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World Petroleum Markets

What the Past Tells Us About the Future

April 11, 2008
Capitol Hill
Washington, DC

Lucian Pugliaresi
Larry Kumins
Energy Policy Research Foundation, Inc.
Washington, DC
www.eprinc.org

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Introduction

Energy Policy Research Foundation Inc. (EPRINC), ***formerly the Petroleum Industry Research Foundation Inc. (PIRINC)***

Founded in NY in 1944

- Moved to Washington from NYC in Feb 2007
- EPRINC brings policy analysis and industry economics to bear on current energy issues

Note: All data in this presentation are from EIA unless otherwise noted. Summary conclusions, comments, etc, are the sole responsibility of EPRINC.

TOPICS FOR TODAY

EPRINC's Perspective on Structure and Pricing in the Upstream Crude Market (some history is useful)

Why Are Crude Prices So High Today?

What Does History and the Structure of the Crude Oil Market Tell Us About Policy Choices (and what is the problem we are trying to fix?)

Assessments of Trends in US and World Petroleum Product Markets

1973-74 Arab Oil Embargo

NOT AN EMBARGO, but instead a

- **Structural Shift in Ownership and Control of the Resources of the Middle East**
- **Fundamental Change in Expectations on Production from Middle East Producers**

As an Embargo it was a failure, market was integrated (lesson not yet learned by Chavez)

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1979 Price "Shock"

OIL MARKET WAS NOT FRAGILE, but instead there was a shift in:

- expectations regarding regional risk; i.e. more risky
- Prospects for future output from Iran and Iraq were reduced substantially, i.e., access to those reserves would now be delayed

1986 Price Collapse

- **Saudi Arabia abandons role as swing producer at low levels of net demand for SA crude**
- **Shift in expectations on Saudi decision making within OPEC and as regulator of world oil market**
- **Sustained reduction in oil use as a percentage of GNP in major Western countries**

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1998 Price Collapse: Six Central Issues

Asian economic crisis brings a collapse in net demand

- **OPEC misreads the oil market**
- **Warm 1997-98 summers in N. America, Europe, Asia**
- **Increase in Russian oil exports as Ruble collapses**
- **Chinese authorities decrease imports in Q4 of 1998**
- **UN authorizes increase in Iraqi exportation in 1998**
- **Asian economic crisis brings a collapse in net demand**

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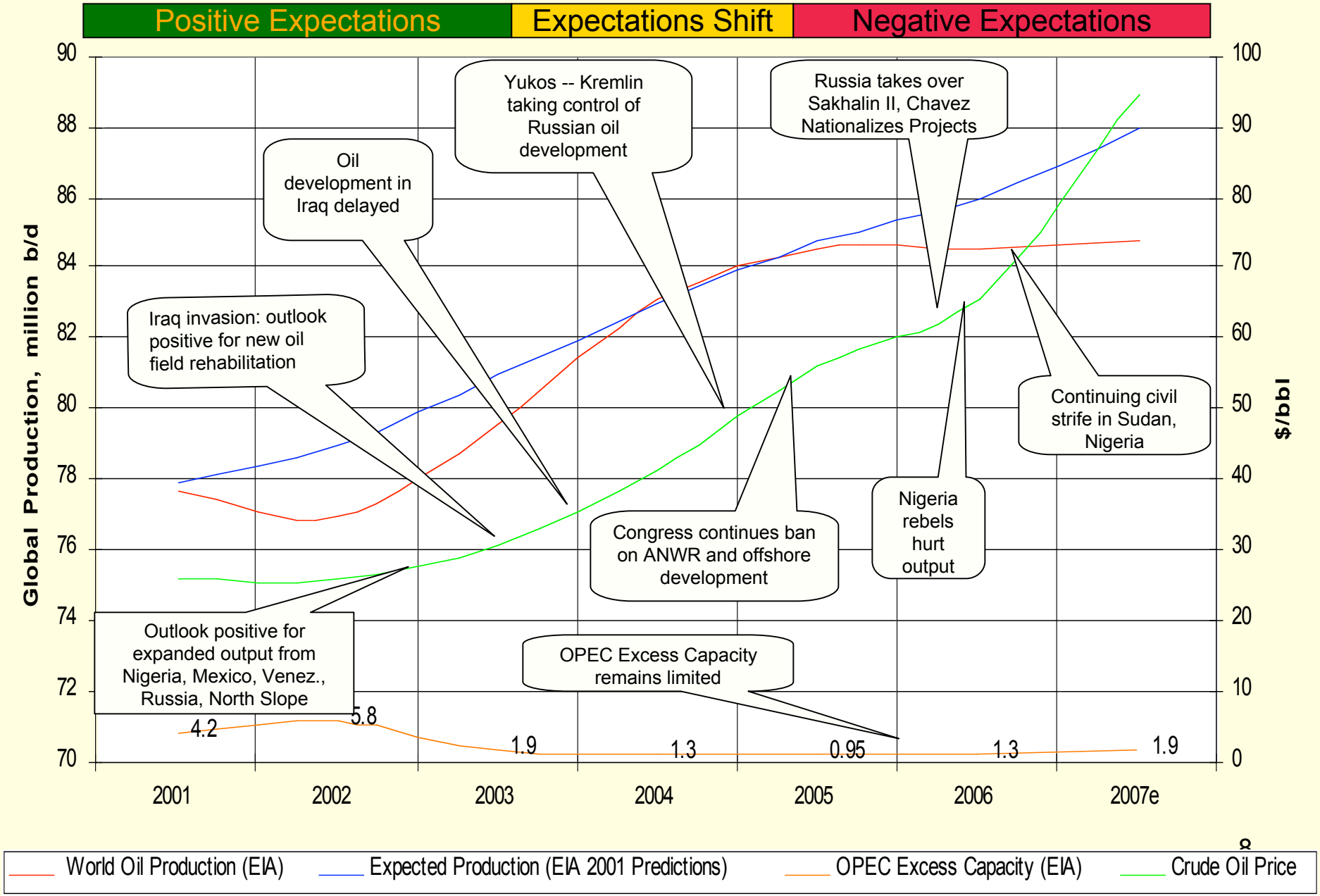
A Series of Unfortunate Events Leading to New Expectations



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The Peak Oil Problem: New Supplies Will Be More Expensive, but We Are Not Running Out of Oil

"One thing is clear: the era of easy oil is over. What we all do next will determine how well we meet the energy needs of the entire world in this century and beyond."

- David J O'Reilly, Chairman & CEO, Chevron Corporation, July 2005

San Joaquin Valley

Testing Hubbard-Method Predictions for Reserves and Production (Billions of Barrels)

	1964	1982	2000
Cumulative Discoveries	7.7	11.8	16.1
Percent Attributable to 1915	49%	69%	76%
Cumulative production as of	8.0-9.5	11.9-12.1	16.1-16.2
Year 2000 production projected in: (mmb/d)	44-112	189	597(actual)

Source: EPRINC, October 2006. *Does the Hubbard Method Provide a Reliable Means for Predicting Future Oil Production*, Richard Nehring, October 2006,

Permian Basin

Testing Hubbard-Method Predictions for Reserves and Production (Billions of Barrels)

	1964	1982	2000
Cumulative Discoveries	17.6	27.9	35.2
Percent Attributable to 1950	85%	86%	84%
Cumulative production as of	19-27.5	28.5-30.5	35.8-37.5
Year 2000 production projected in: (mmb/d)	162-479	326-479	910(actual)

Source: EPRINC, October 2006. *Does the Hubbard Method Provide a Reliable Means for Predicting Future Oil Production*, Richard Nehring, October 2006,

What Does the Permian and San Joaquin Tell Us About the Hubbard Predictions

- Knowledge and technology grow over time
- Big payoff to long term access to both existing and new oil provinces
- More importantly Hubbard Method does not reveal……
  - The Backstop Price
  - Total Recovery

WHAT DOES THIS ANALYSIS TELL US ABOUT THE ENERGY SECURITY PROBLEM?

- Current Market Price Probably Tied to a "Perfect Storm" of Unfortunate Events – More Than Declining Reserves (Peak Oil)
- Longer Term Energy Security Problem Remains "A Concentration of Low Cost Reserves Among Relatively Few Players."
- This Concentration of Low Cost Reserves Poses Risks to the US (wealth transfers, price spikes)
- Focus on Import Dependence Not Likely to Fundamentally Address Energy Security Problem and Can Be Costly. Policy Focus Should be On Reducing Vulnerability.
- What Would be the Elements of an Effective Strategy Given This Analysis?

The Refining Sector

Imbalances and Uncertainties

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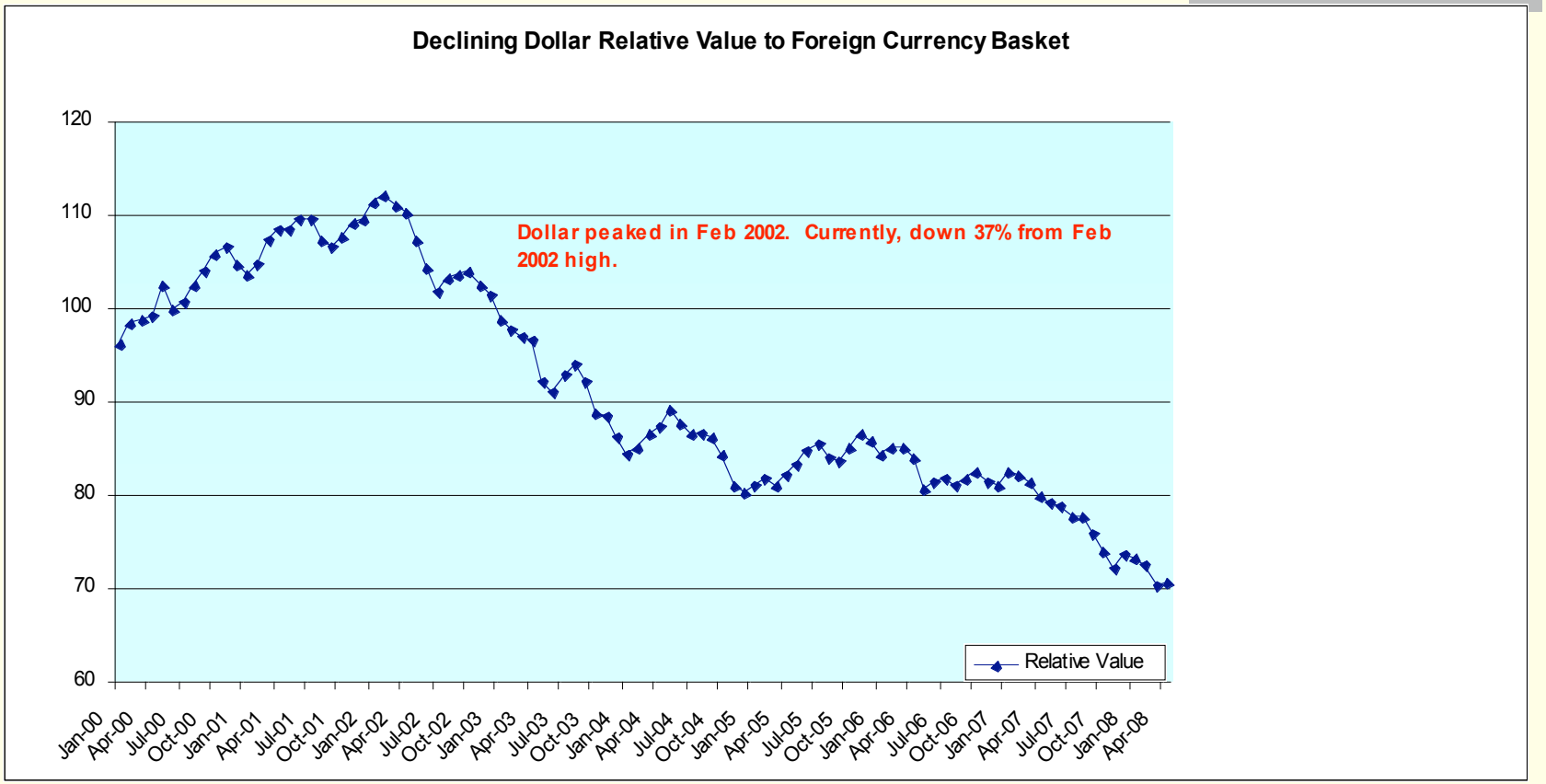
Declining Dollar Value Relative to Foreign Currency Basket



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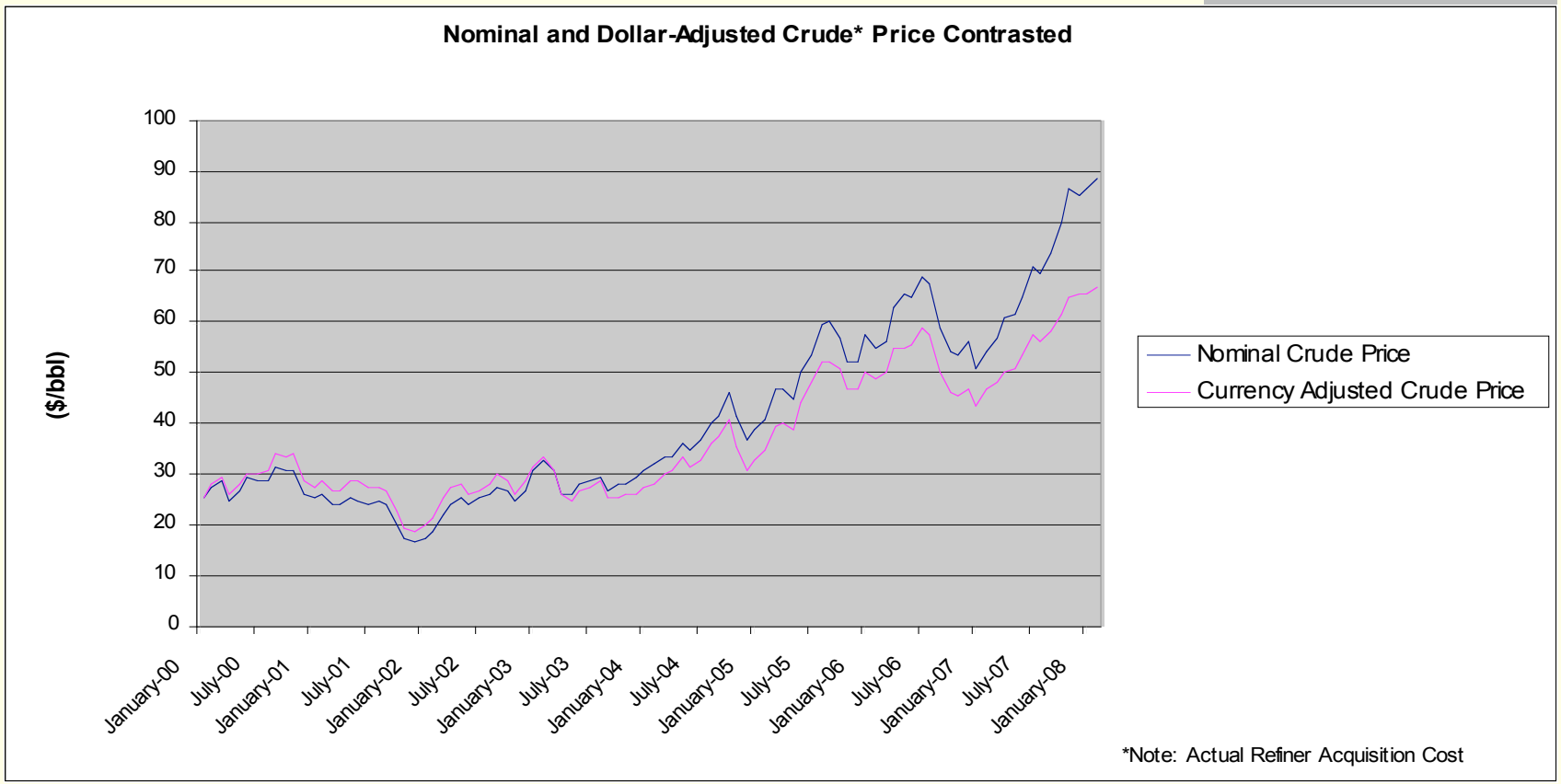
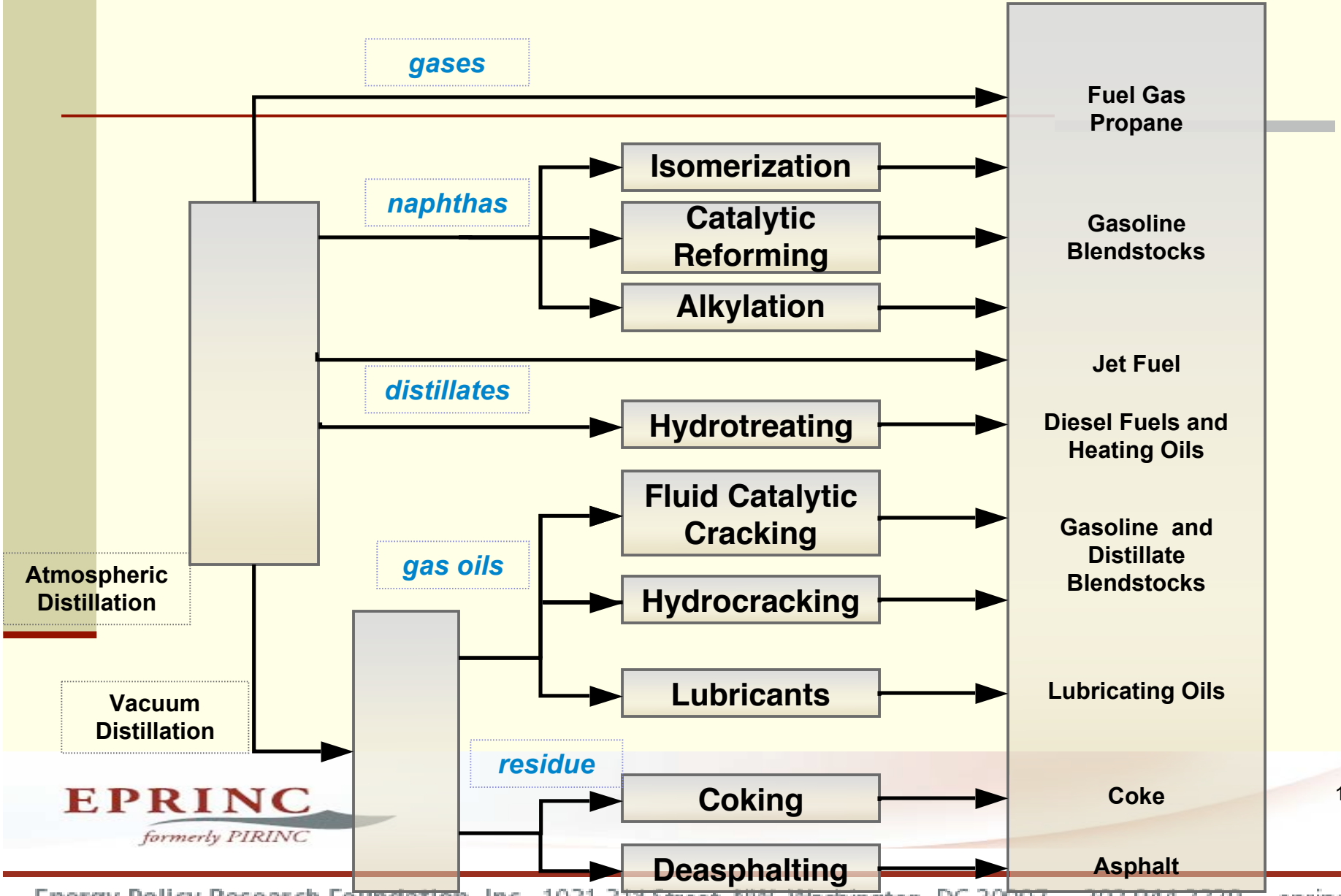
Nominal and Dollar- Adjusted Crude Prices



What's a Refinery?



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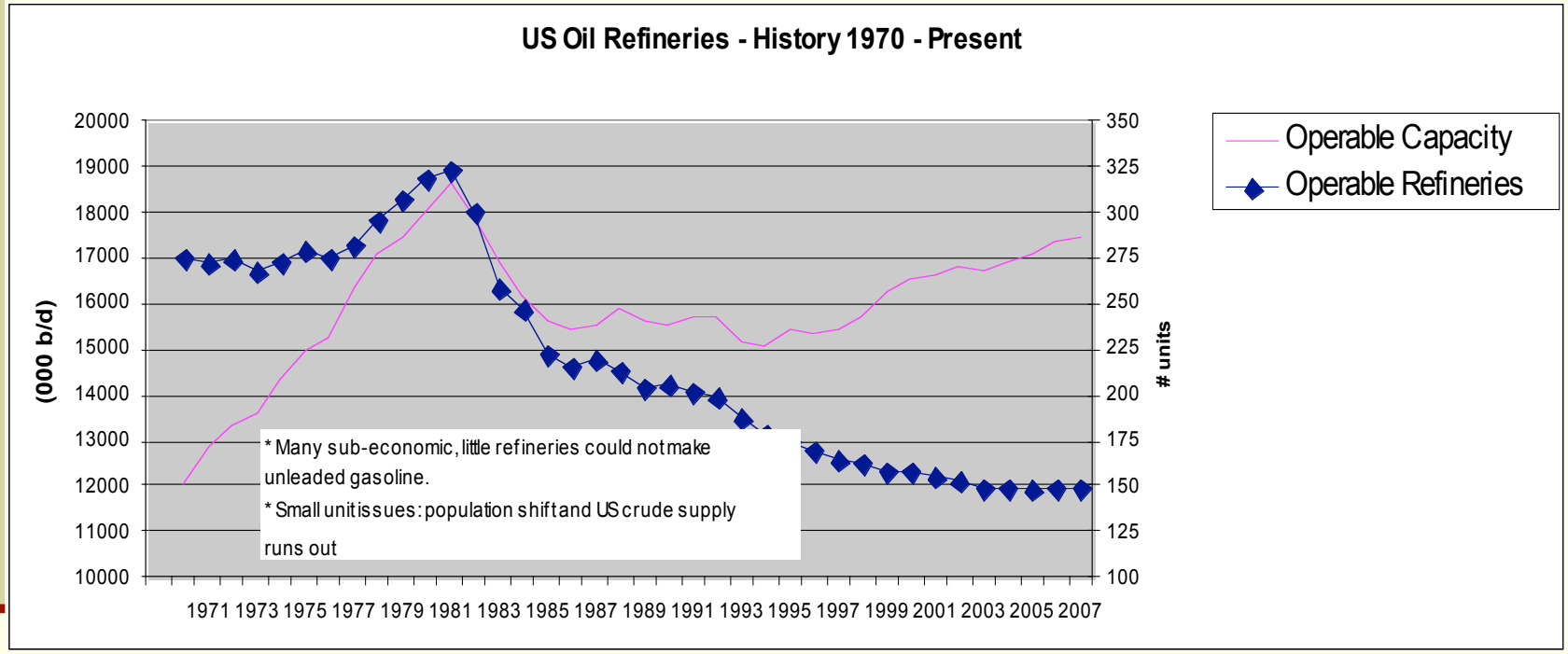
Modular Investment in Refinery Upgrades

- Need to:
  - Make high specification products
  - Make cleaner gasoline
  - Make gasoline for ethanol blending
  - Make ultra-low sulfur diesel (ULSD)
  - Make across-the-board sulfur reduction
  - Adjust to declining crude quality
  - Reduce refinery site emissions

U.S. Oil Refineries History: 1970 - Present

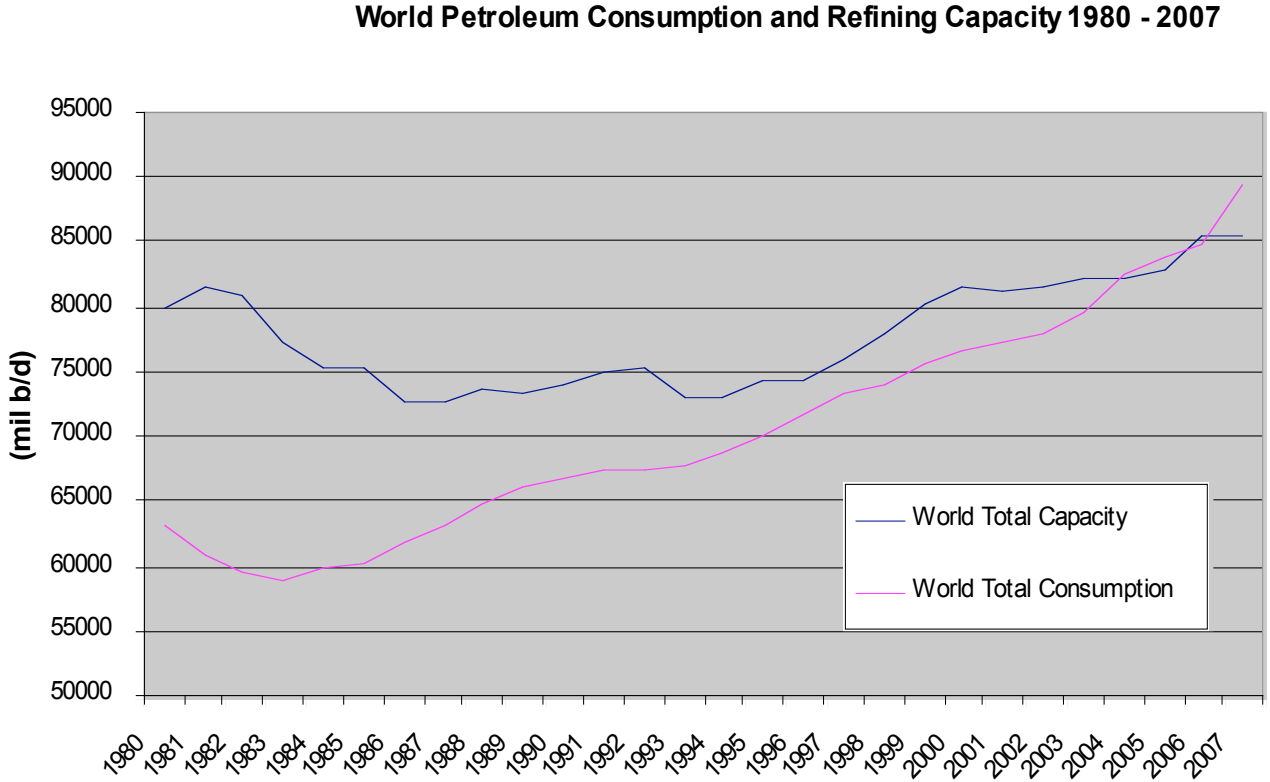


U.S. Oil Refineries History: 1970 - Present

- 1970s: The Small Refiner Bias in the 1973 price control program encouraged the building of excess small refineries.
- 1979: Price controls end.
- 1980-1990: Rationalization of refining.
  - Closure of small, uneconomic units - adversely impacted by population and crude supply shifts.
  - Capacity at existing, better-located facilities expanded.
    - Remaining refinery campuses become bigger, more efficient.
- Mid-1990s: Capacity grows; demand grows faster.
- 2000s: More investment needed to expand existing refineries.
  - Regulatory issues
  - Capital requirements and investment decisions

What happened to "Refining's Golden Age?"

World Petroleum Consumption and Refining Capacity: 1980 - 2007



* Global excess capacity until early 1990s - investment climate?

* 2003: Demand catches up with capacity - China?

* 2007: Demand exceeds capacity?

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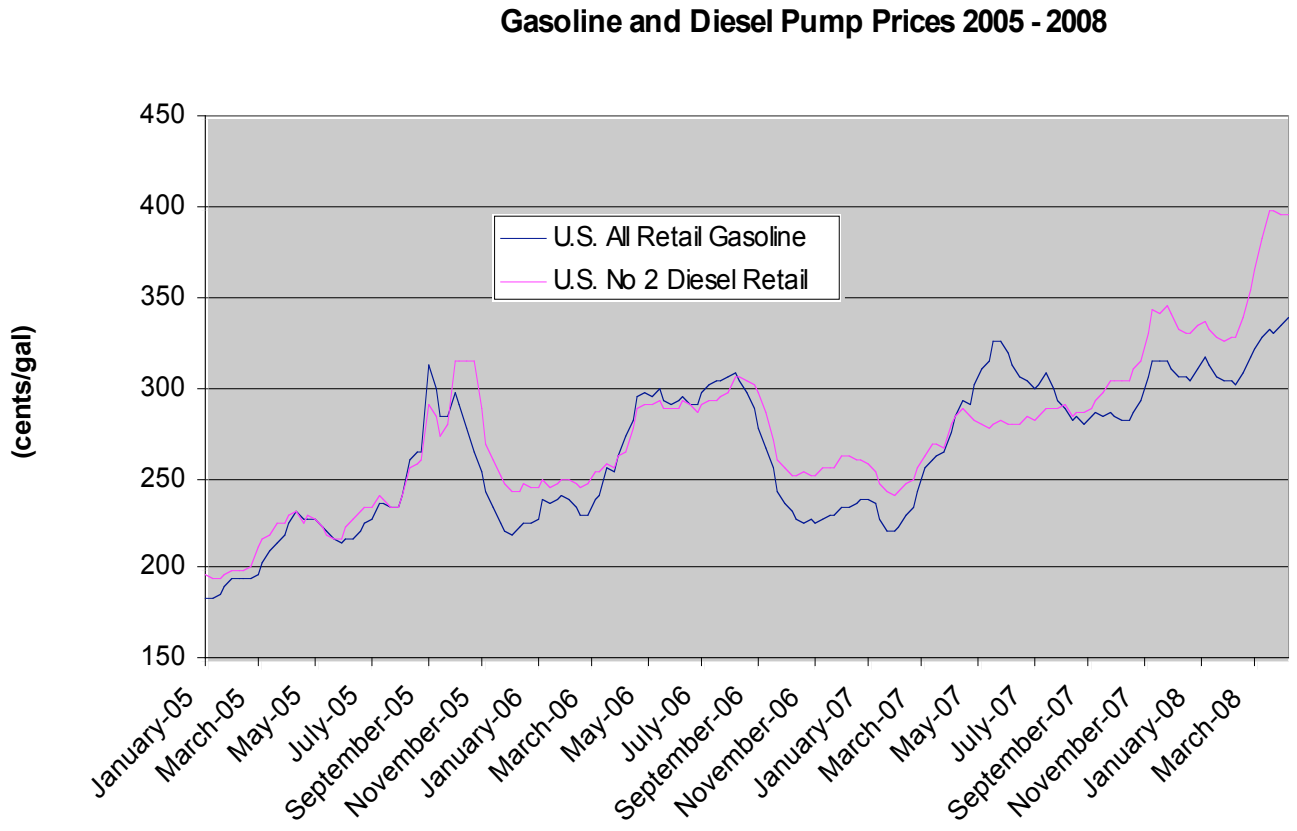
U.S. Gasoline and Diesel Pump Prices 2005 - 2008



2005: Old relationship: Gaso prices above diesel.

2006: Relationship changes.

2007/8: ***Dramatic*** change.

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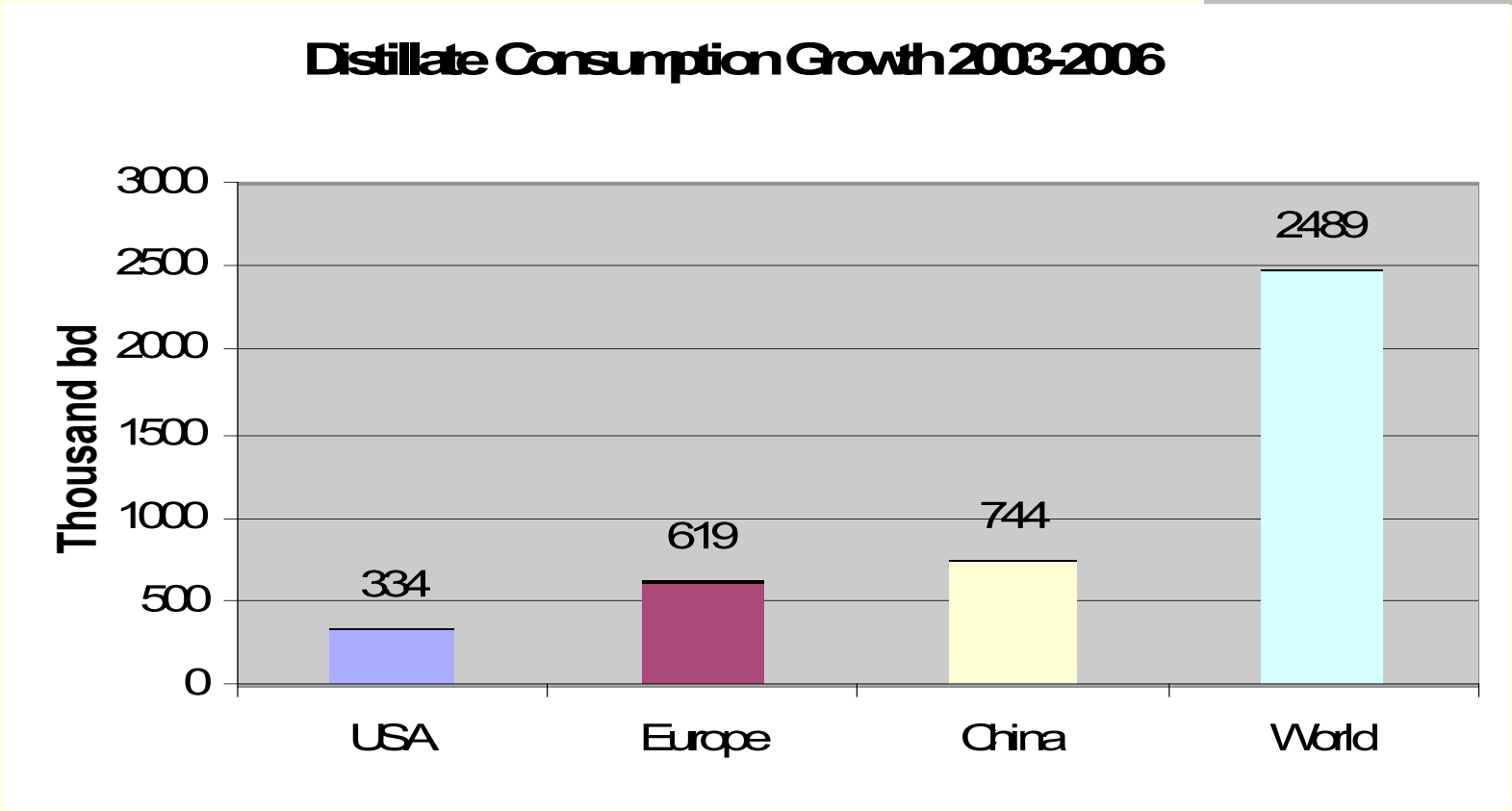
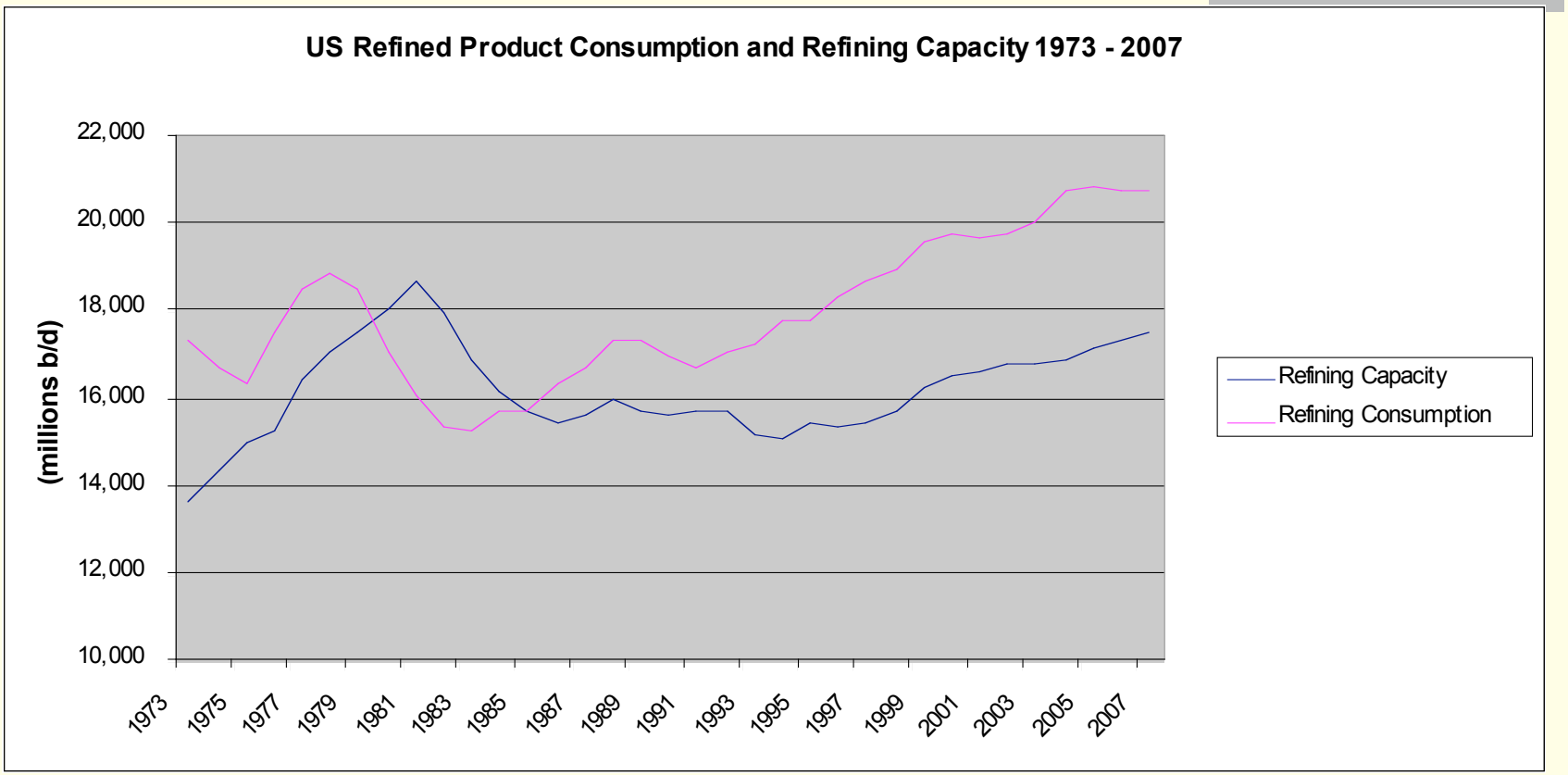
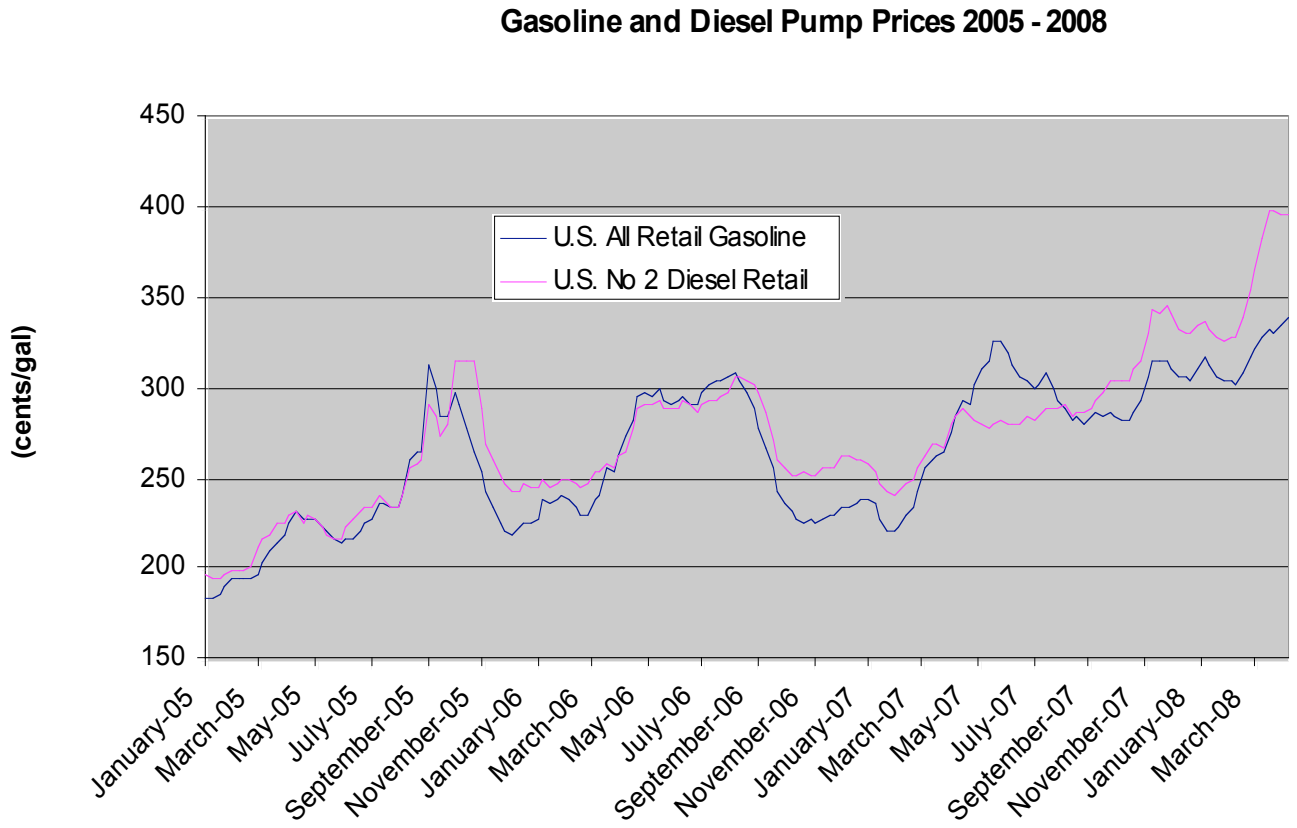
Global Distillate Consumption Growth: 2003 - 2006



U.S. Refined Product Consumption and Refining Capacity: 1973 - 2007



U.S. Gasoline and Diesel Pump Prices 2005 - 2008



2005: Old relationship: Gaso prices above diesel.

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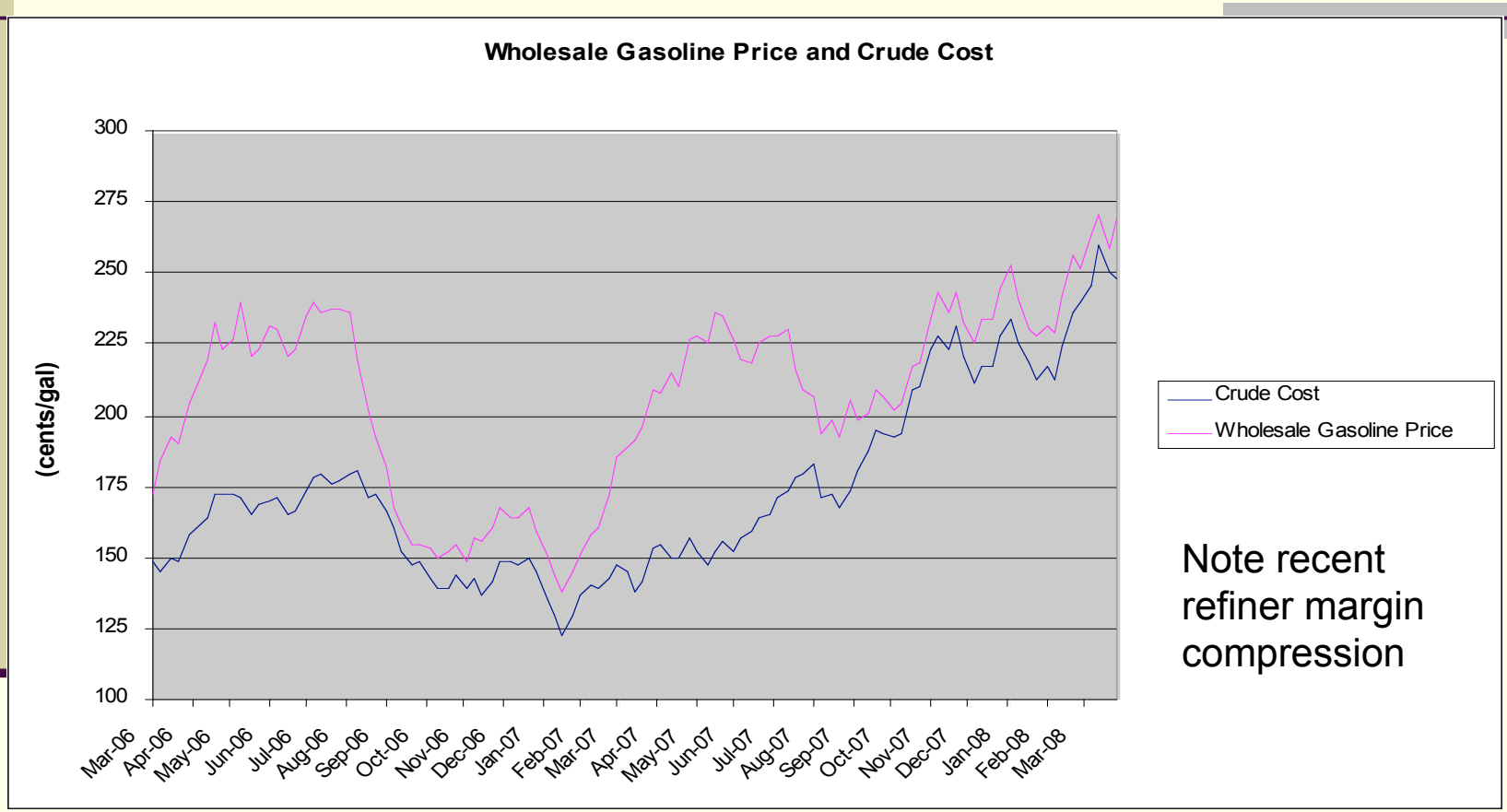
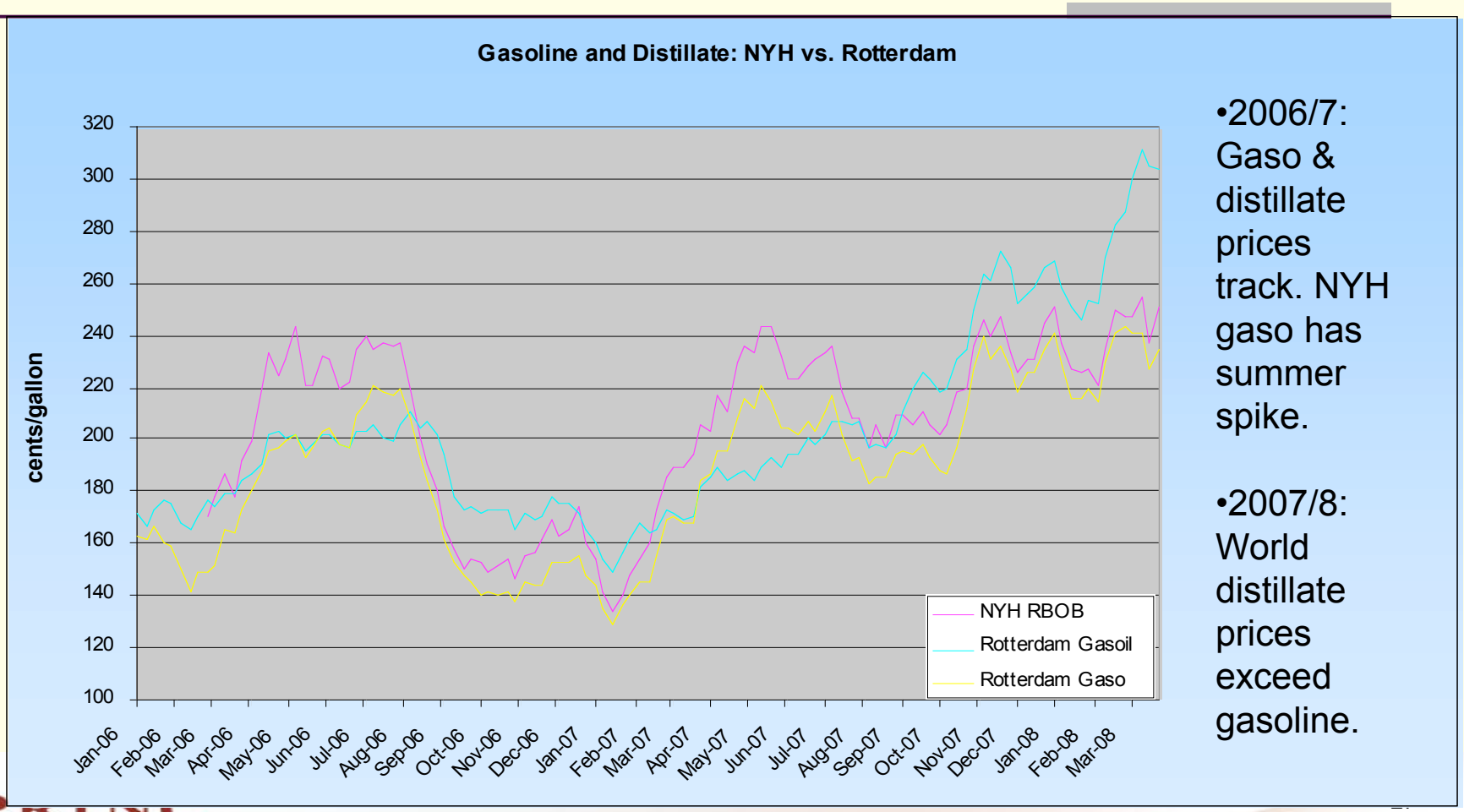
U.S. Wholesale Gasoline Price and Crude Cost: 2006 - 2008



Note recent refiner margin compression

Gasoline and Distillate Prices: NYH vs. Rotterdam 2006 - 2008



- 2006/7: Gaso & distillate prices track. NYH gaso has summer spike.
- 2007/8: World distillate prices exceed gasoline.

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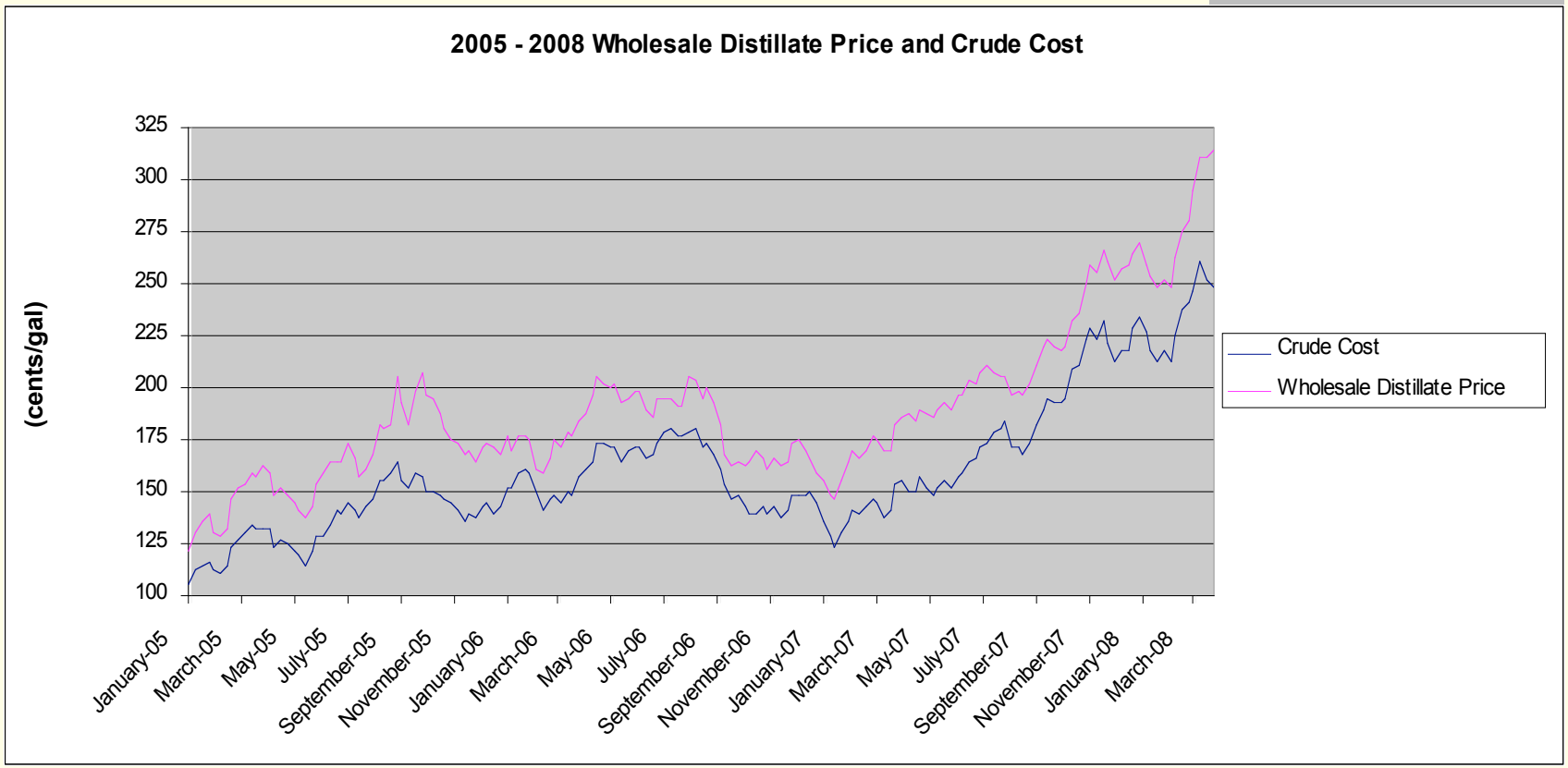
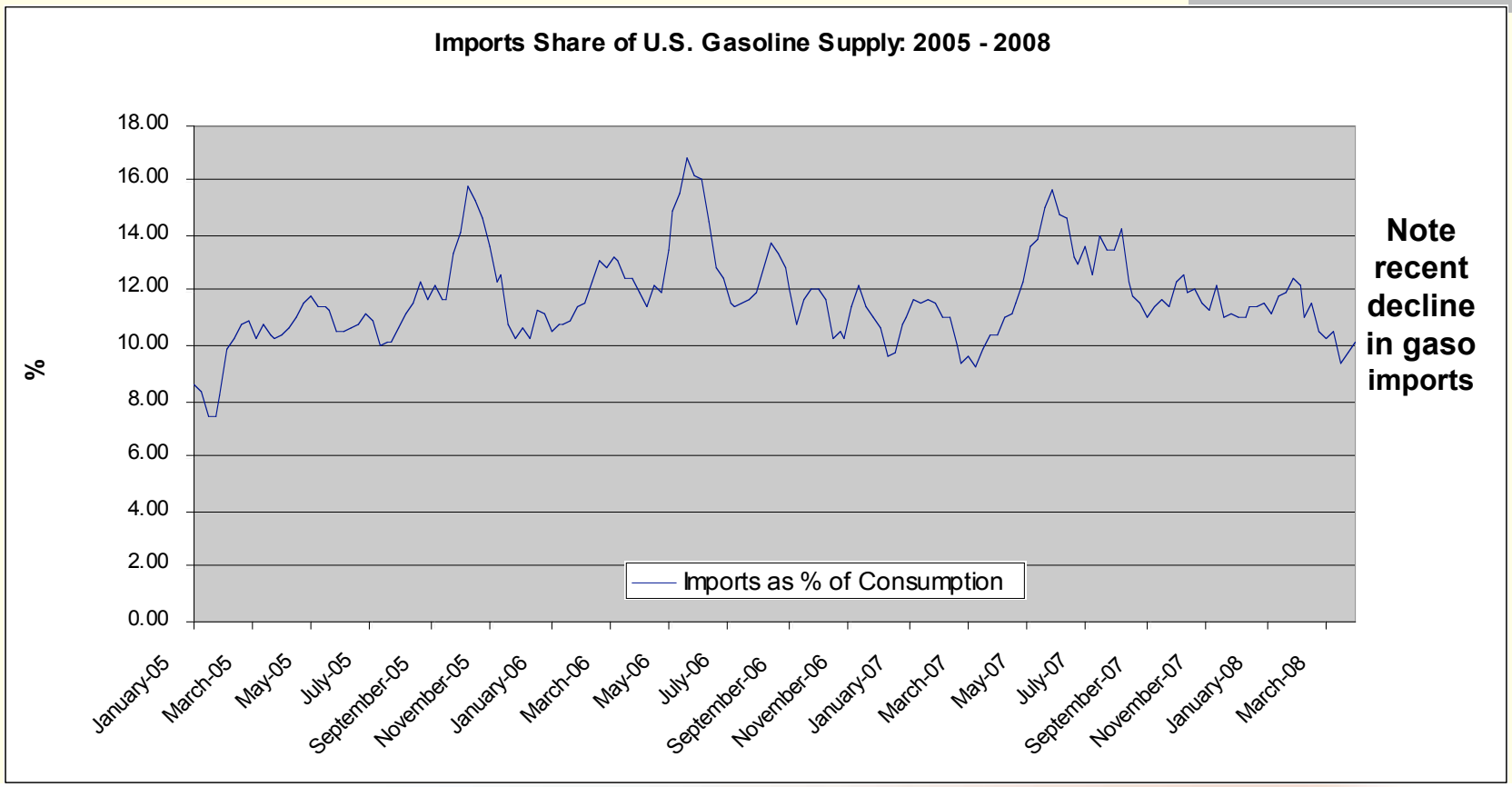
U.S. Wholesale Distillate Price and Crude Cost: 2005 - 2008



Gasoline Imports as Percentage of Consumption: 2005 - 2008



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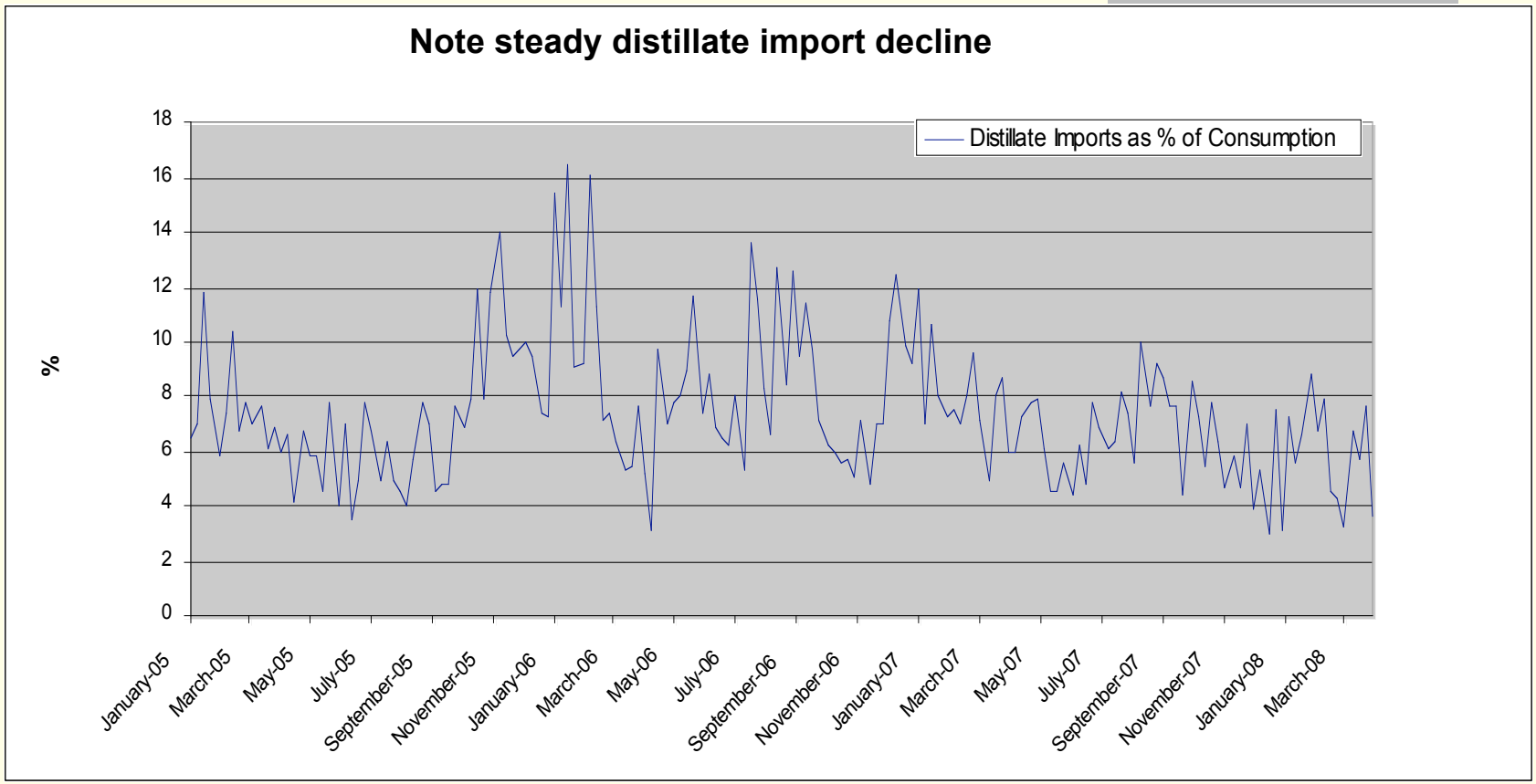
Imports Share of U.S. Distillate Supply: 2005 - 2008



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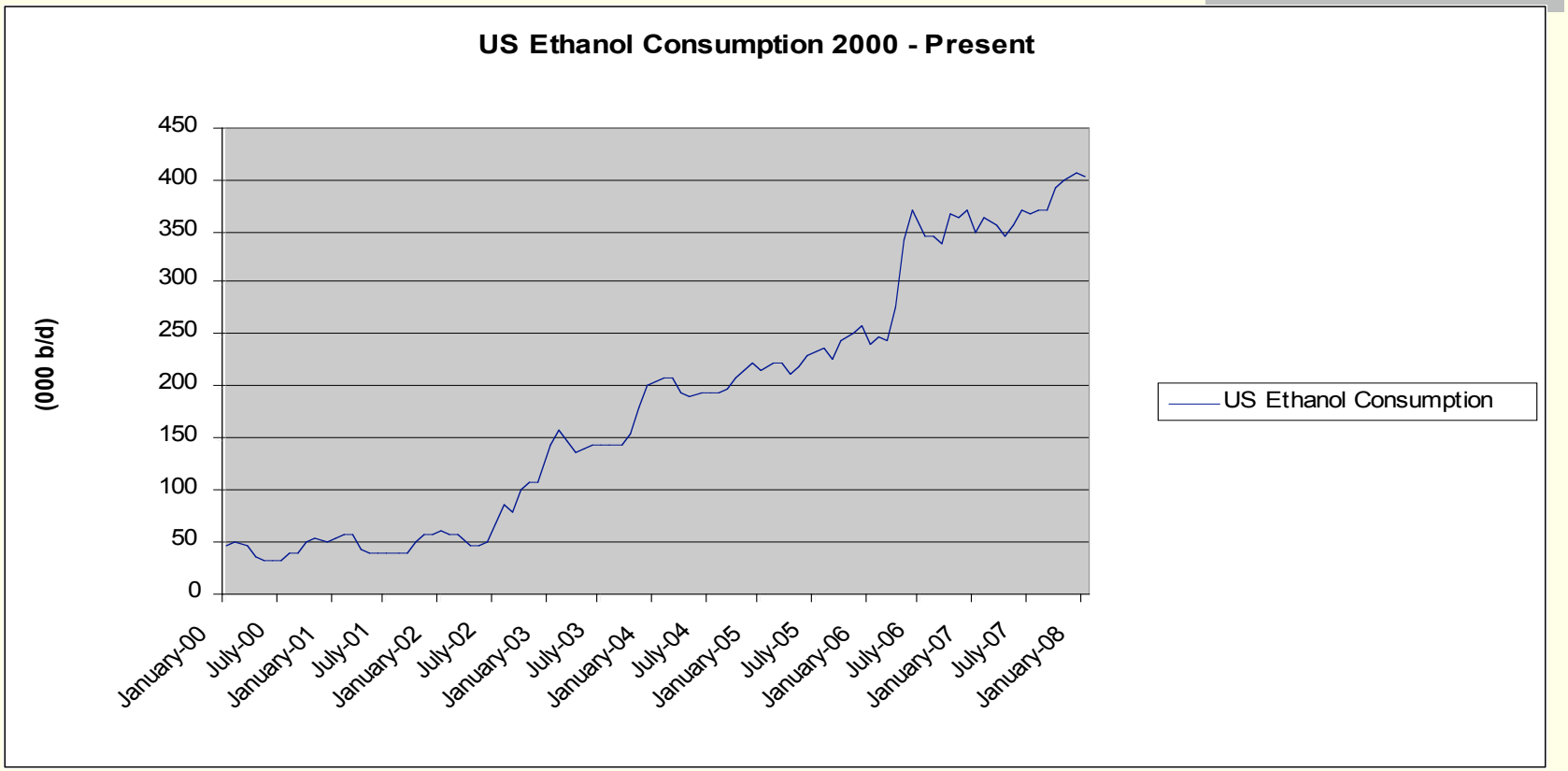
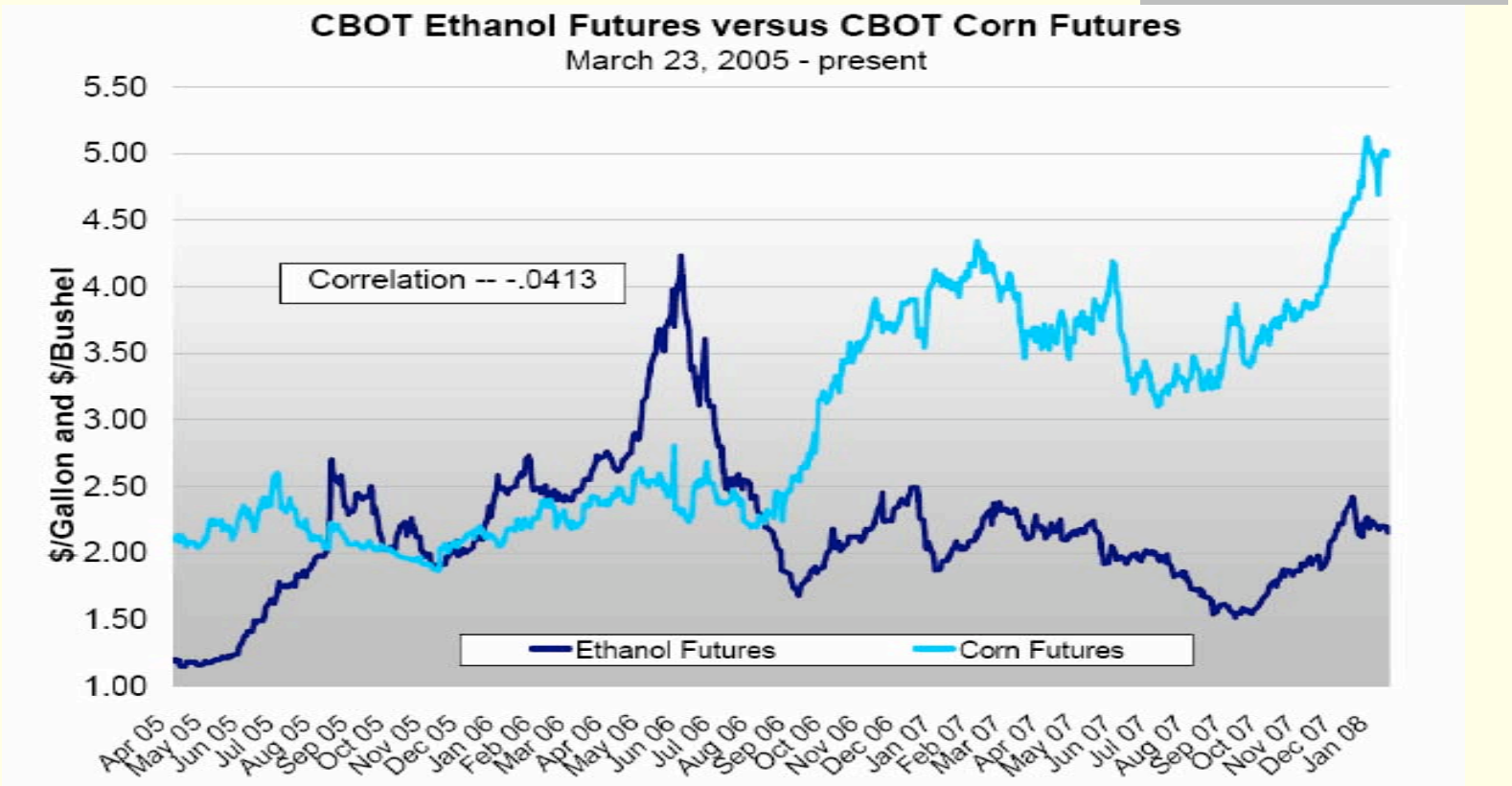
US Ethanol Consumption: 2000 - Present



US Ethanol Consumption: 2000 - Present

- Quick ramp-up made it look easy—but really was **displacement of MTBE**
- Ethanol does not displace much foreign oil. 6 bil gallons per year of ethanol saves approx 100 million bbls of oil.
- Corn prices have risen from $1.60 to $6.00. How much attributable to ethanol driven demand? $1.00? $2.00?
- At $1.00/bu, oil saved cost $130/bbl; at $2.00/bu, the figure is $230 per bbl.
- Current Ethanol Economics Looks Dicey—With high corn prices, low fuel ethanol prices, existing plants earn losses.
- Existing plants have 7 bil gal capacity; mandate calls for 2 bil more
- Plants under construction and planned may not be completed/brought on line
- If corn prices remain stable at current levels, ethanol prices must rise by at least $0.50 per gallon in order for ethanol to be sufficiently profitable to attract investment.
- More capacity needed to meet 9 bil gal mandate for 2008

CBOT Ethanol Futures versus CBOT Corn Futures



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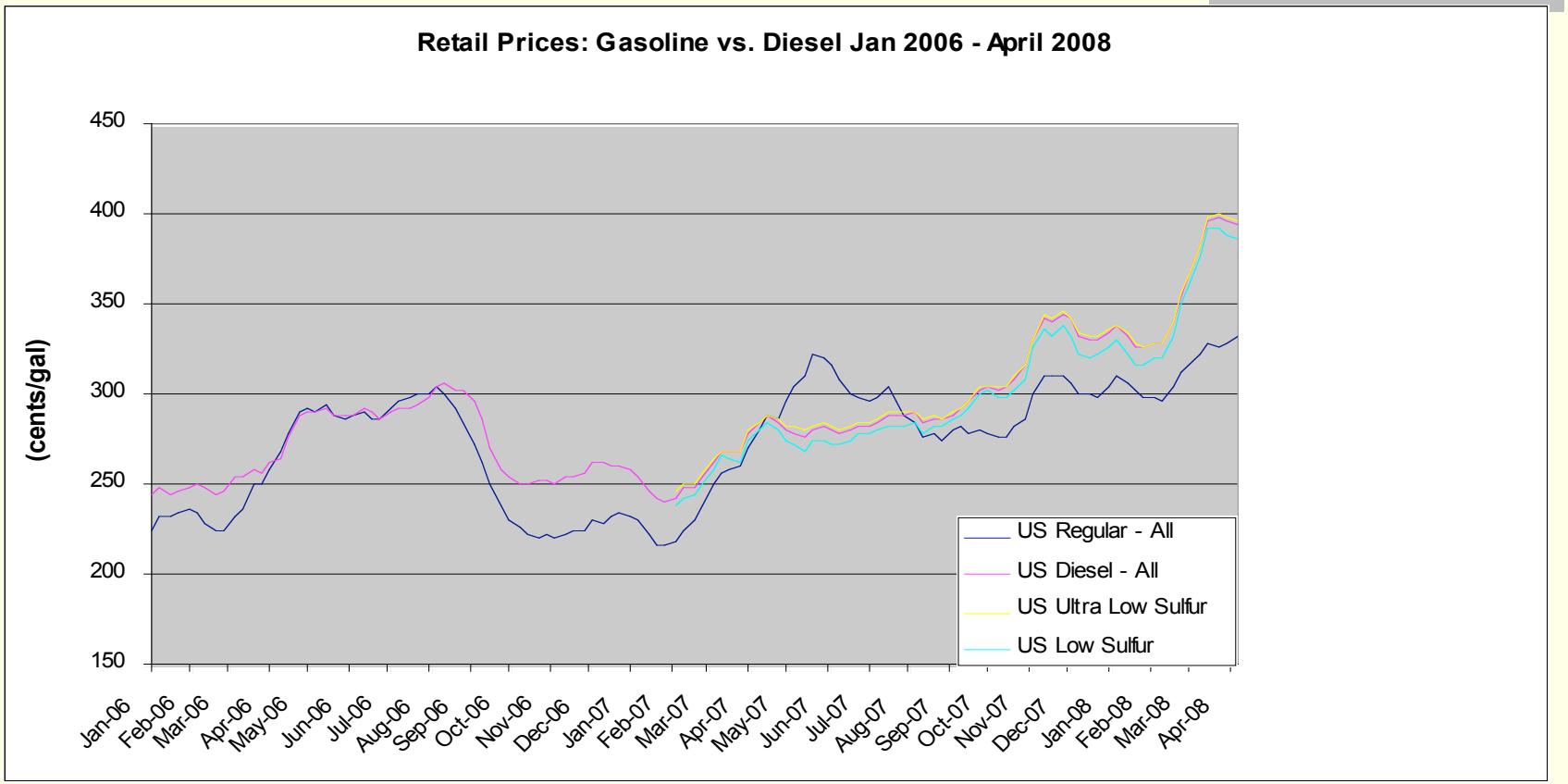
Ethanol Production Cost ($/Gal)

Ethanol Production Cost ($/gal.)

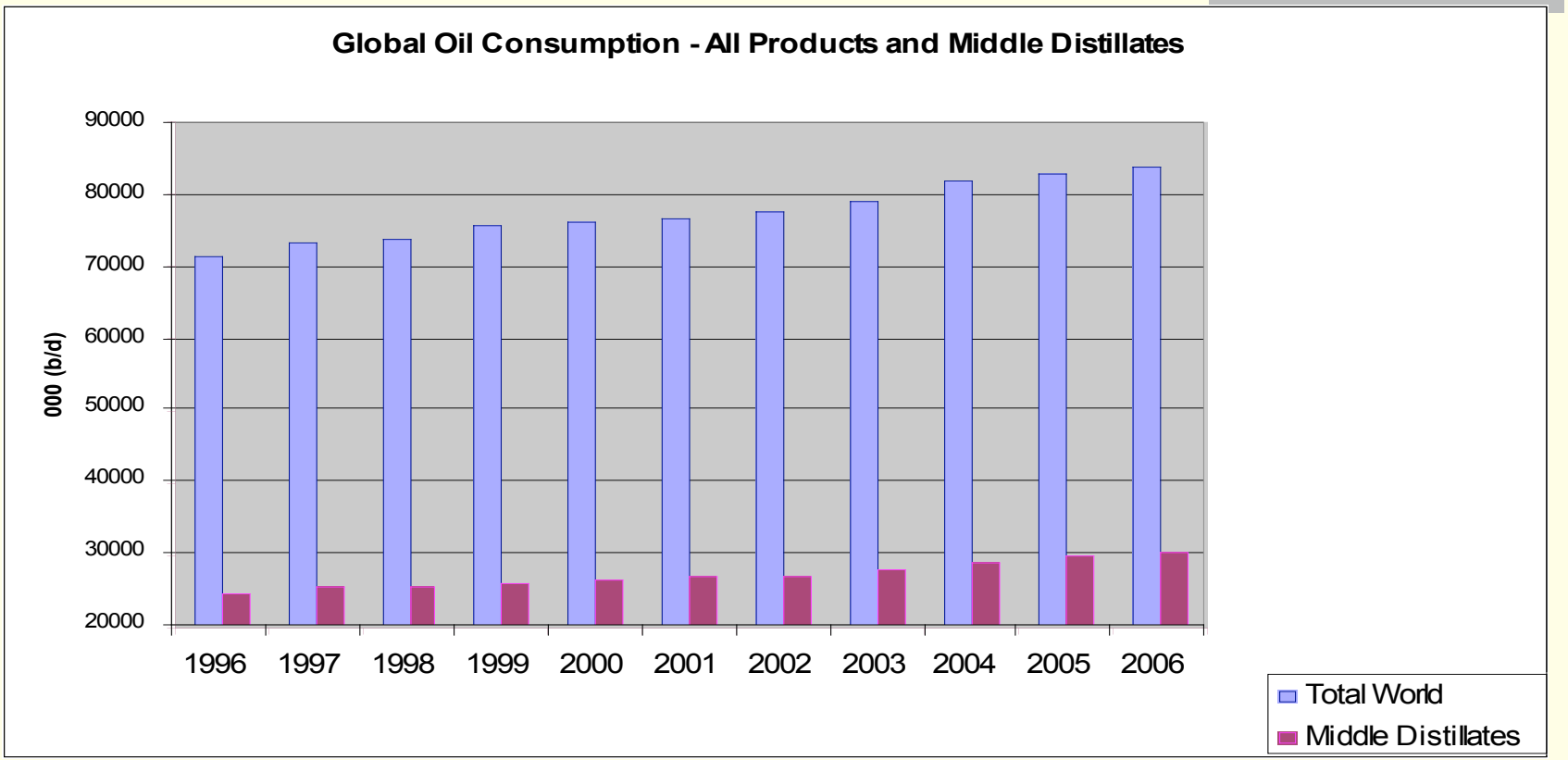
Cost	Wet Mill	Dry Mill
Natural Gas	0.30	0.30
Miscellaneous Inputs	0.56	0.52
Corn ($6/bu)	2.31	2.14
Co-product credit	-1.03	-0.41
Subtotal	2.14	2.55
Remaining To Cover Fixed Costs/Profit	**0.36**	**-0.05**

Sources: Simmons & Company International; EPRINC Calculations

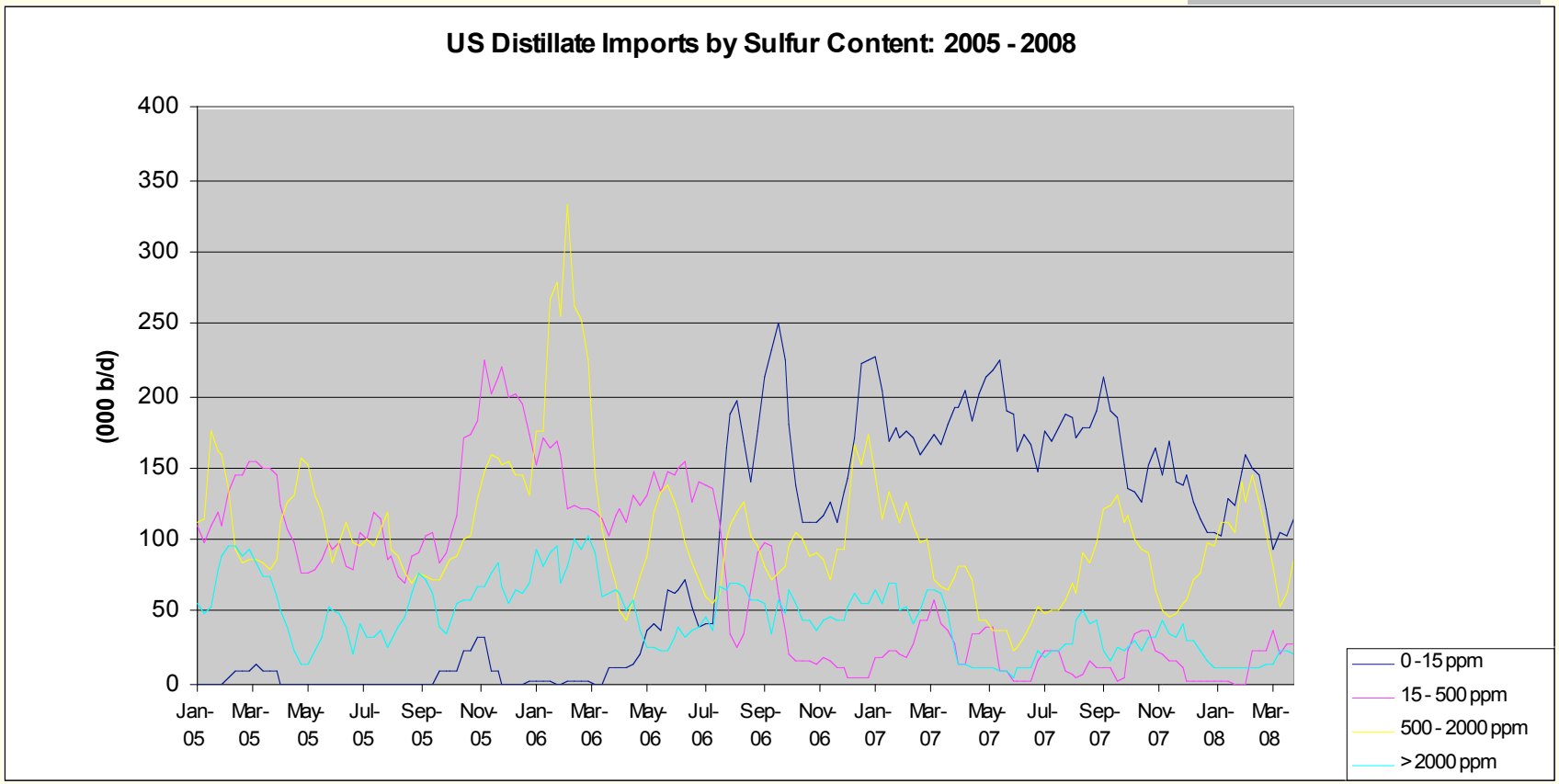
U.S. Retail Prices: Gasoline vs. Diesel 2006 - 2008



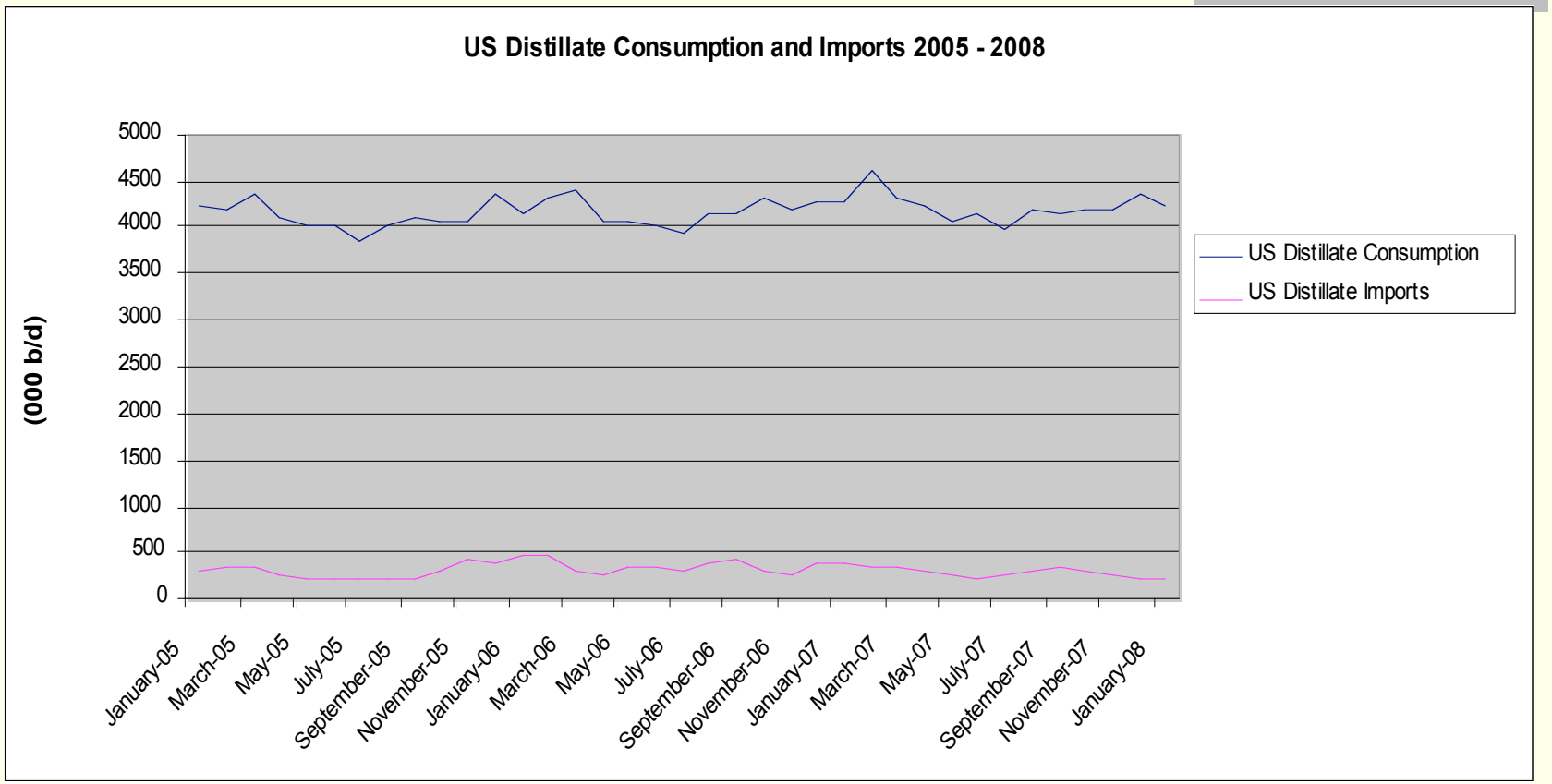
Global Oil Consumption – All Products and Middle Distillates



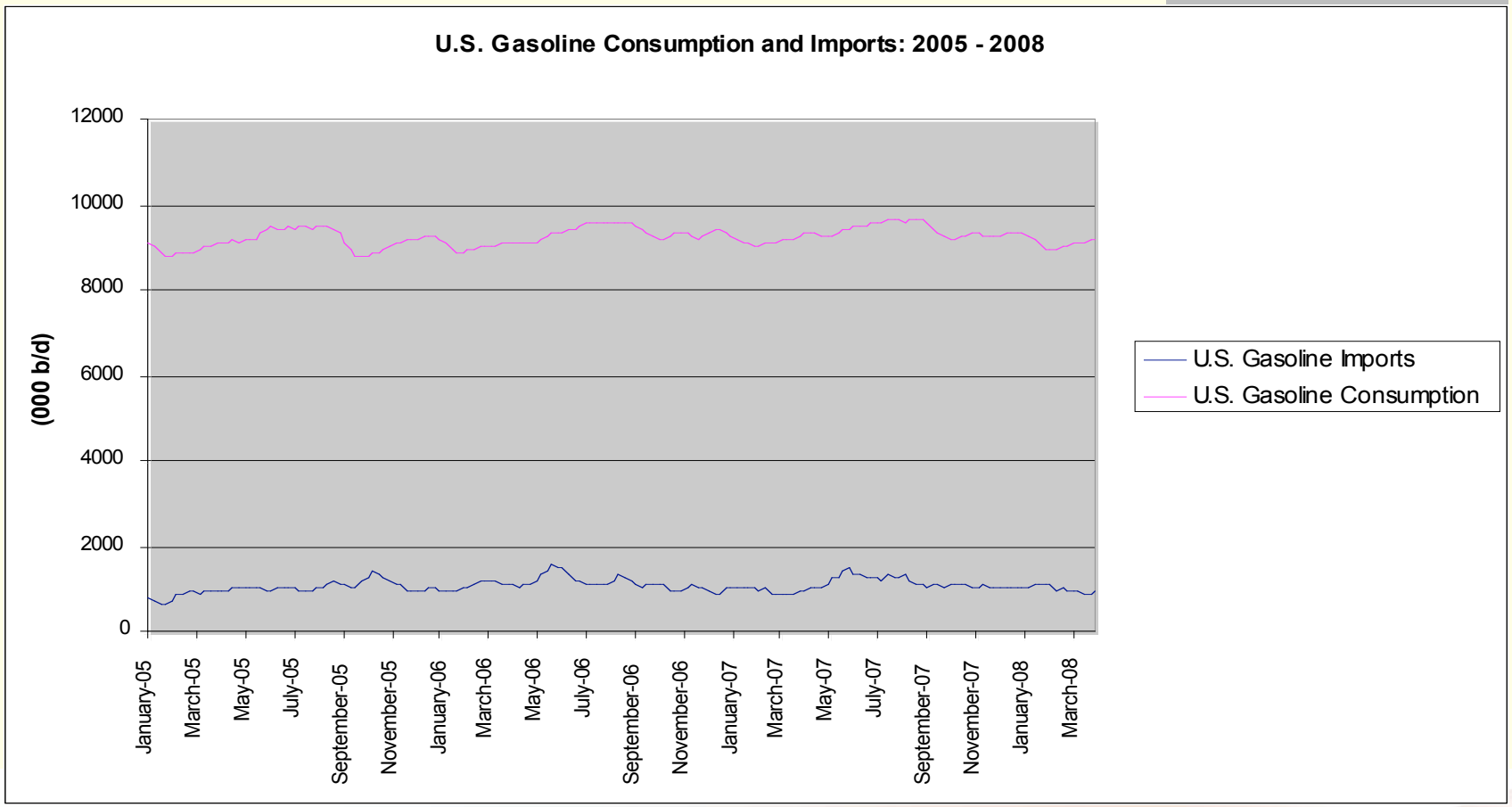
U.S. Distillate Imports by Sulfur Content: 2005 - 2008



U.S. Distillate Consumption and Imports: 2005 - 2008



U.S. Gasoline Consumption and Imports: 2005 - 2008



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THE END