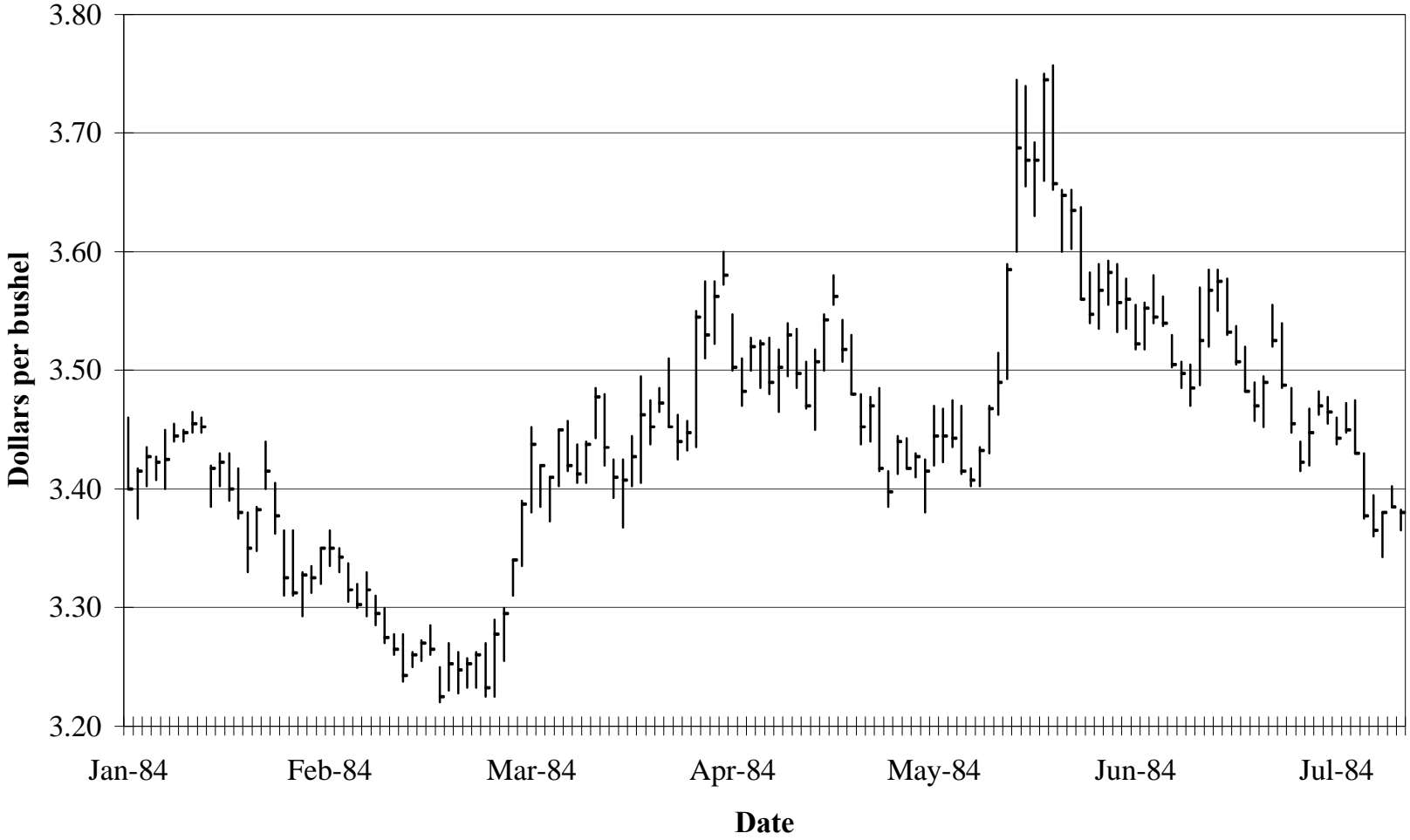
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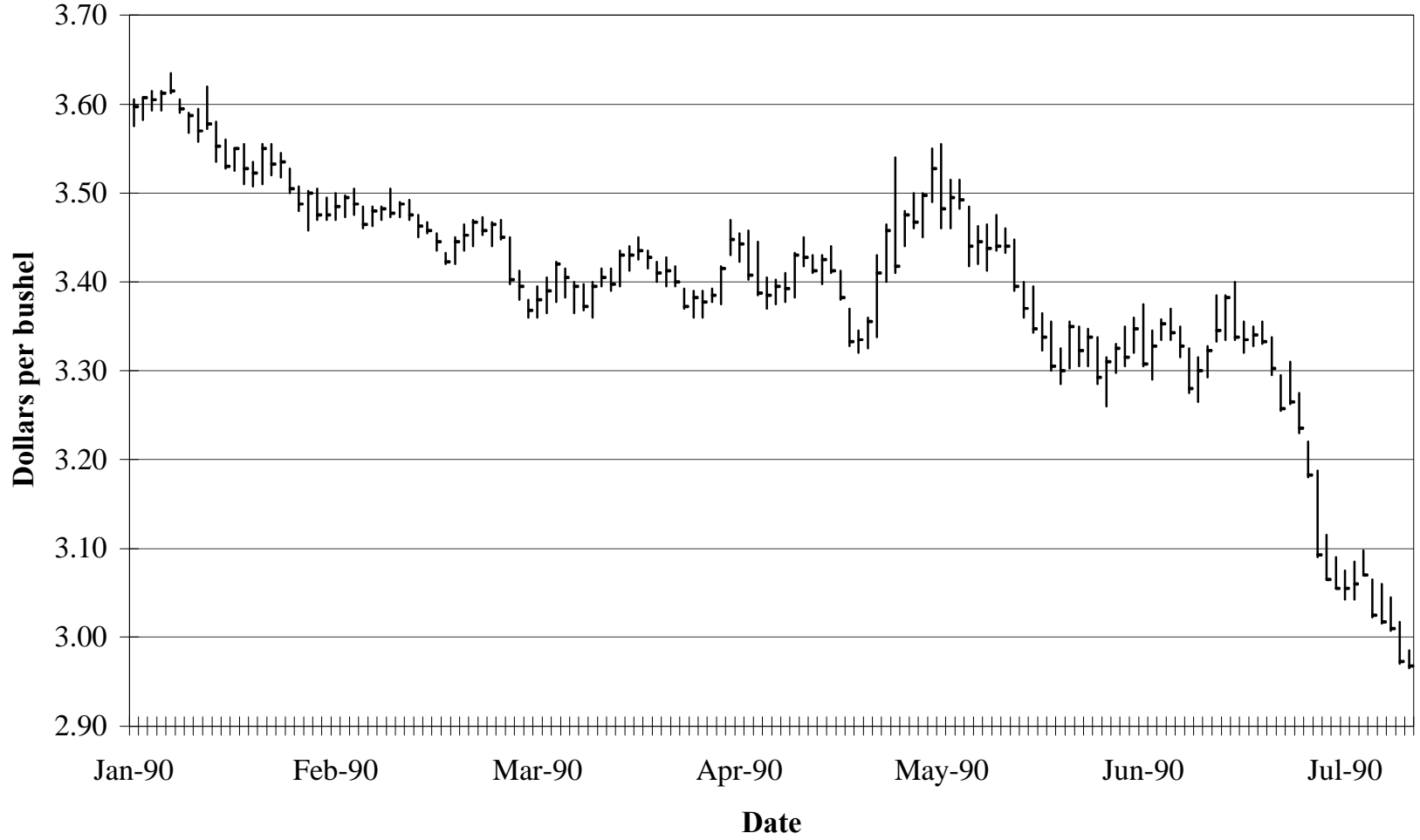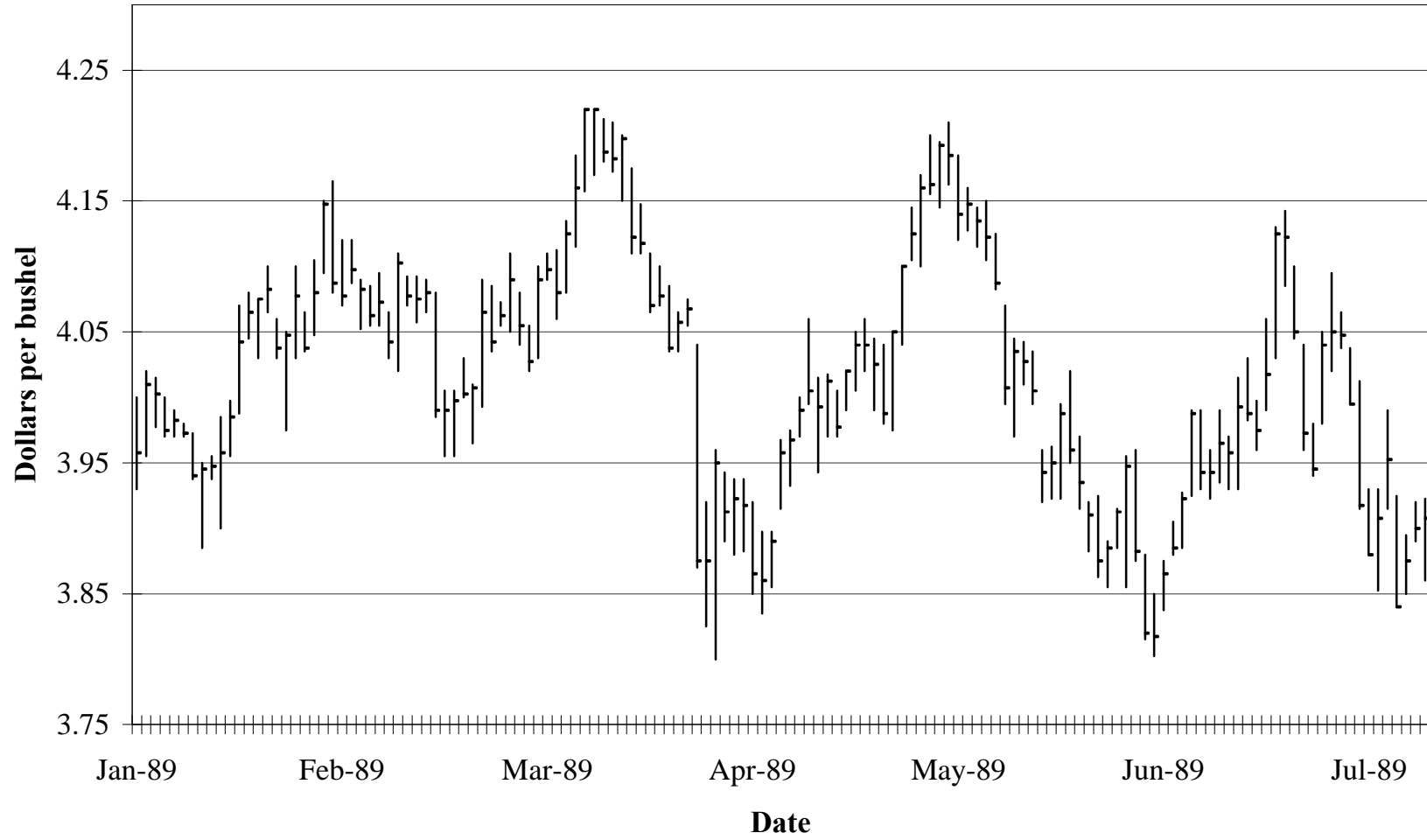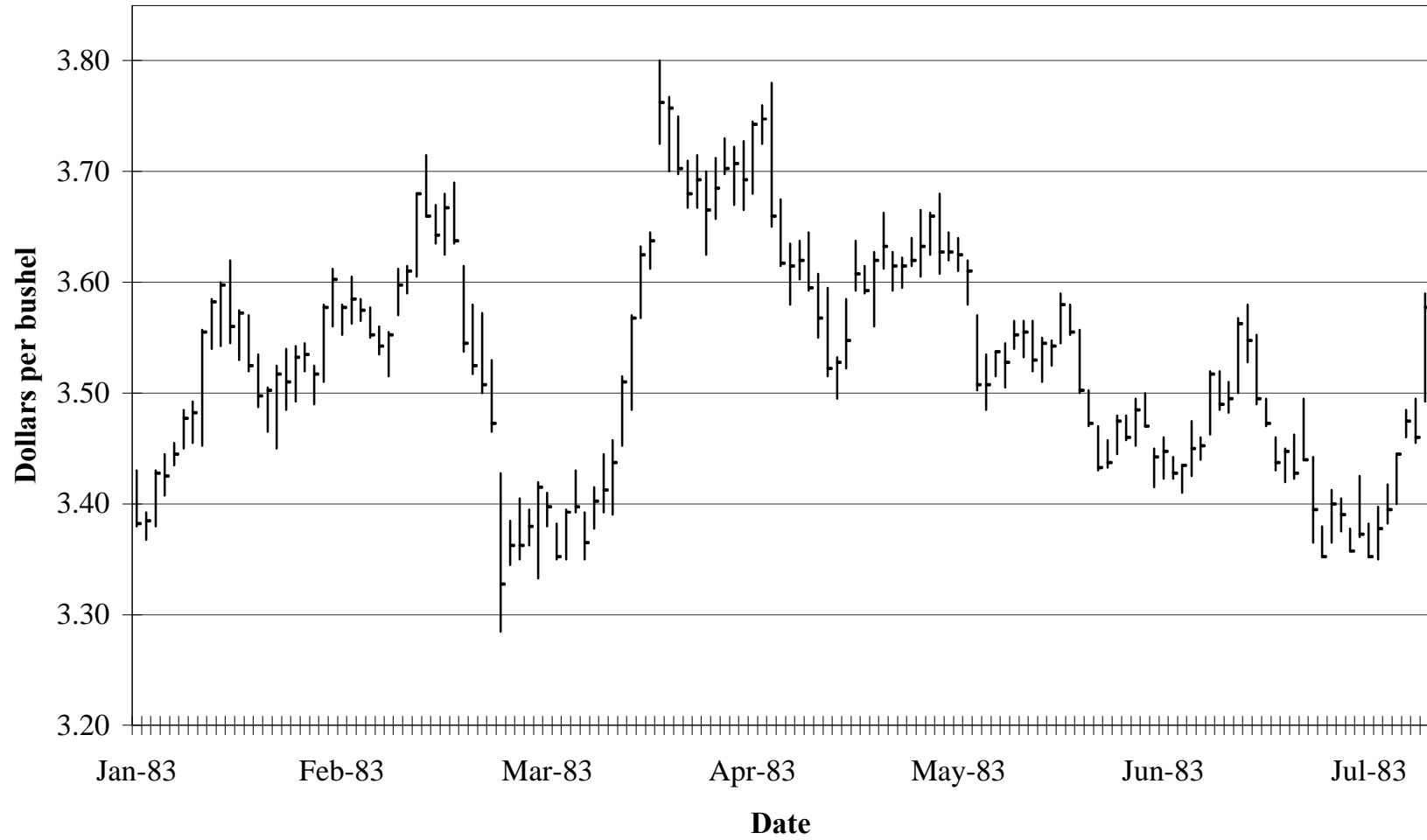
1988 July Wheat Futures, Chicago

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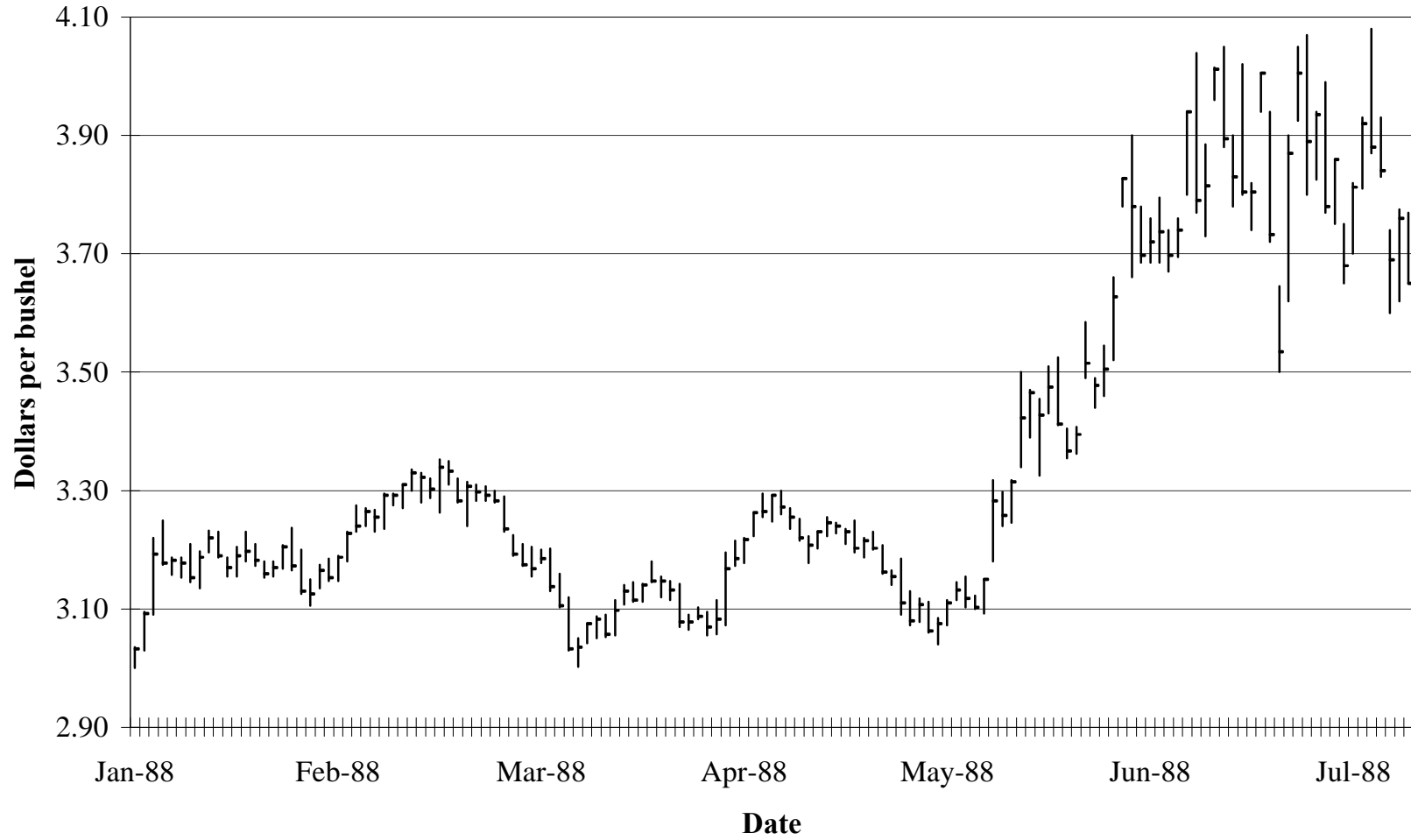
1987 July Wheat Futures, Chicago
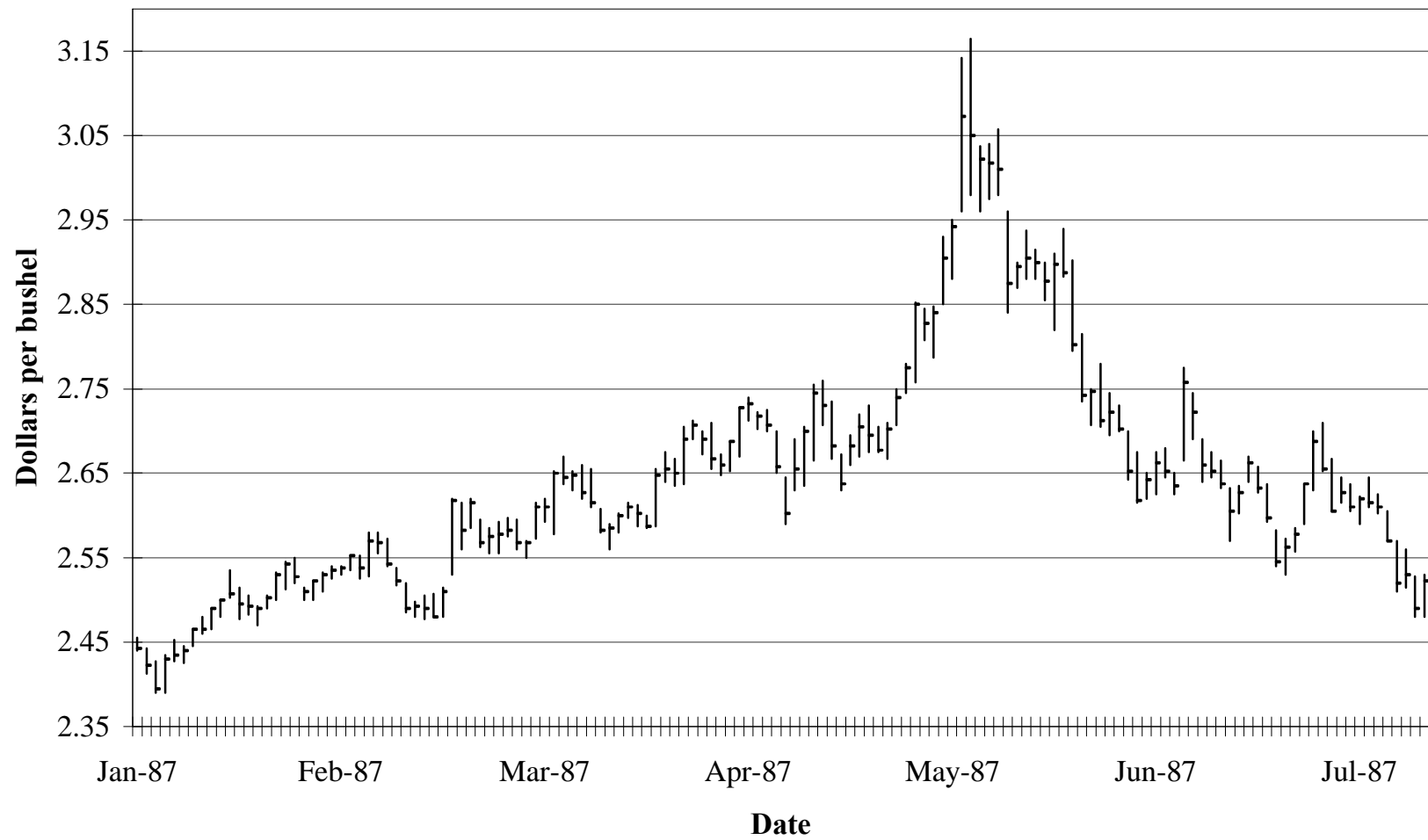
1986 July Wheat Futures, Chicago
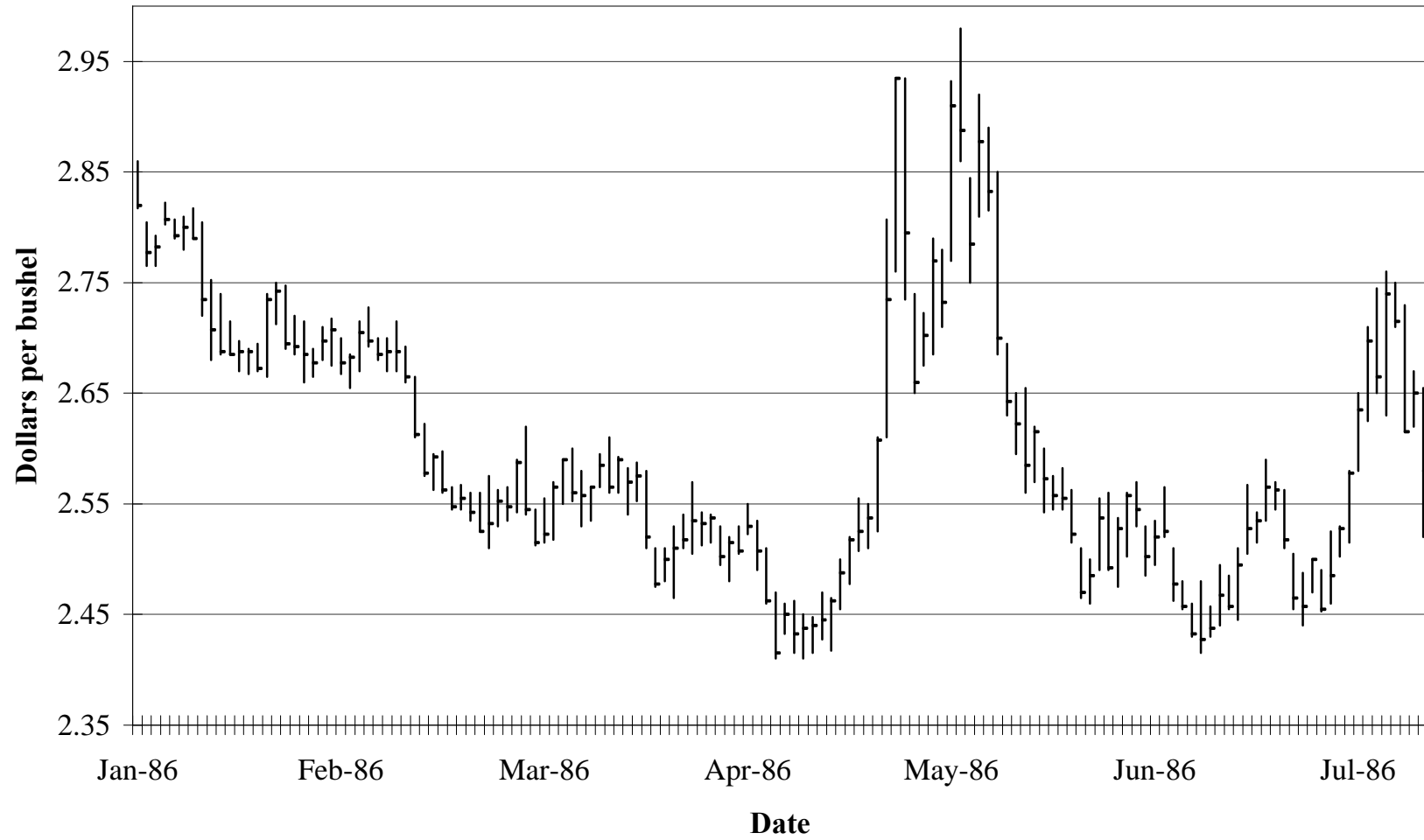
1985 July Wheat Futures, Chicago

1984 July Wheat Futures, Chicago

Dollars per bushel (y-axis)

Date (x-axis)

1983 July Wheat Futures, Chicago

1982 July Wheat Futures, Chicago