

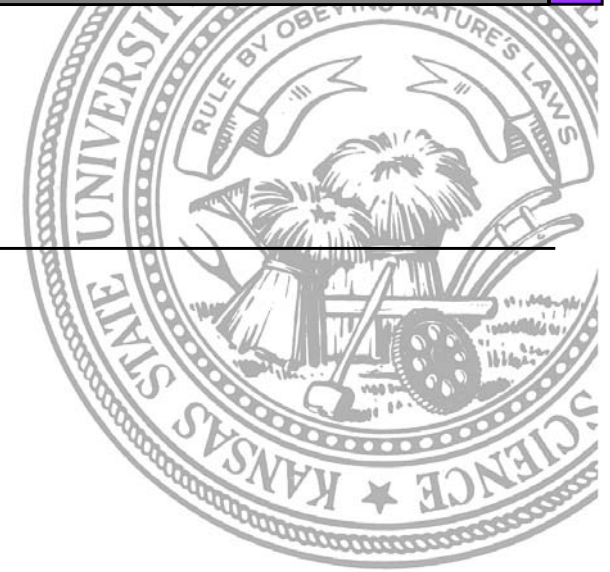
Hedge Funds Impact on Agricultural Commodities

August 15-16, 2006



Midwest, Great Plains and
Western Outlook Conference

Joseph O. Arata
Kansas State University



Outline

- I. What is a Hedge Fund
- II. Agricultural Commodity Open Interest
- III. Volatility
- IV. Hedge Fund Impact on Agricultural Commodity Prices

Definition

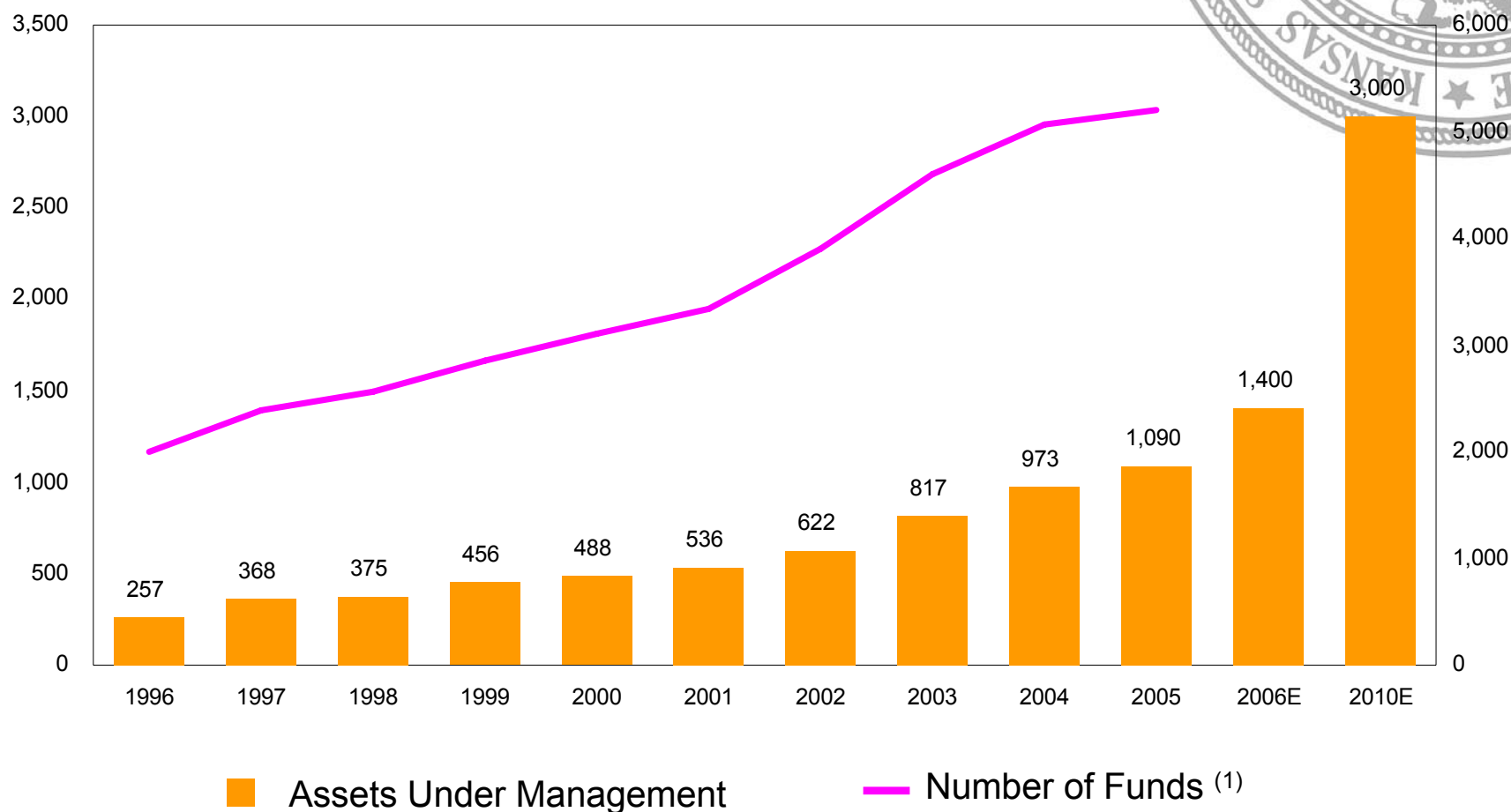
- **Webster's Dictionary of Hedge:**
 - **Boundary**
 - **Means of Protection**

 - **Exploded in the 1990's**
 - **\$1,400 Billion in assets in over 5,000 Funds**



Growth of Hedge Funds

Assets (\$Billions)



Legal Definition

- Freedom from ICA (1940) controls on:

- leverage
- short-selling
- cross-holding
- 10% limits
- incentive compensation
- derivative positions

- Limitations on:

- number of U.S. investors
- solicitation of U.S. investors
- public advertising and disclosure



Hedge Fund Location

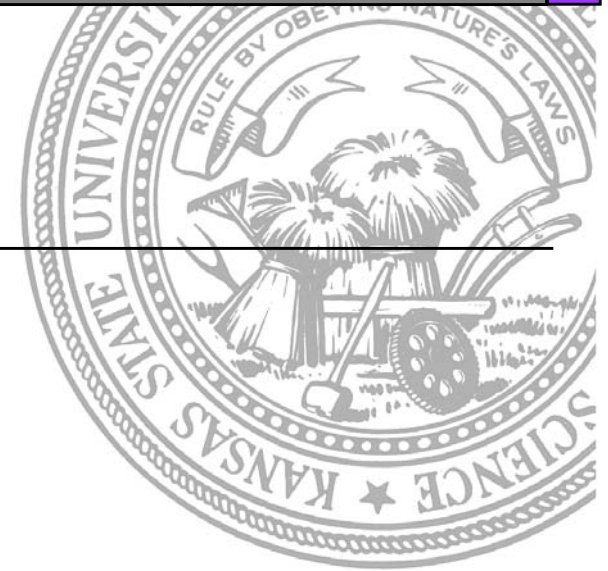
Location	Percent Assets
Cayman Islands	35%
United States	32%
British Virgin Islands	8%
Bermuda	8%
Bahamas	4%
Luxembourg	3%
Asia	4%

Hedge Fund Trading Volume

	Percent of Volume
Convertible bonds	89%
Distressed debt	66%
Credit derivatives	38%
Emerging-market bonds	33%
Leveraged loans	33%
Below-investment grade bonds	20%
Commodities	6%

Classifications

- Convertible Arbitrage
- Equity Hedge
- Event Driven
- Distressed Securities
- Merger Arbitrage
- Equity Market Neutral



Classifications

- ❑ **Convertible Arbitrage:** Long convertible bonds or preferred, short underlying common stock and short underlying credit risk.
- ❑ **Equity Hedge:** Long or short equities, typically with a net long bias.
- ❑ **Event Driven:** Corporate transactions and special situations.
- ❑ **Distressed Securities:** Long undervalued securities of companies in financial distress or operating under Chapter 11.

Classifications

- **Merger Arbitrage:** Long/short equity securities of companies involved in corporate transactions.
- **Equity Market Neutral:** Long undervalued equities and short overvalued equities, usually coordinated on a factor exposure basis.



Hedge Funds and Futures

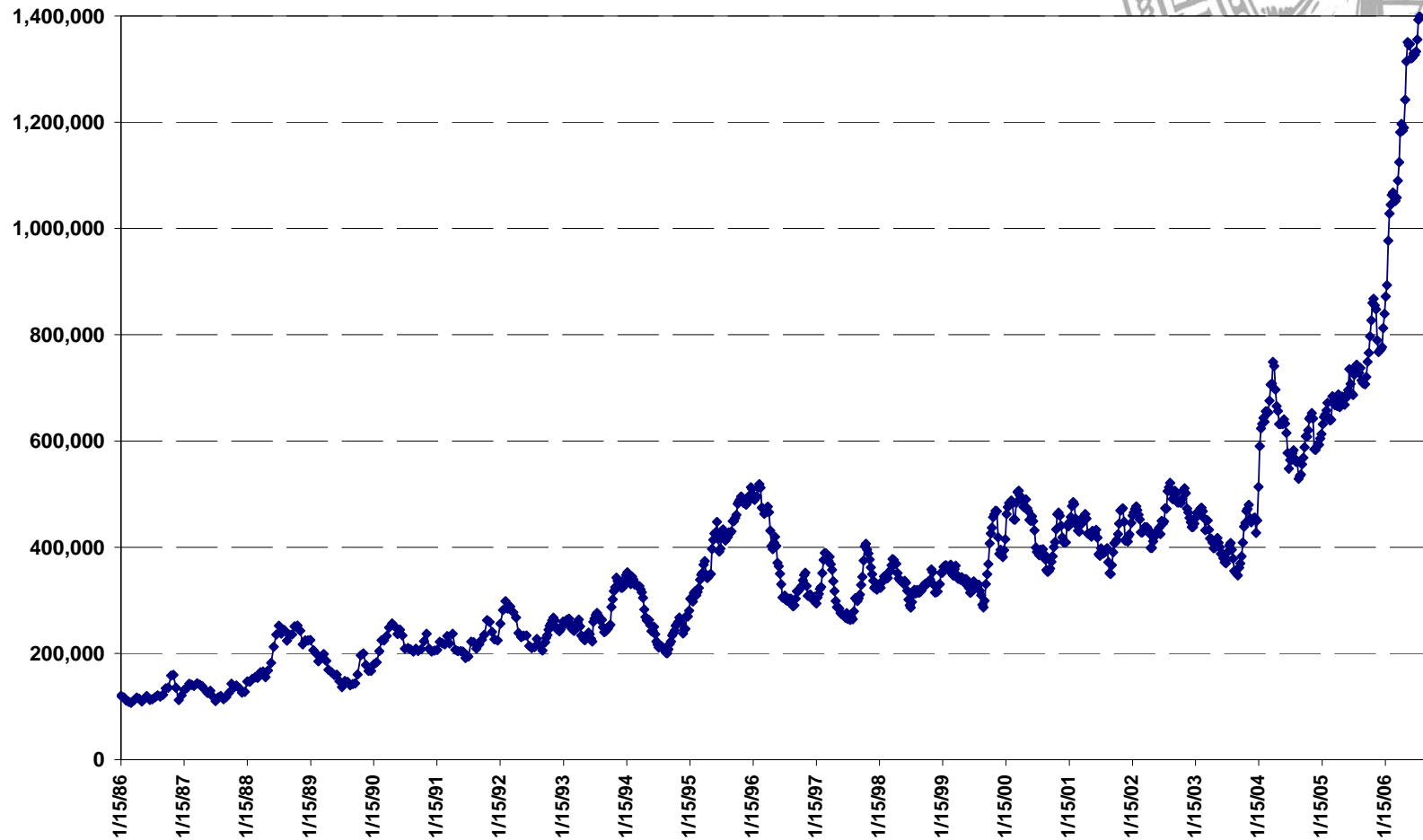
- Increase Volatility
- Drive prices away from fundamental values - “spec bubble” –
- Manipulate market
- Extrapolate past trends – “herding”



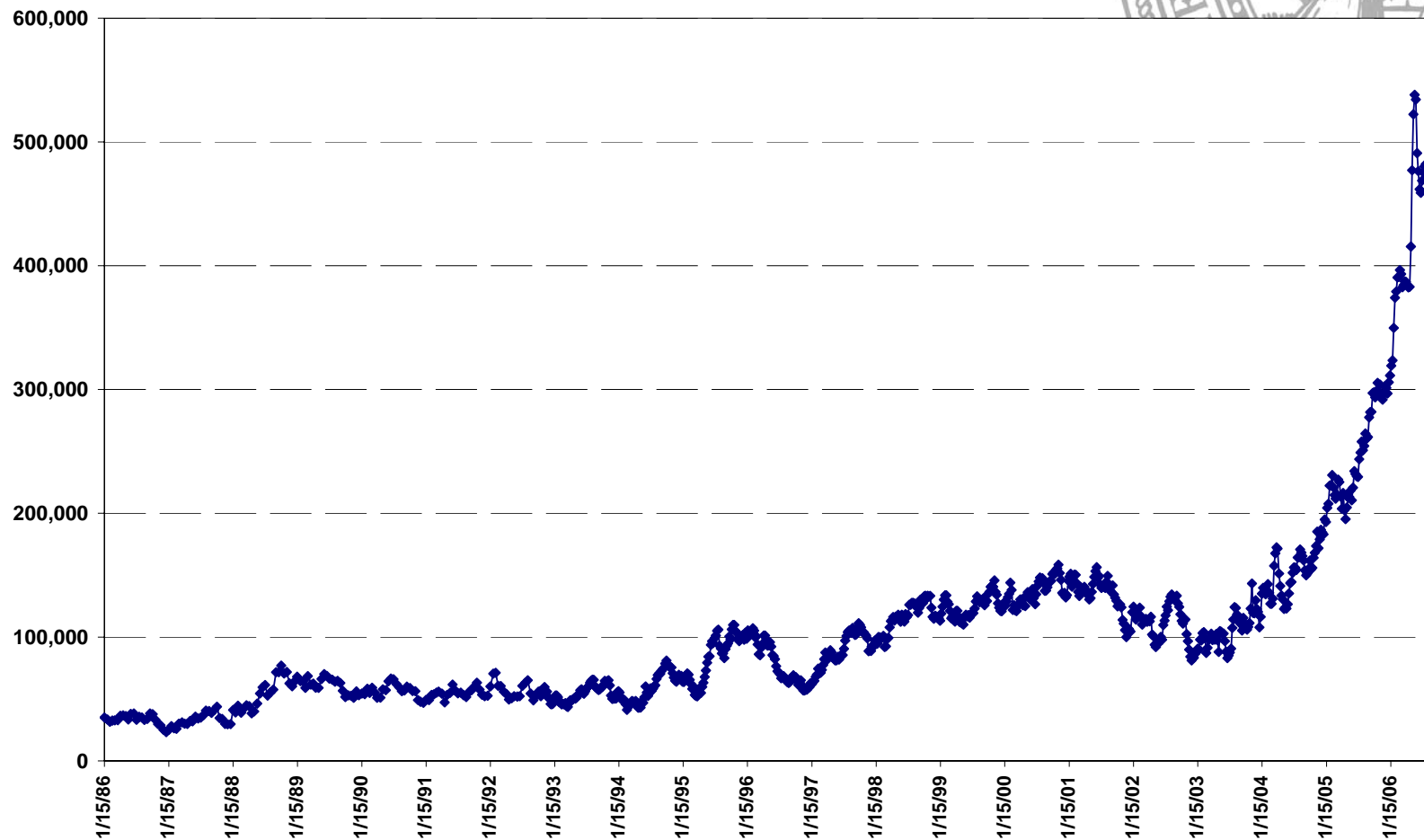
Open Interest

- **The total number of futures contracts long or short in a delivery month or market that have been entered into and not yet liquidated by an offsetting transaction or fulfilled by delivery.**
- **Also called Open Contracts or Open Commitments.**

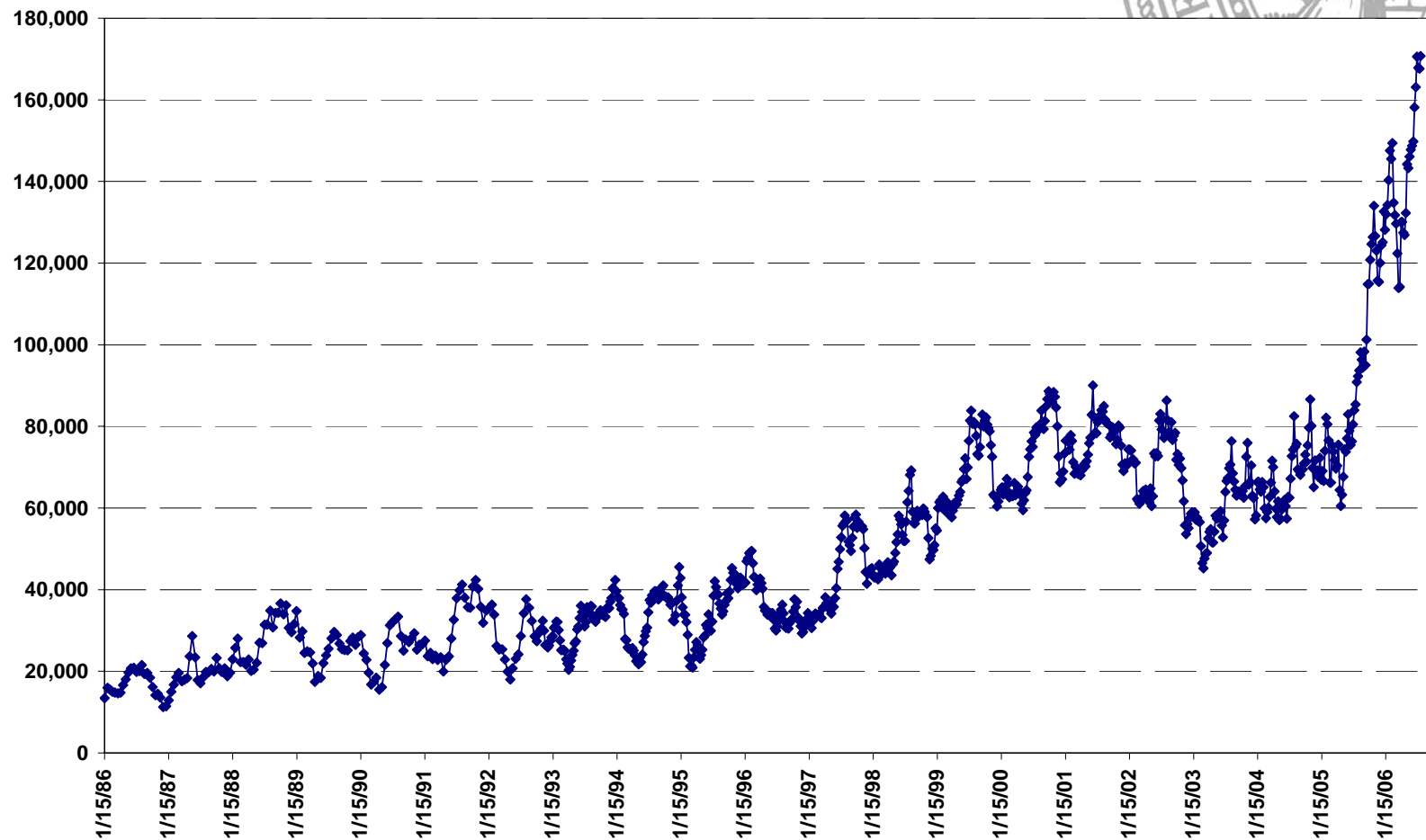
Corn Open Interest – CBOT



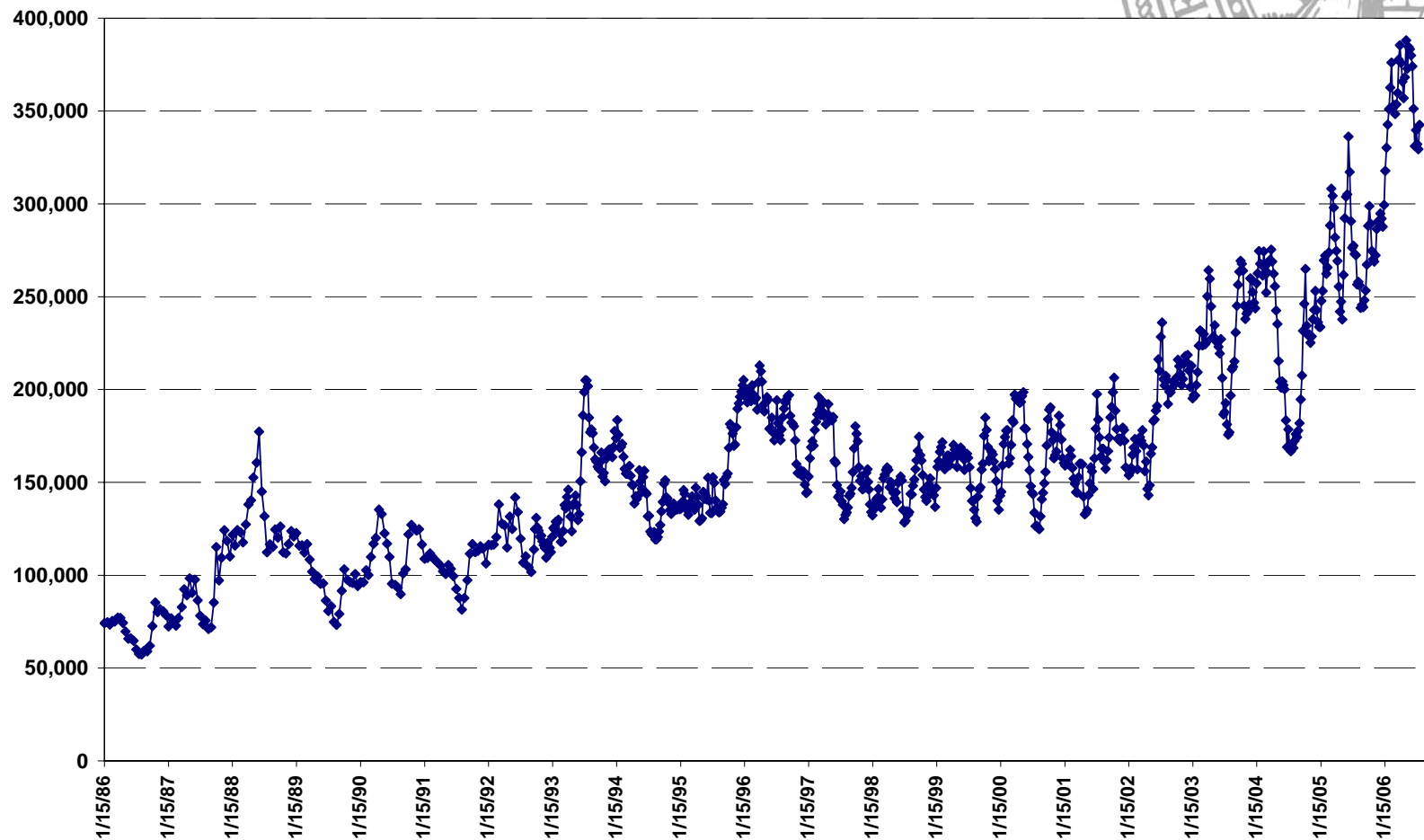
Wheat Open Interest – CBOT



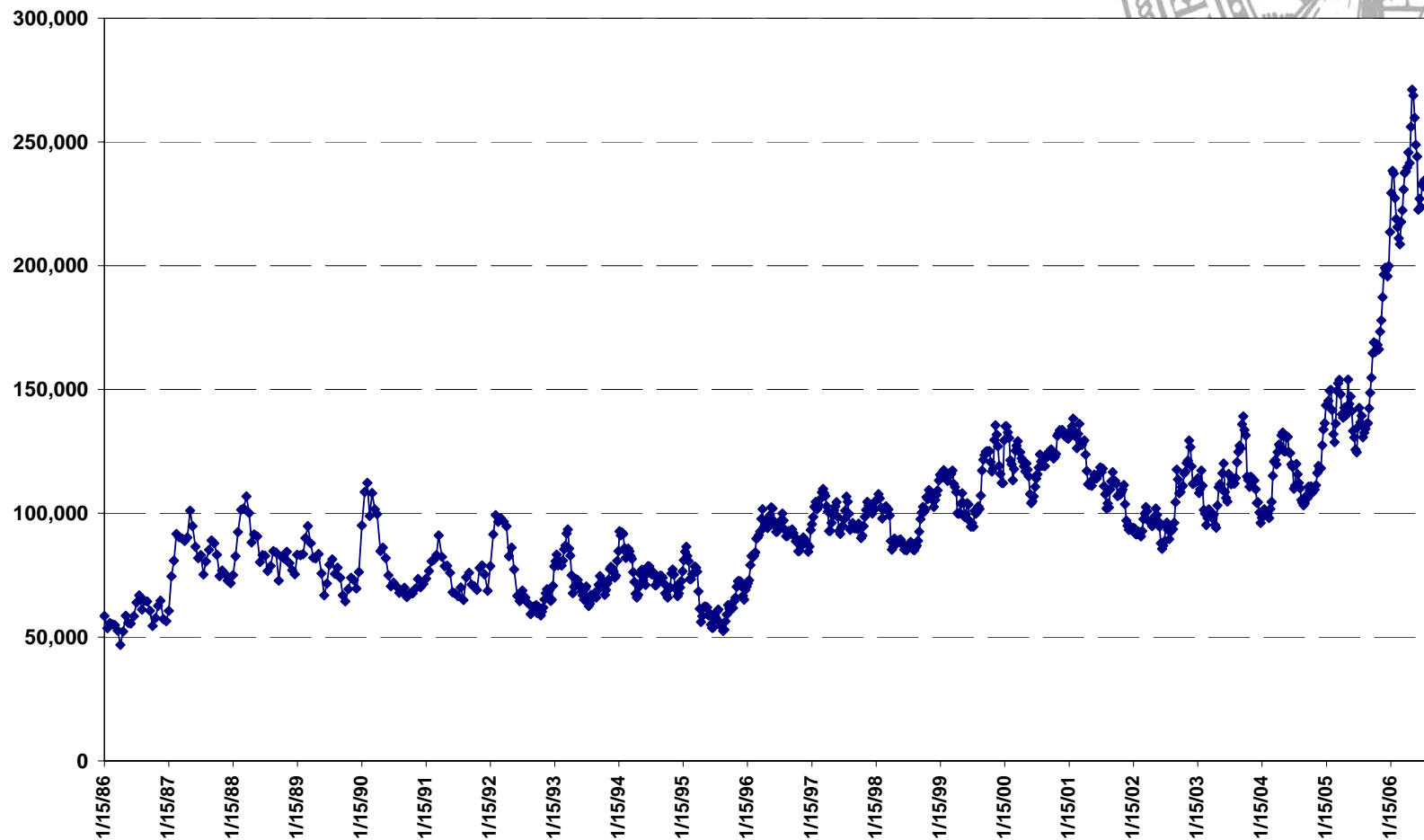
KC Wheat Open Interest – KCBT



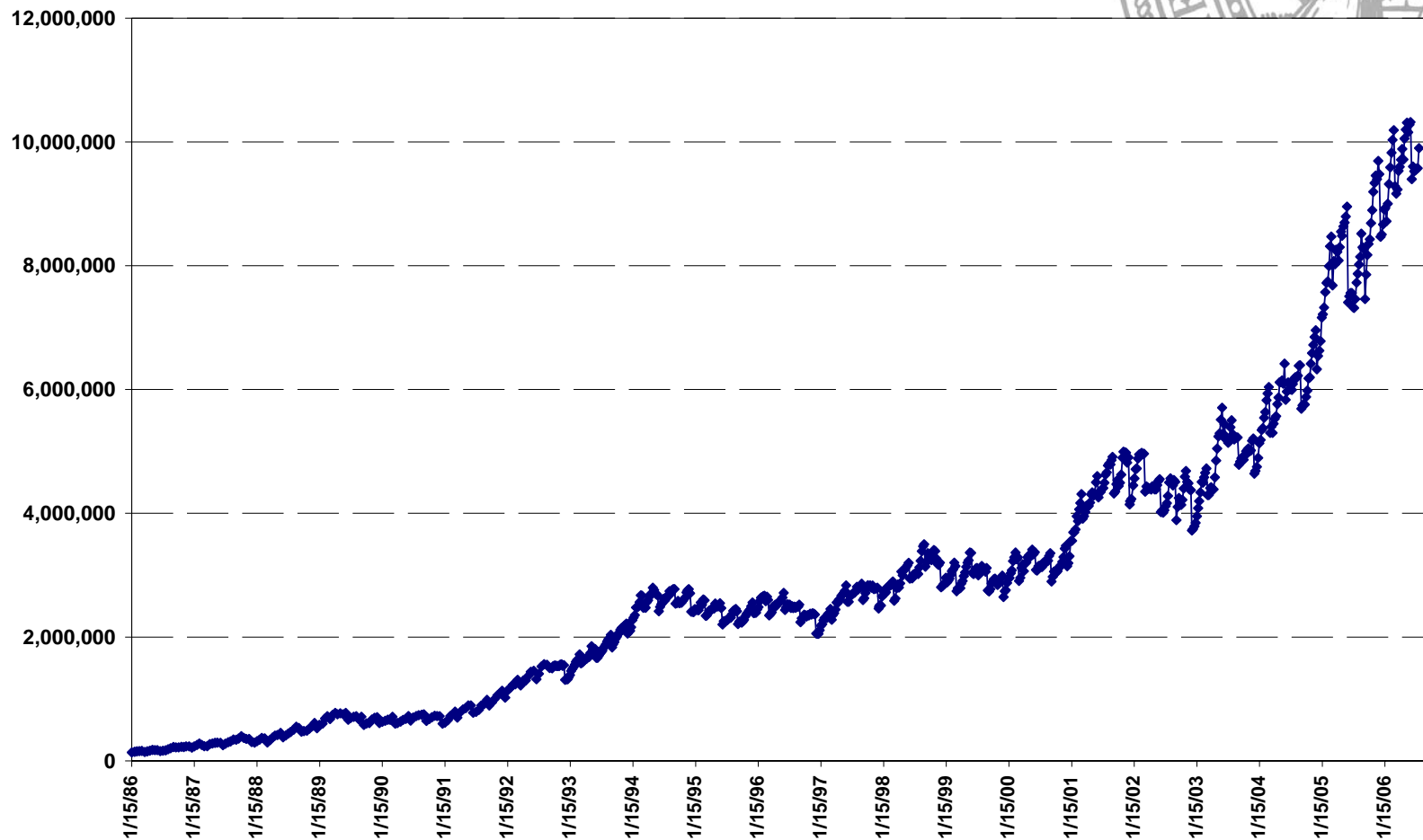
Soybean Open Interest – CBOT



Live Cattle Open Interest – CME



3 Month Euro Dollar – CME



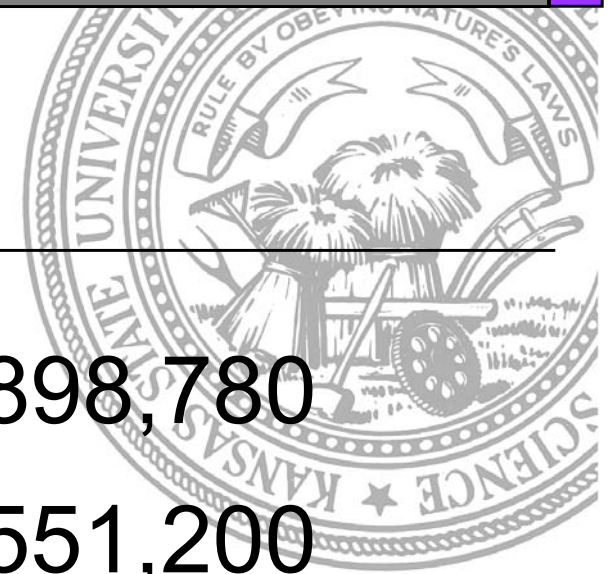
Open Interest

	<u>Jan 2004</u>	<u>Aug 2006</u>	<u>% Change</u>
Corn	450,278	1,399,222	210.8%
Wheat	116,310	482,088	314.5%
Soybeans	243,722	342,520	40.5%
Live Cattle	96,071	233,026	142.6%
Euro	4,894,589	9,899,184	102.5%

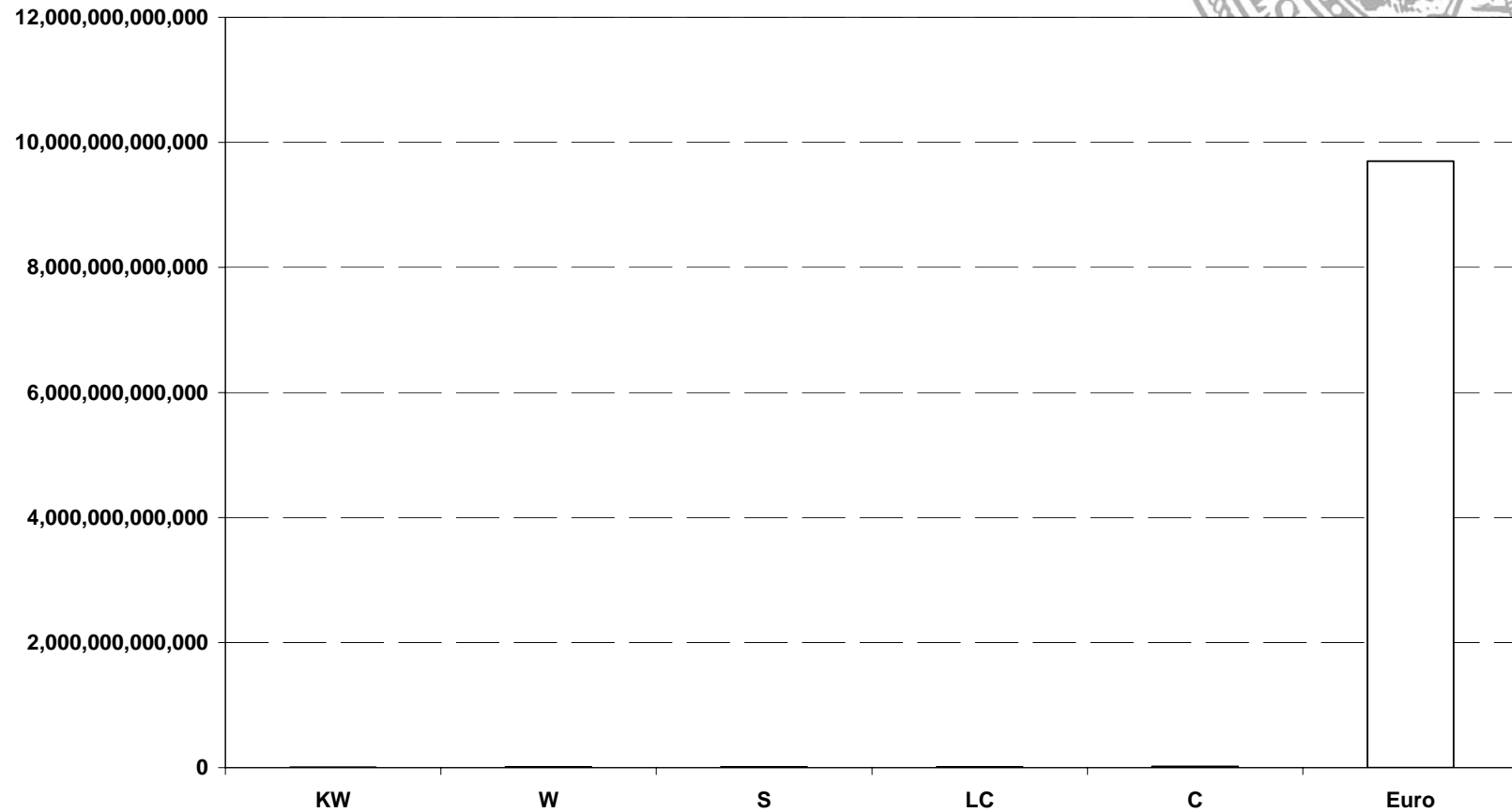
Contracts

Futures Contracts Value

KC Wheat	\$3,924,898,780
Wheat	\$9,593,551,200
Soybeans	\$9,525,481,200
Live Cattle	\$10,699,659,040
Corn	\$18,329,808,200
Euro	\$9,701,200,320,000



Futures Contracts Value



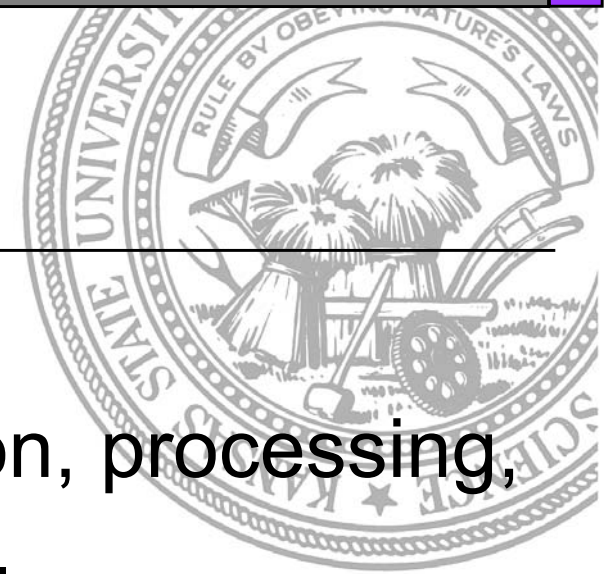
Open Interest

- Commercial – CL – CS

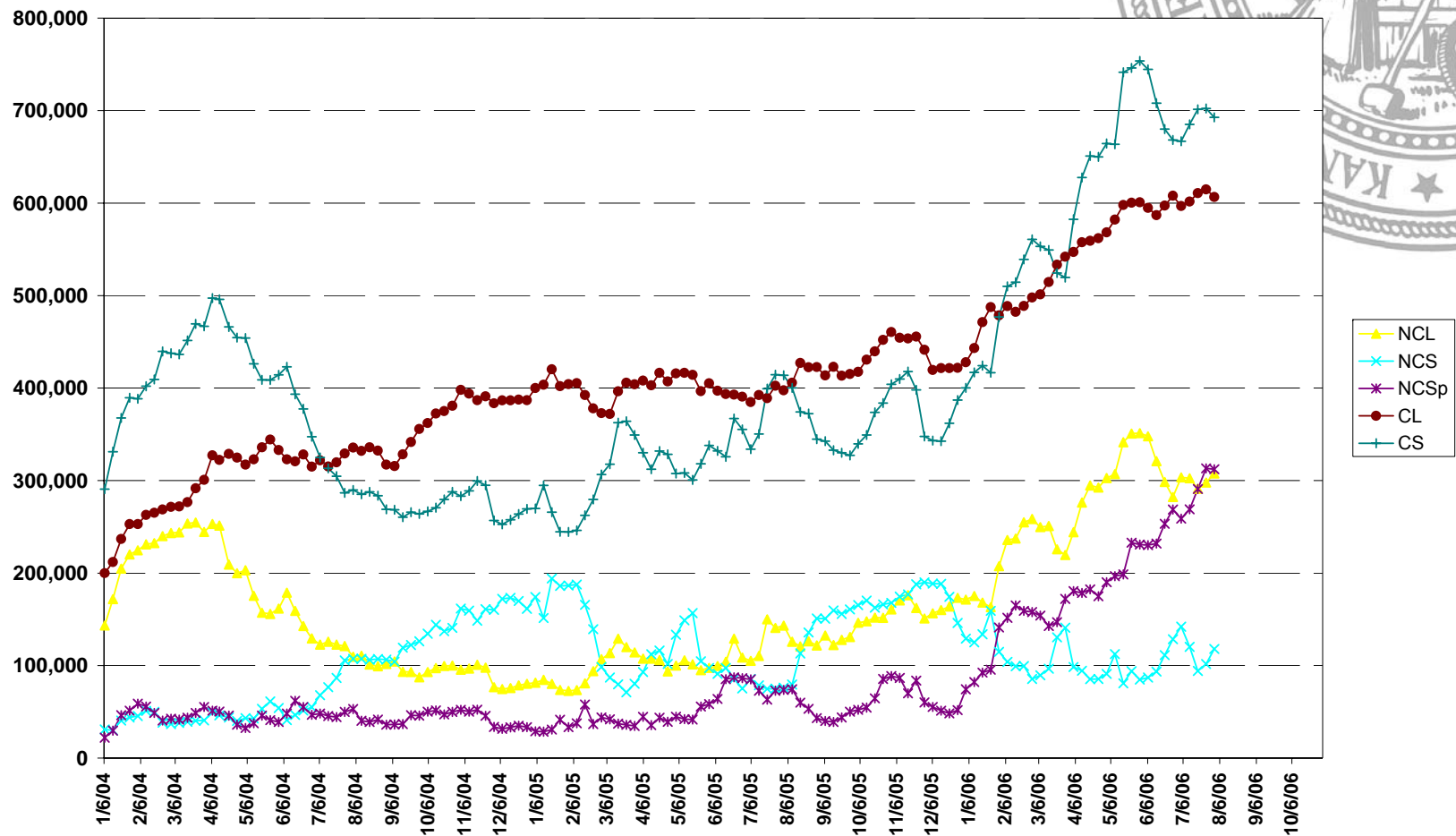
An entity involved in the production, processing, or merchandising of a commodity.

- Non-commercial – NCL – NCS

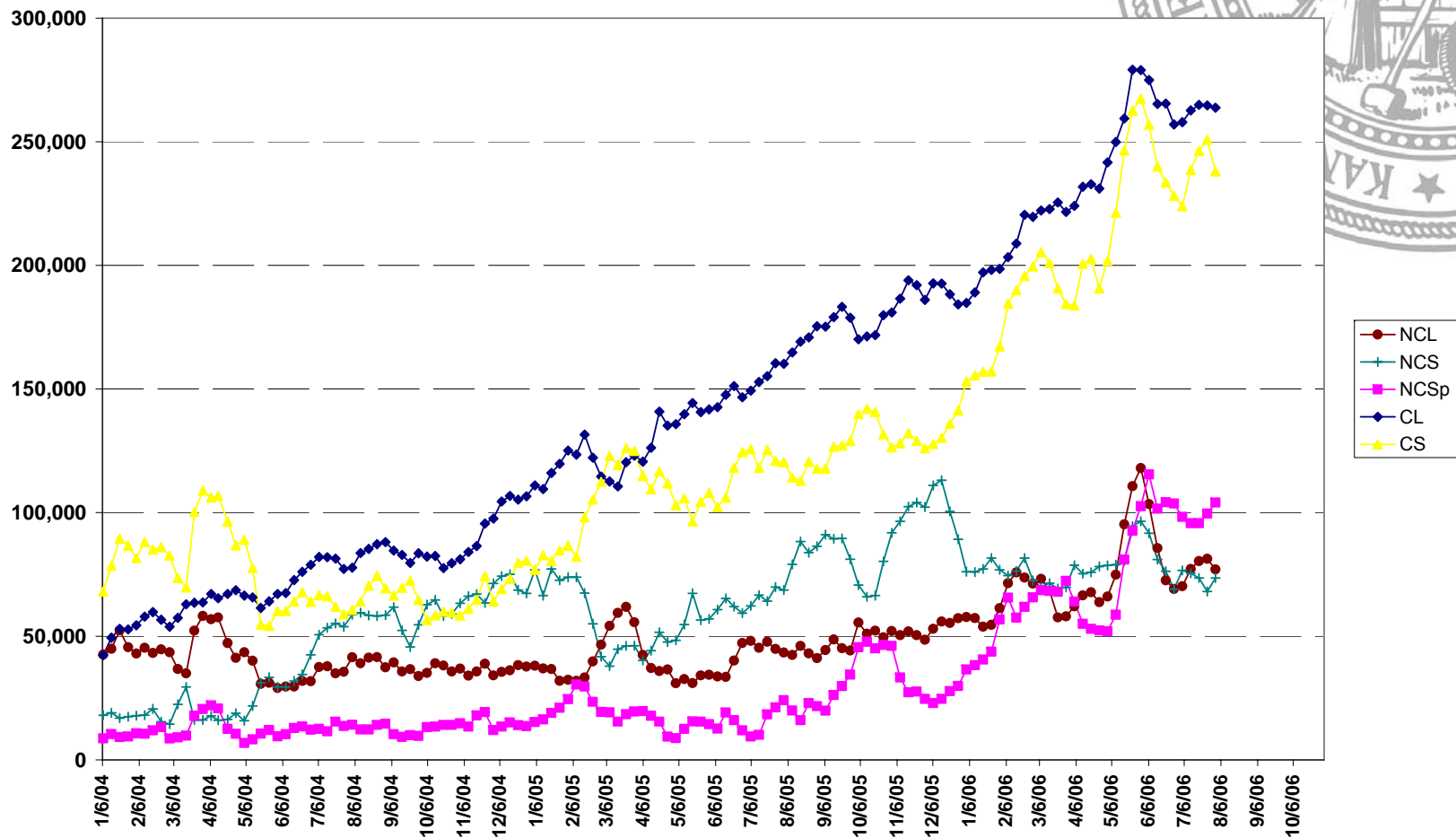
Not engaged in business activities hedged by the use of the futures or option markets.
Speculators.



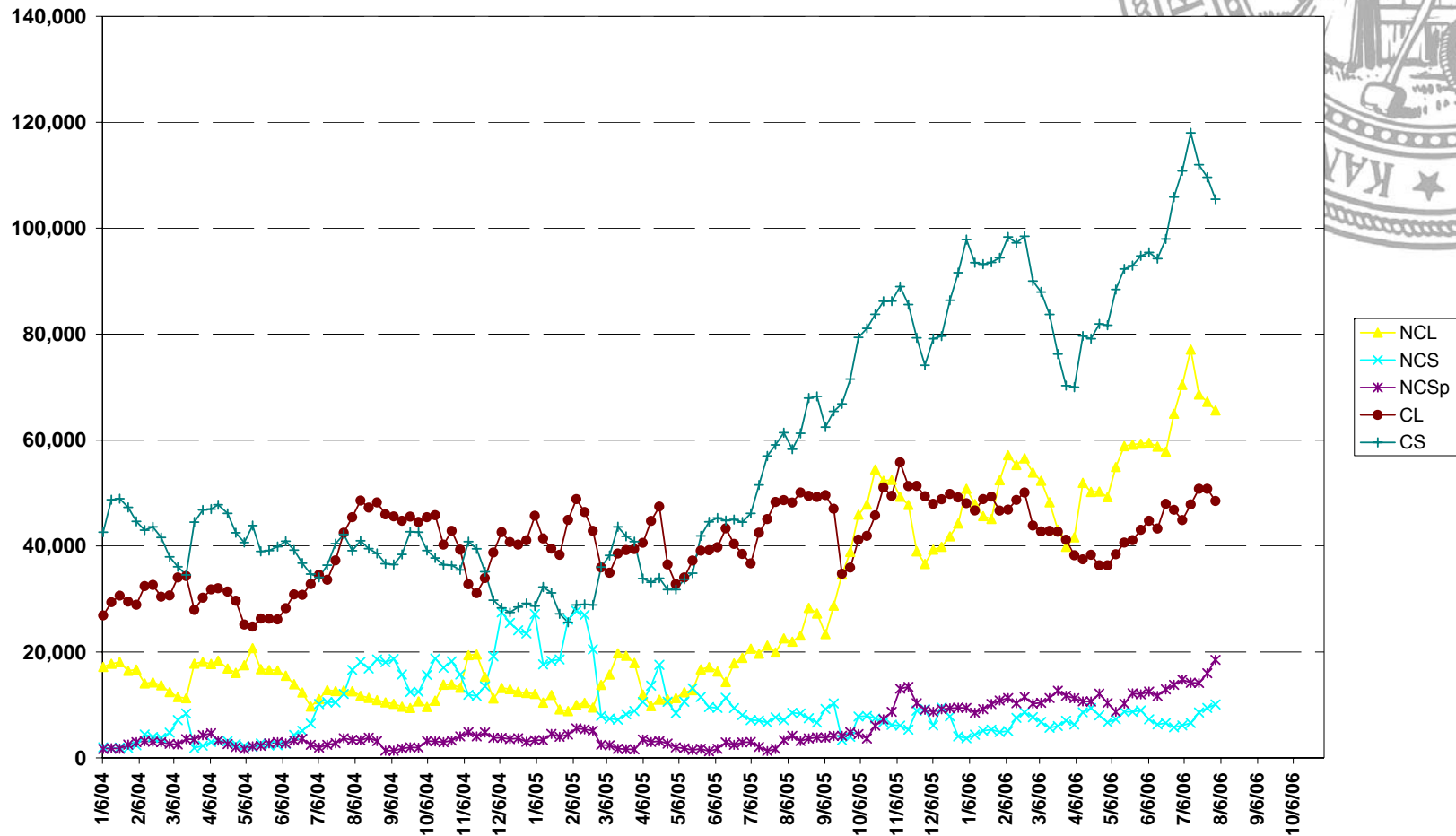
Corn Open Interest – CBOT



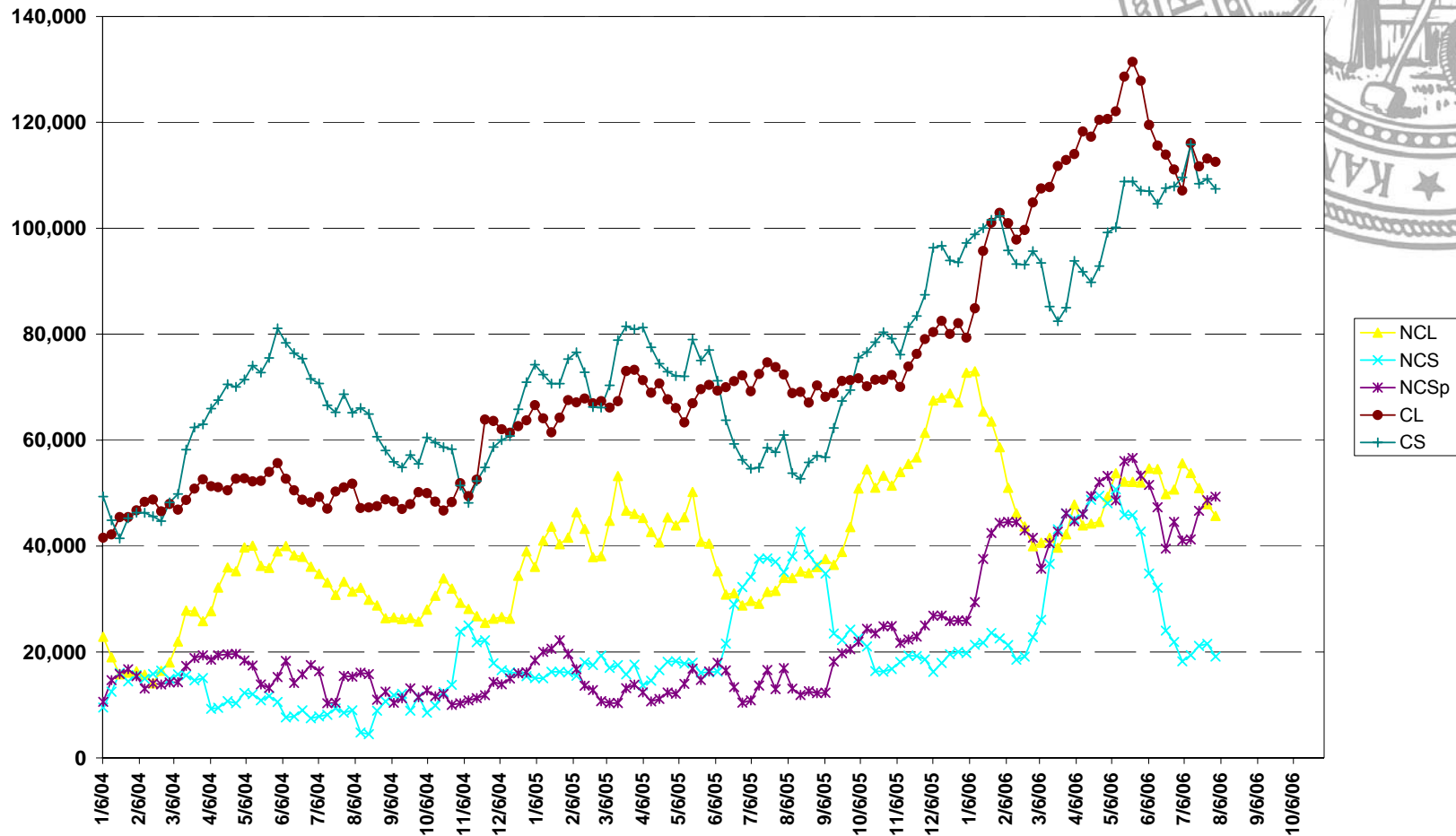
Wheat Open Interest – CBOT



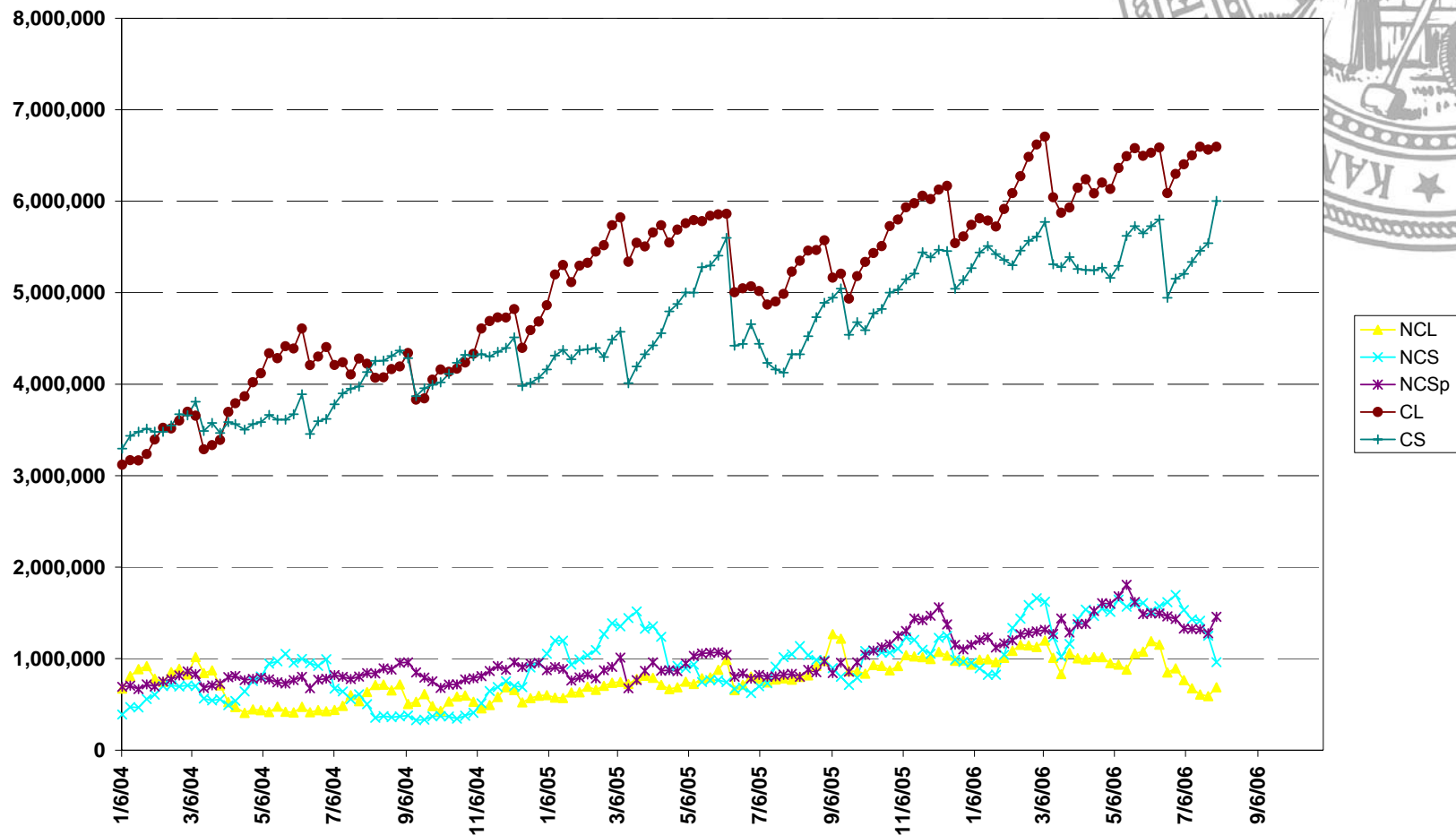
KC Wheat Open Interest – CBO



Live Cattle Open Interest – CME



3 Month Euro \$ Open Interest – CME



Data

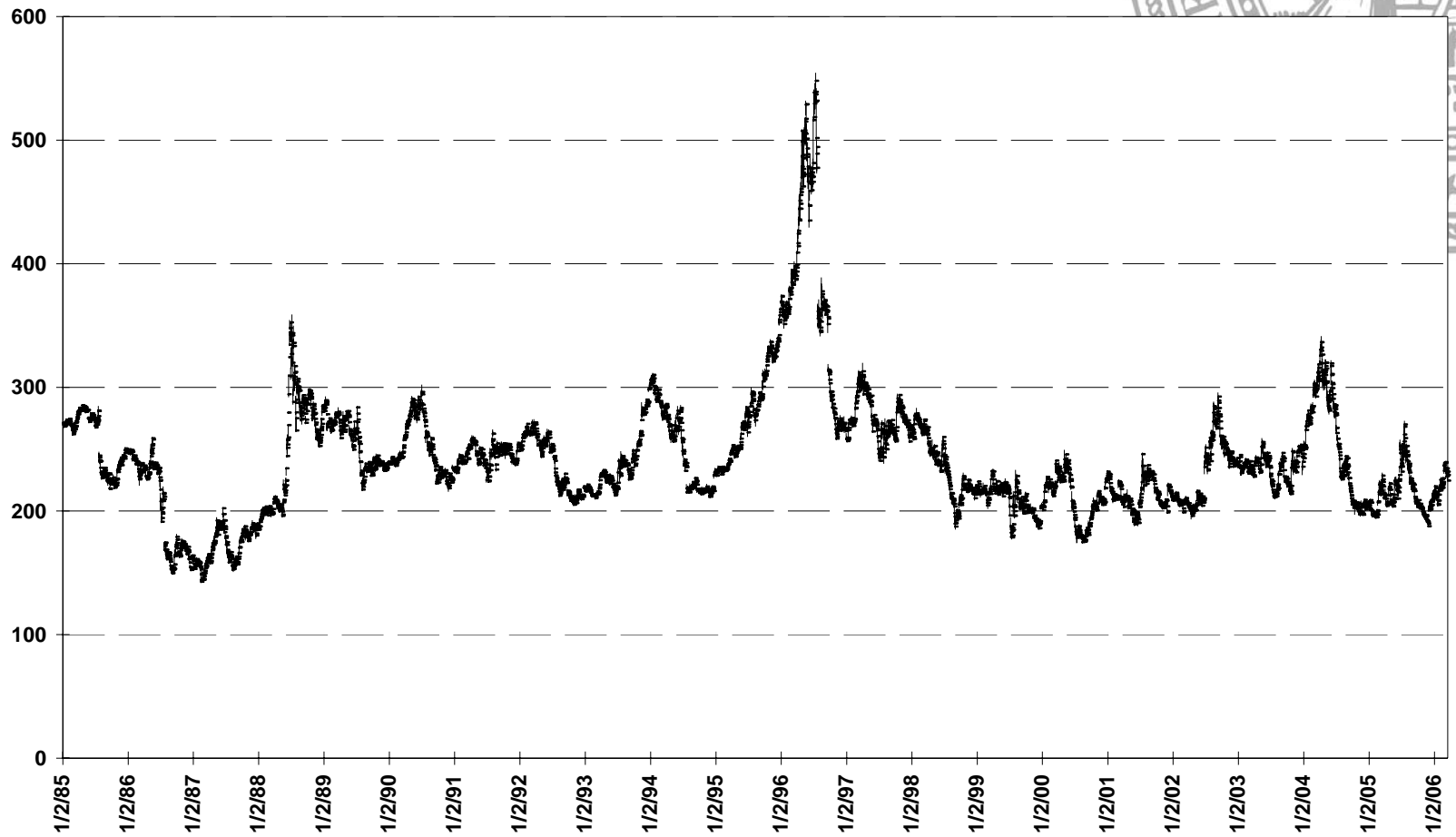
- Series of high-frequency time-stamped futures price transactions data: corn, wheat, soybean, cattle and euro \$'s futures price data from January 1985 to May 2006.



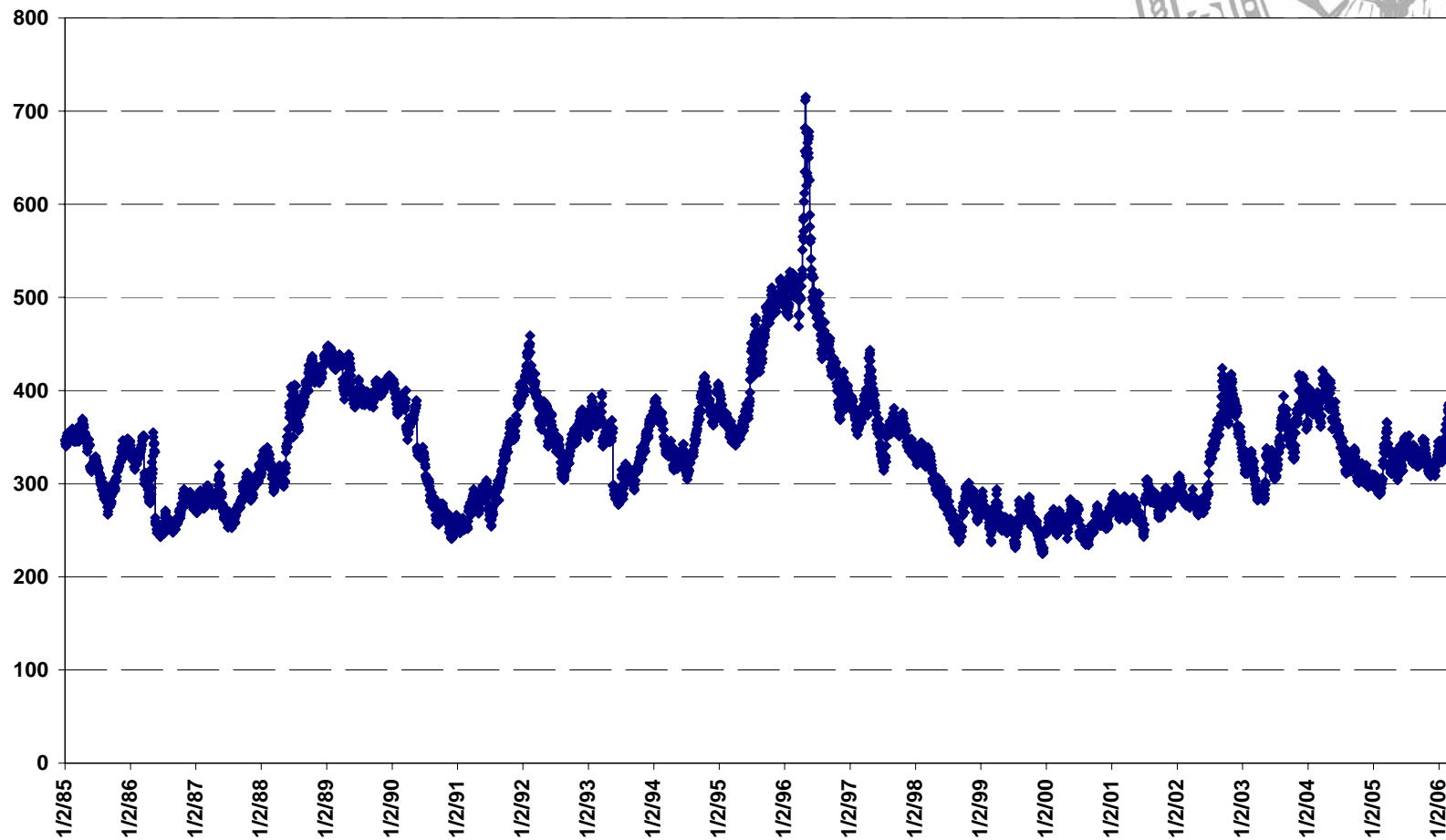
Corn Futures Continuation - CBOT



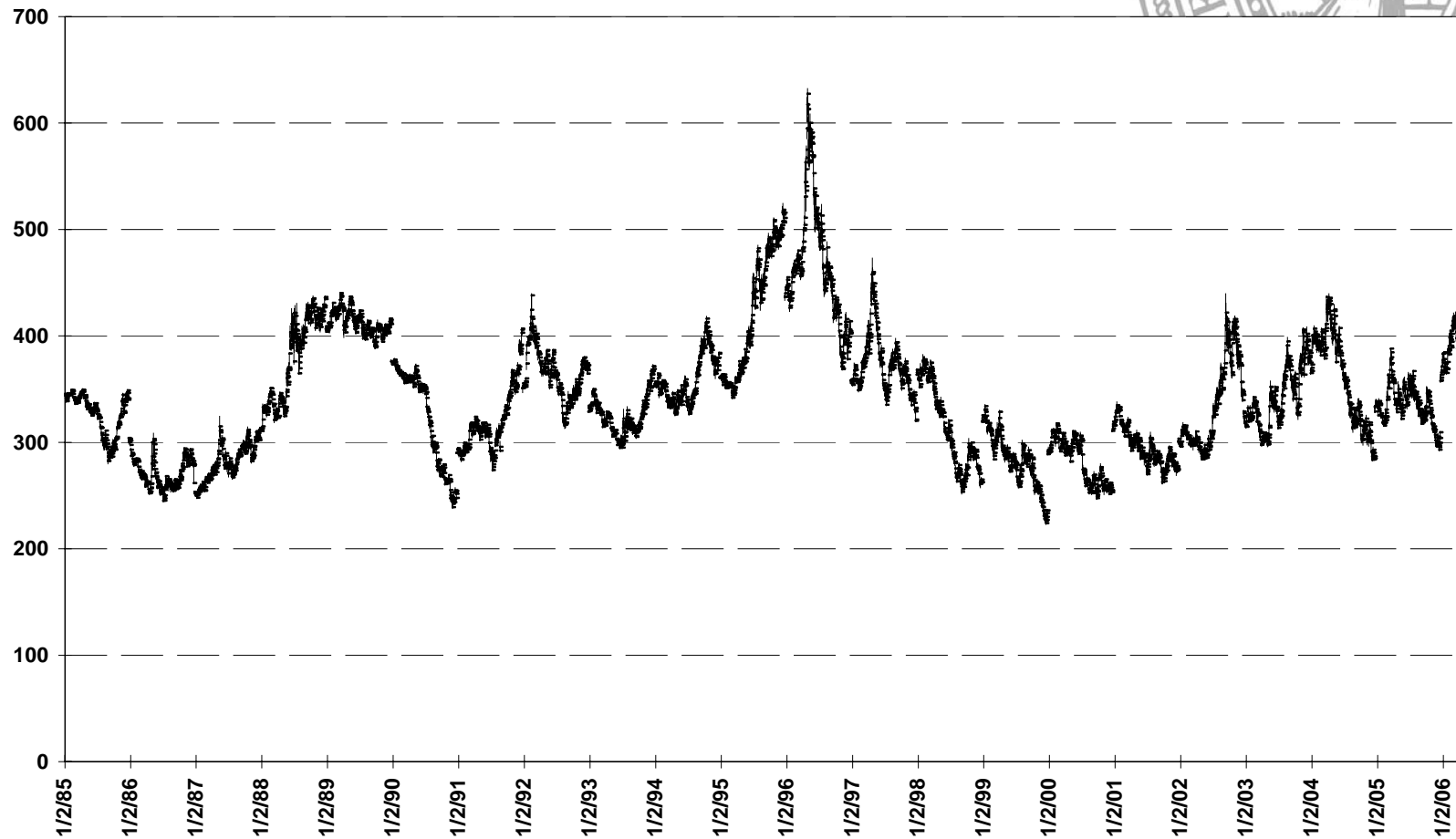
Corn Futures Continuation - CBOT



Wheat Futures Continuation - CBOT



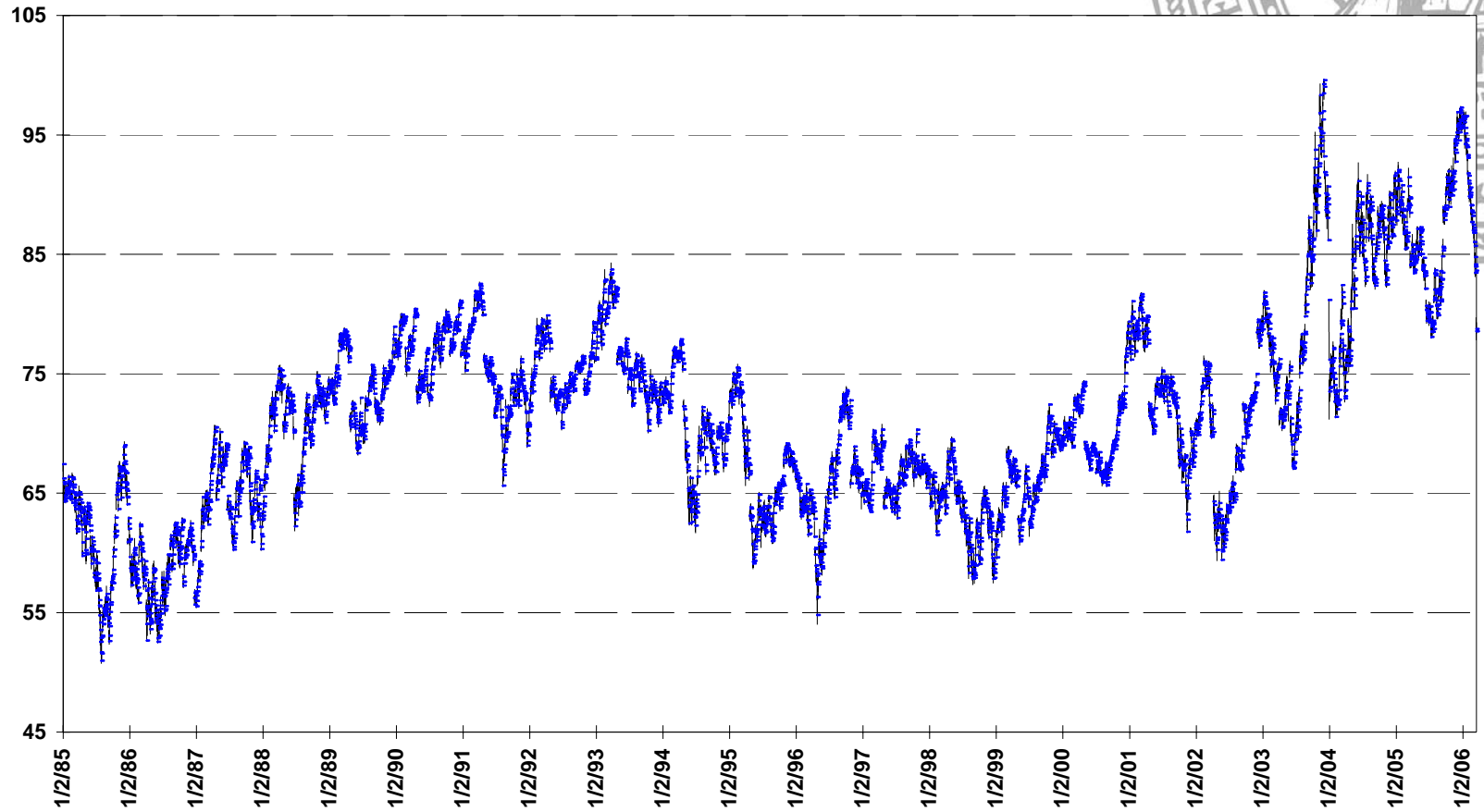
Wheat Futures Continuation - CBOT



Soybean Futures Continuation - CBOT



Cattle Futures Continuation - CME



Volatility - Variance

- The traditional estimator of a price series variance using the close to close prices for a stationary time series is:

$$\sigma_{cc}^2 = \frac{1}{n} \sum_{t=1}^n \left(\ln \frac{C_t}{C_{t-1}} \right)^2 ,$$

Volatility - Variance

- The mean-adjusted variant of the close to close estimator is:

$$\hat{\sigma}_{acc}^2 = \frac{1}{n-1} \sum_{t=1}^n \left(\ln \frac{C_t}{C_{t-1}} \right)^2 - \frac{[\ln(C_n / C_0)]^2}{n(n-1)},$$

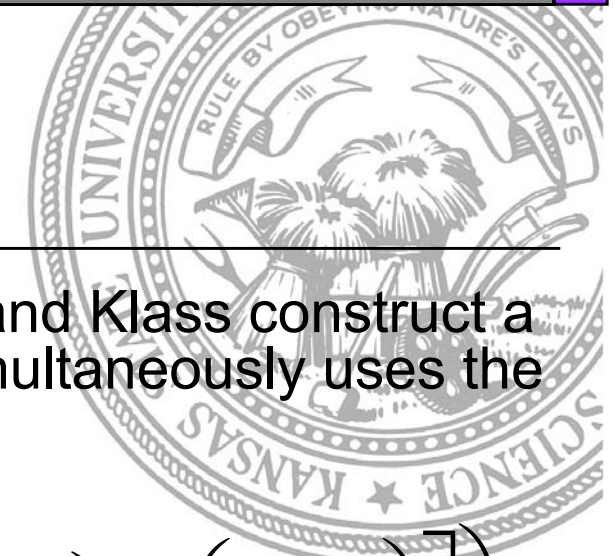
Volatility - Variance

- Parkinson (1980) introduces the following extreme-value estimator for a drift security:

$$\hat{\sigma}_{hl}^2 = \frac{1}{4n \ln 2} \sum_{t=1}^n \left(\ln \frac{H_t}{L_t} \right)^2,$$

- H_t – high, L_t – low

Volatility - Variance

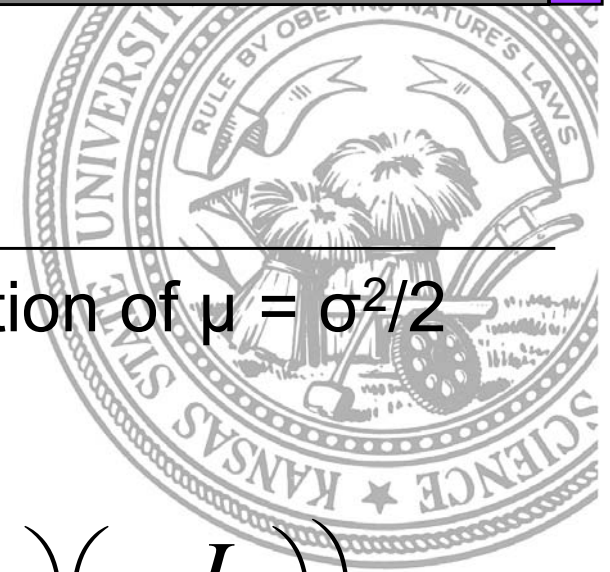


- Following Parkinson's assumptions, Garman and Klass construct a minimum variance unbiased estimator that simultaneously uses the opening, high, low and close prices:

$$\hat{\sigma}_{ohlc}^2 = \frac{1}{n} \sum_{t=1}^n \left(0.511 \left(\ln \frac{H_t}{L_t} \right)^2 - 0.019 \left[\ln \left(\frac{C_t}{O_t} \right) \ln \left(\frac{H_t L_t}{O_t^2} \right) \right] \right. \\ \left. - 2 \ln \left(\frac{H_t}{O_t} \right) \ln \left(\frac{L_t}{O_t} \right) - 0.383 \left[\ln \left(\frac{C_t}{O_t} \right)^2 \right] \right)$$

- O_t – open, H_t – high, L_t – low, C_t - close

Volatility - Variance

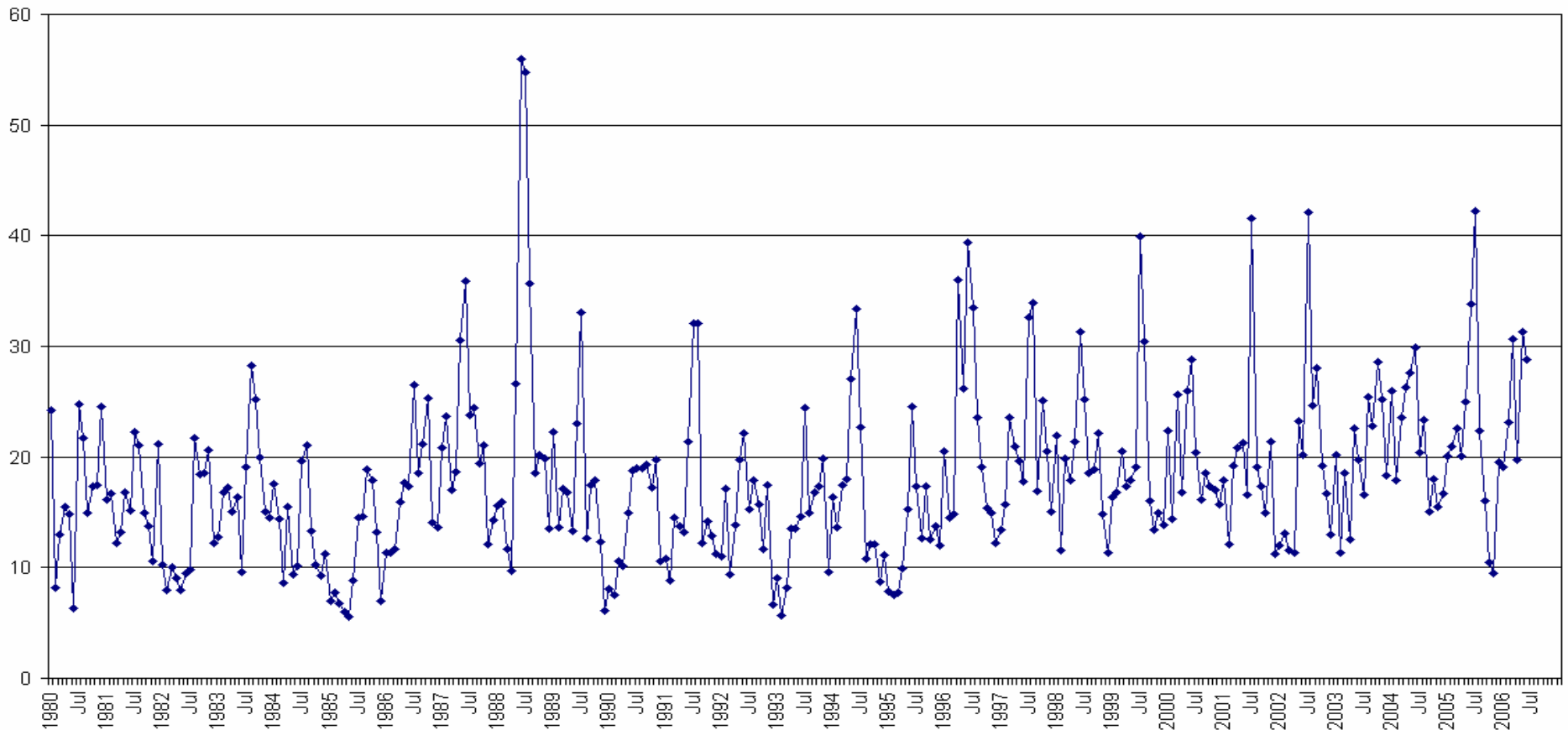


- Rogers and Satchell relax the assumption of $\mu = \sigma^2/2$ with the following:

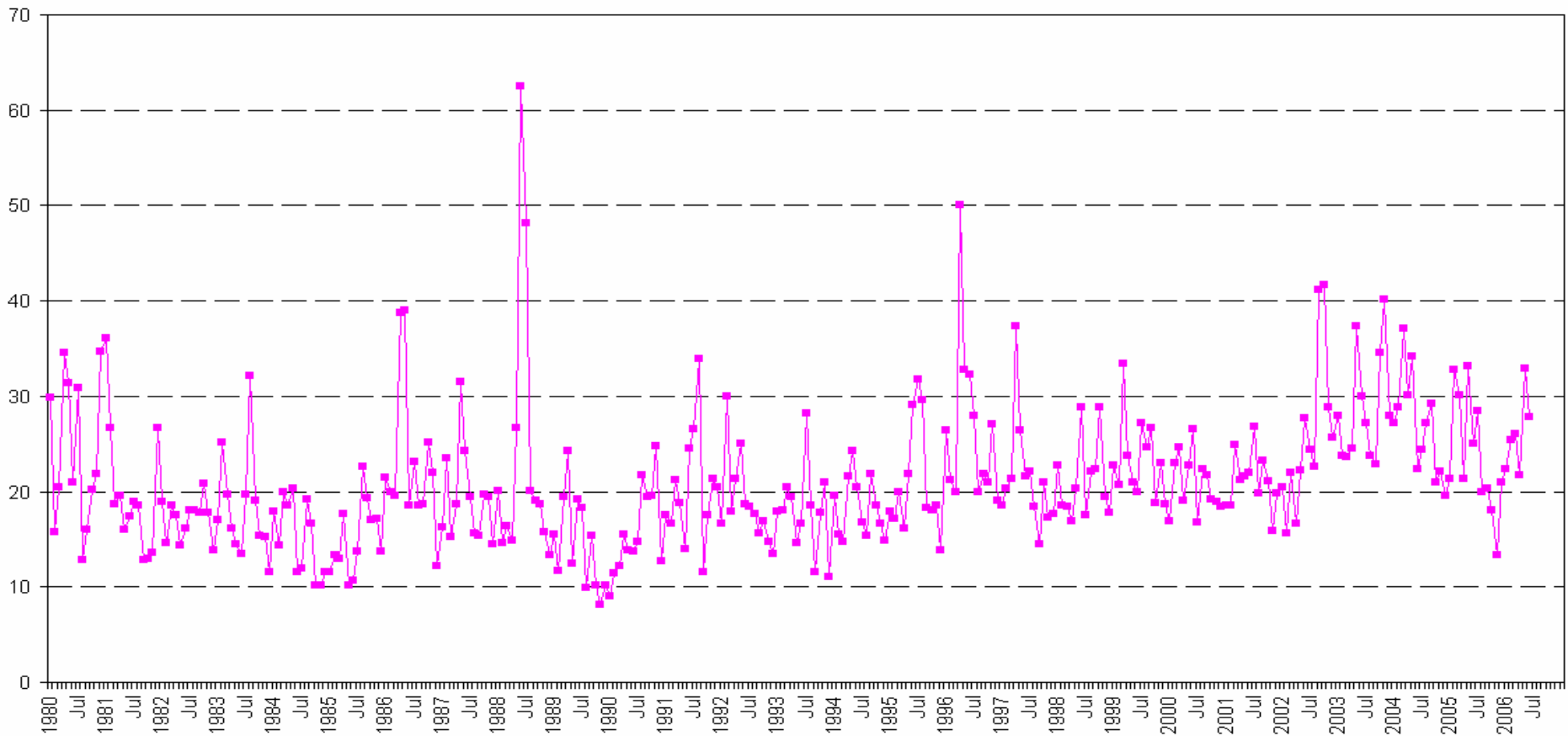
$$\hat{\sigma}_{ohlc2}^2 = \frac{1}{n} \sum_{t=1}^n \left(\left(\ln \frac{H_t}{C_t} \right) \left(\ln \frac{H_t}{O_t} \right) + \left(\ln \frac{L_t}{C_t} \right) \left(\ln \frac{L_t}{O_t} \right) \right),$$

- O_t – open, H_t – high, L_t – low, C_t - close

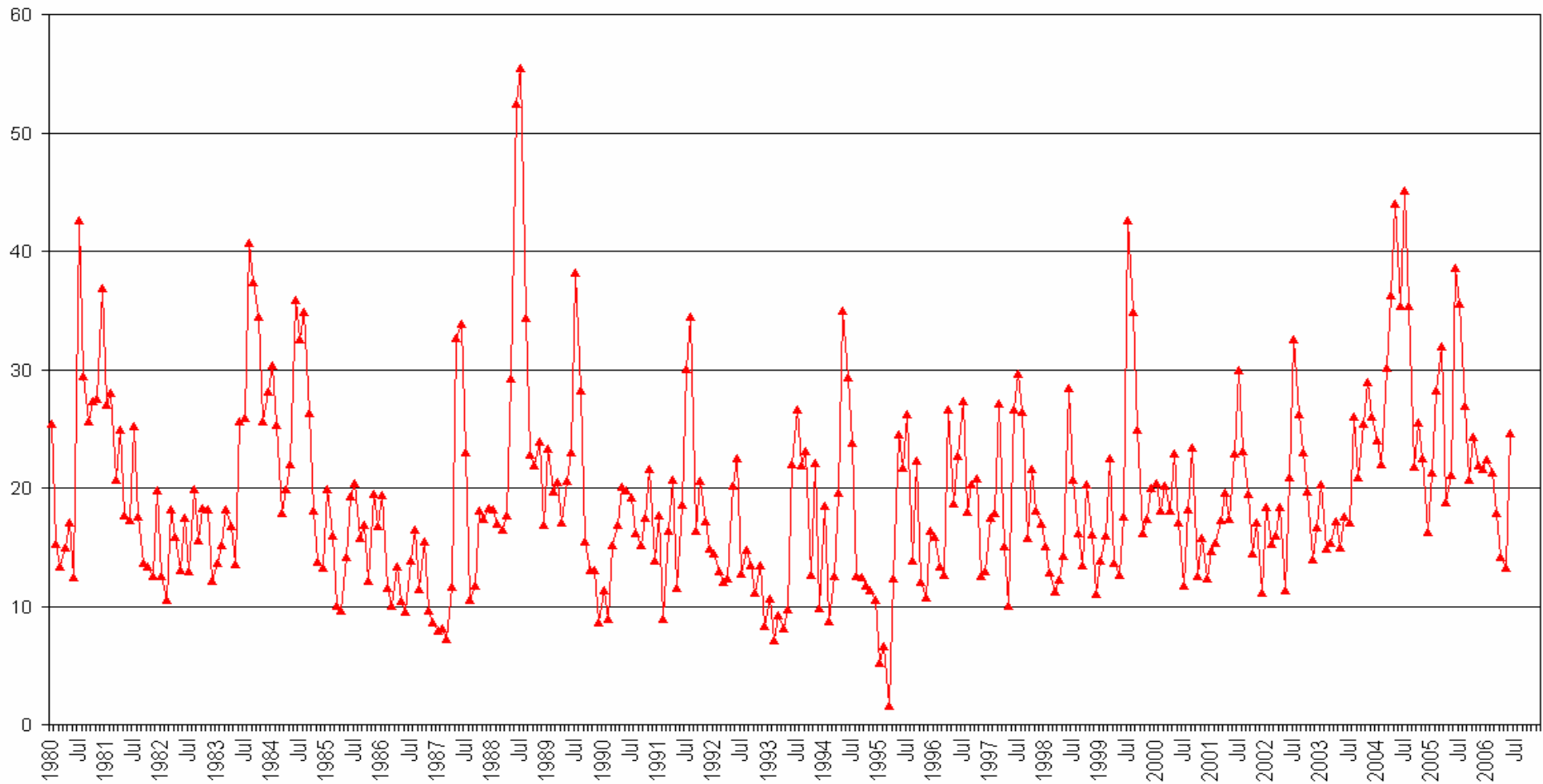
Corn Volatility cc - CBOT



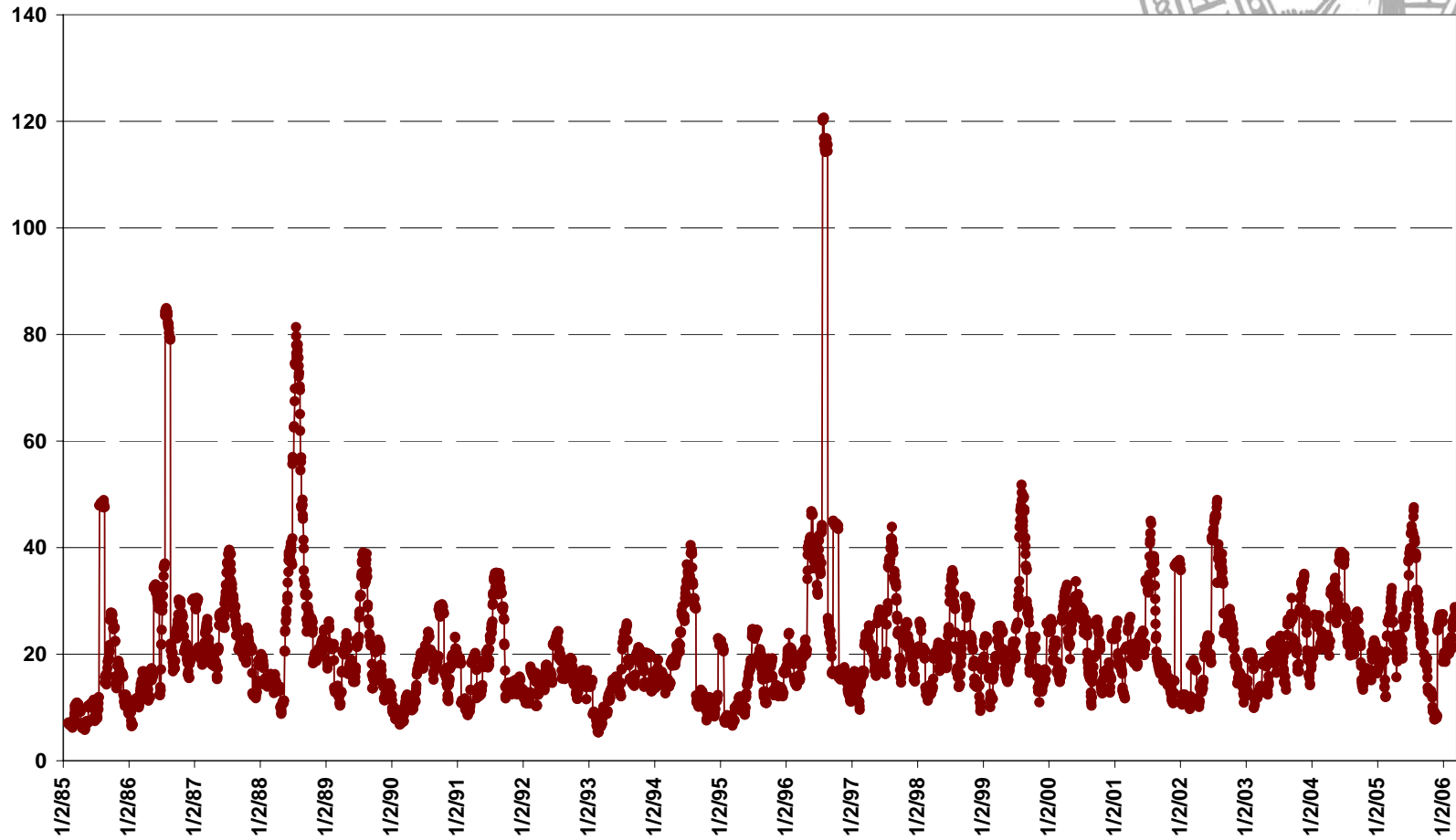
Wheat Volatility cc - CBOT



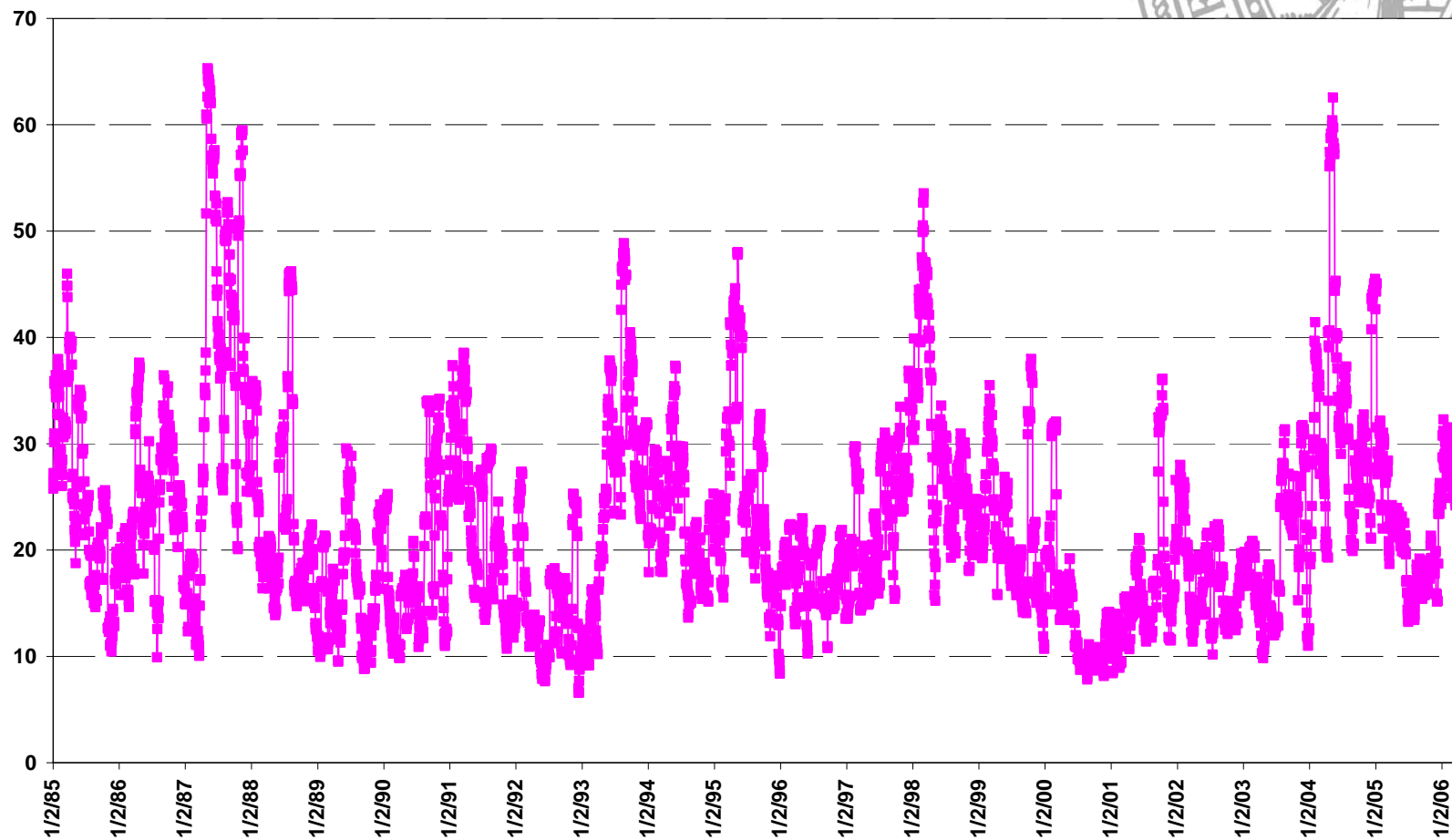
Soybean Volatility cc – CBOT



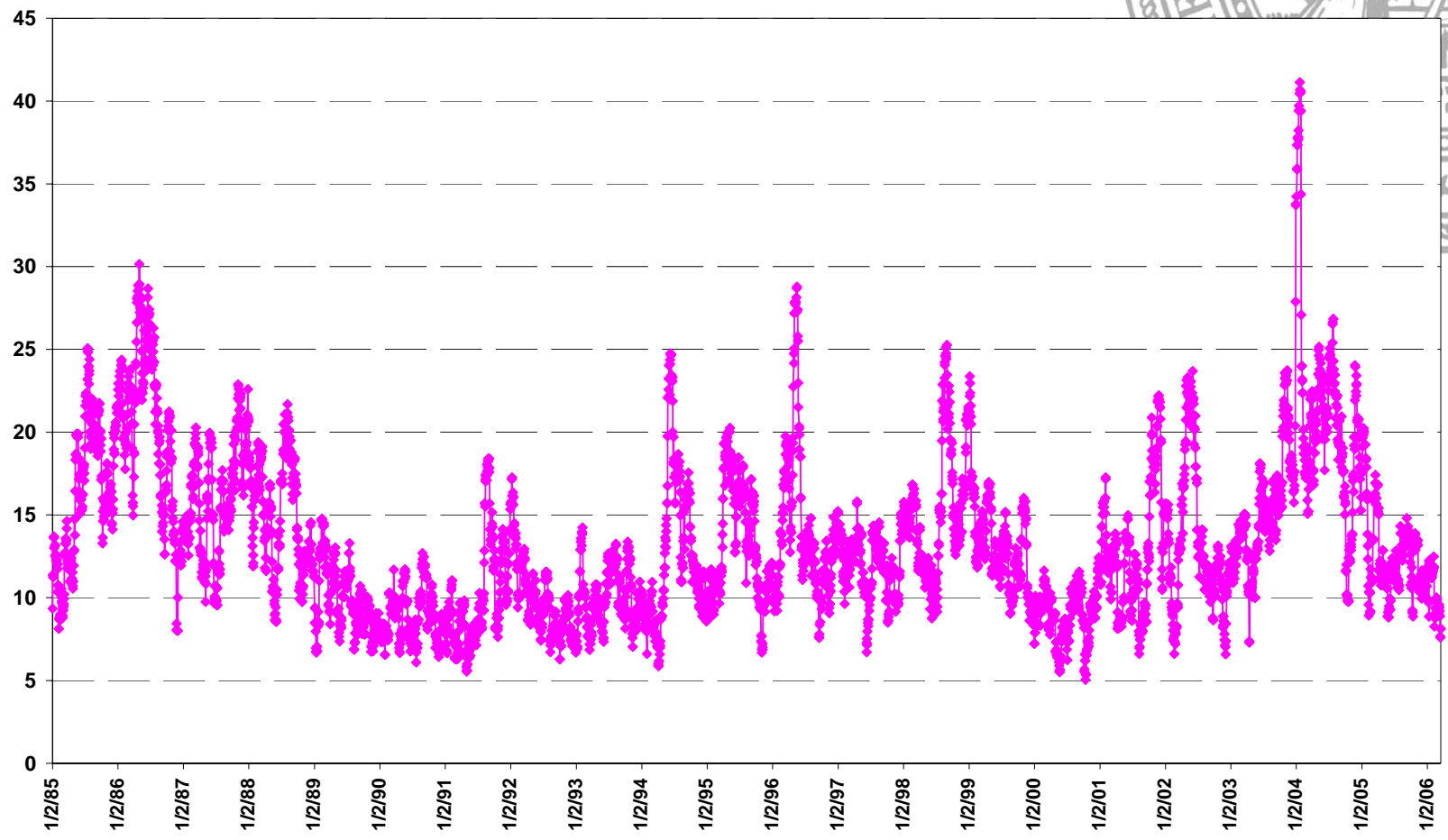
Corn Volatility ohlc – CBOT



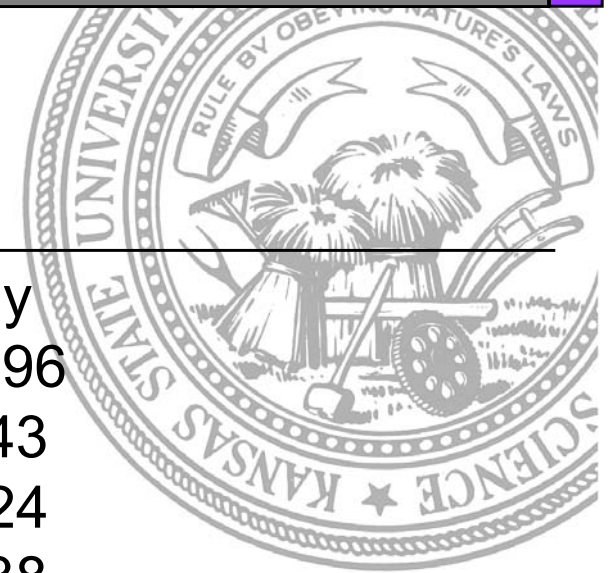
Soybean Volatility ohlc – CBO



Live Cattle Volatility ohlc – CME



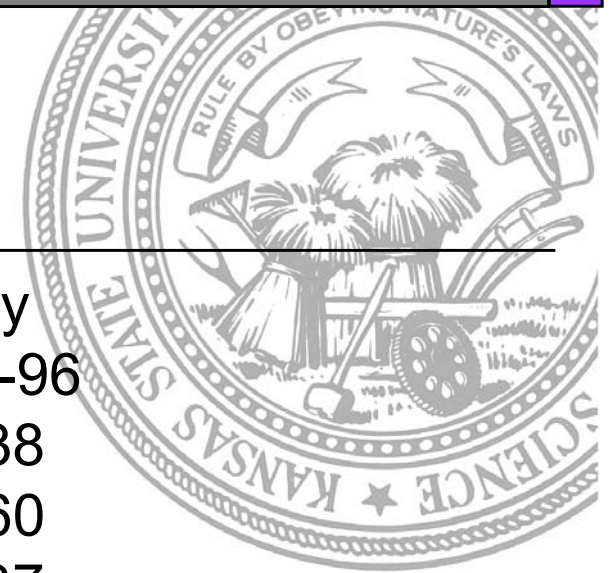
Cash Corn Prices



	Annual 1985-96	Daily 1985-96
Average	244	243
Variance	879	1,424
Standard Dev	30	38
Skewness	-1.64	-0.75
Krutosis	3.38	0.04

	1997-06	1997-06
Average	230	232
Variance	2,948	1,206
Standard Dev	54	35
Skewness	2.08	0.64
Krutosis	5.40	-0.39

Corn futures – nearby - CBOT

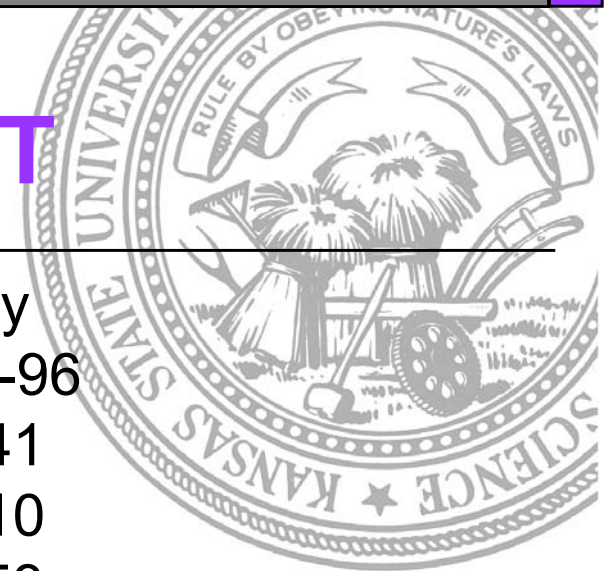


	Annual 1985-96	Daily 1985-96
Average	238	238
Variance	734	1,360
Standard Dev	27	37
Skewness	-1.70	-0.41
Krutosis	3.45	-0.07

	1997-06	1997-06
Average	233	232
Variance	2,383	944
Standard Dev	49	31
Skewness	2.30	0.77
Krutosis	6.20	-0.05

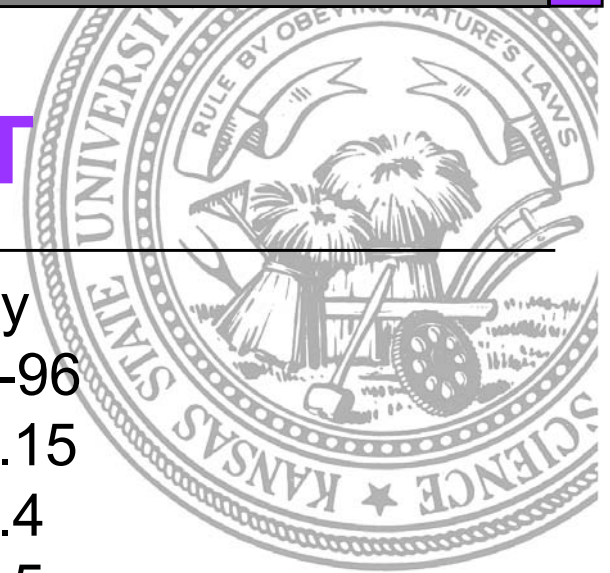
Wheat futures – nearby - CBOT

	Annual 1985-96	Daily 1985-96
Average	340	241
Variance	1,744	2,810
Standard Dev	42	53
Skewness	0.07	0.17
Krutosis	-0.57	-0.82
	1997-06	1997-06
Average	315	313
Variance	5,003	2,347
Standard Dev	71	49
Skewness	1.10	0.39
Krutosis	1.73	-0.88



Cattle futures – nearby - CBOT

	Annual 1985-96	Daily 1985-96
Average	69.93	70.15
Variance	38.7	48.4
Standard Dev	6.1	7.5
Skewness	-0.52	-0.51
Krutosis	-1.19	-0.62
	1997-06	1997-06
Average	75.02	74.90
Variance	21.3	85.3
Standard Dev	4.9	9.2
Skewness	0.23	0.73
Krutosis	-1.01	-0.45

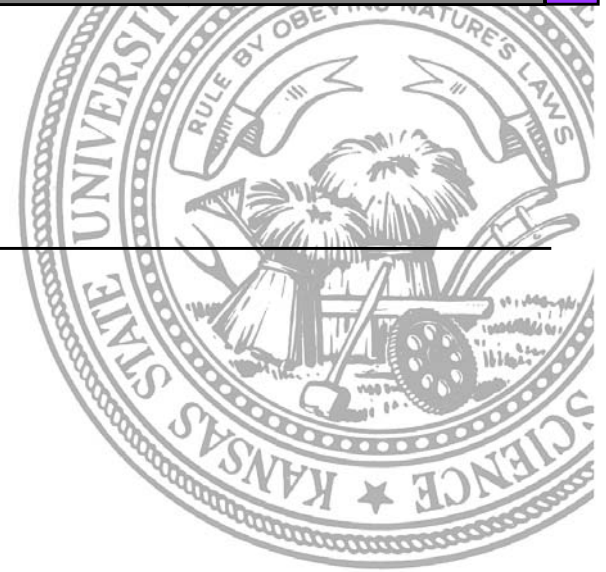


Exchange-Traded Funds

□ DB Commodity Index Tracking – DBC

<u>Commodity</u>	<u>Weight</u>
Light Sweet Crude	33.67
Heating Oil	17.98
Aluminum	15.34
Gold	11.6
Corn	10.78
Wheat	10.63





Asset Class Allocation by Institutional Investors

Asset Class	Percent Allocation
Equity	51%
Fixed Income	17%
Real Estate	4%
Hedge Funds	15%
Private Equity	3.2%
Venture Capital	3.5%
Natural Resources	3%

Source: NACUBO Endowment Study

MANAGER MIGRATION

◆ Traditional Fund Mangers Who Switched to HF/Alpha Overlay:

1.	Jack Meyer	Harvard Mgt	→	Alpha Overlay
2.	Brian Posner	Warburg Pincus	→	Hygrove Partners
3.	Michael DiCarlo	John Hancock	→	DFS Advisors HF
4.	Leon Cooperman	Goldman	→	Omega HF
5.	Jeffrey Vinik	Fidelity	→	Vinik Asset Mgmt
6.	Rob Donahue	Solomon Brothers	→	Own fund
7.	Greg Jackson	Oakmark Global	→	Blum Capital HF
8.	David Glancy	Fidelity	→	Own fund
9.	Peter Trapp	Needham	→	Own fund
10.	Warren Lammert	Janus		Granite Point Capital
11.	Nicholas Tiller	Fidelity	→	Hedge fund
12.	Chirstopher Zepf	Fidelity	→	Hedge fund
13.	Dan Szemis	Merrill Lynch	→	Hedge fund
14.	Gary Schlarbaum	Morgan Stanley	→	Schlarbaum Capital
			→	