

# World Petroleum Markets

What the Past Tells Us About the Future

**April 11, 2008**  
**Capitol Hill**  
**Washington, DC**

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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

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**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)**

## 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

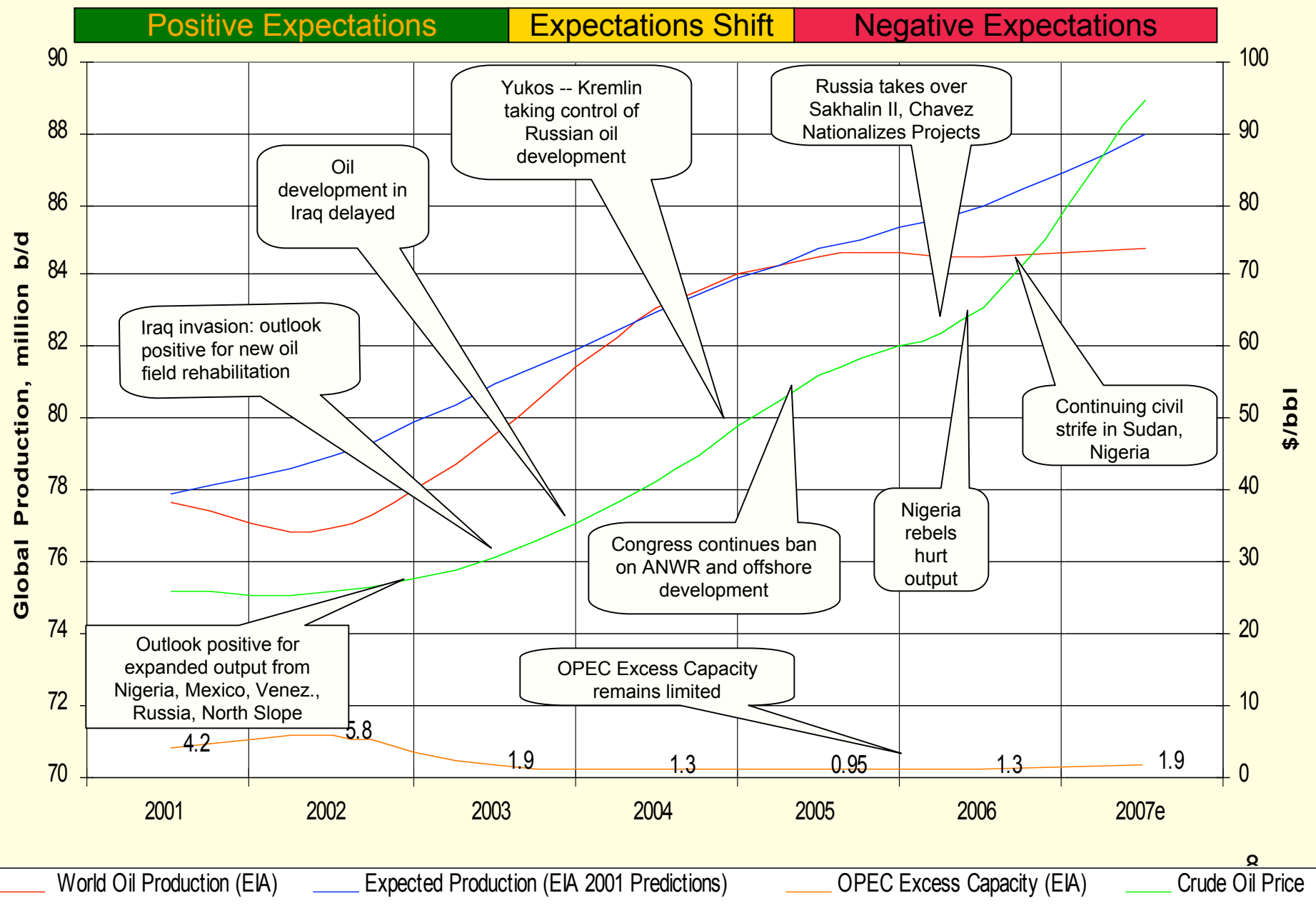
- **Saudi Arabia abandons role as swing producer at low levels of net demand for SA crude**
- **Shift in expectations on Saudi decision making within OPEC and as regulator of world oil market**
- **Sustained reduction in oil use as a percentage of GNP in major Western countries**

## **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**

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

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

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

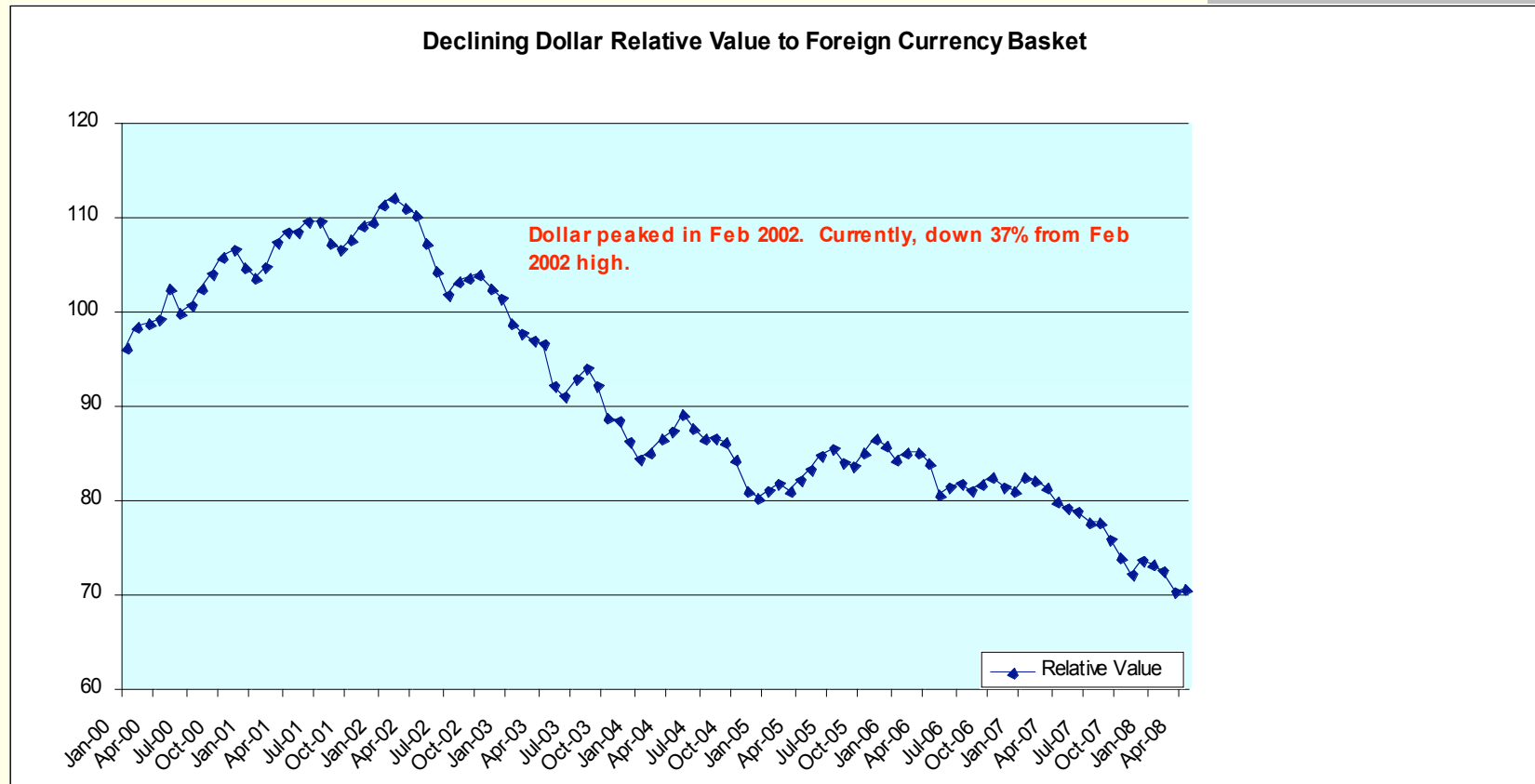
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## Imbalances and Uncertainties

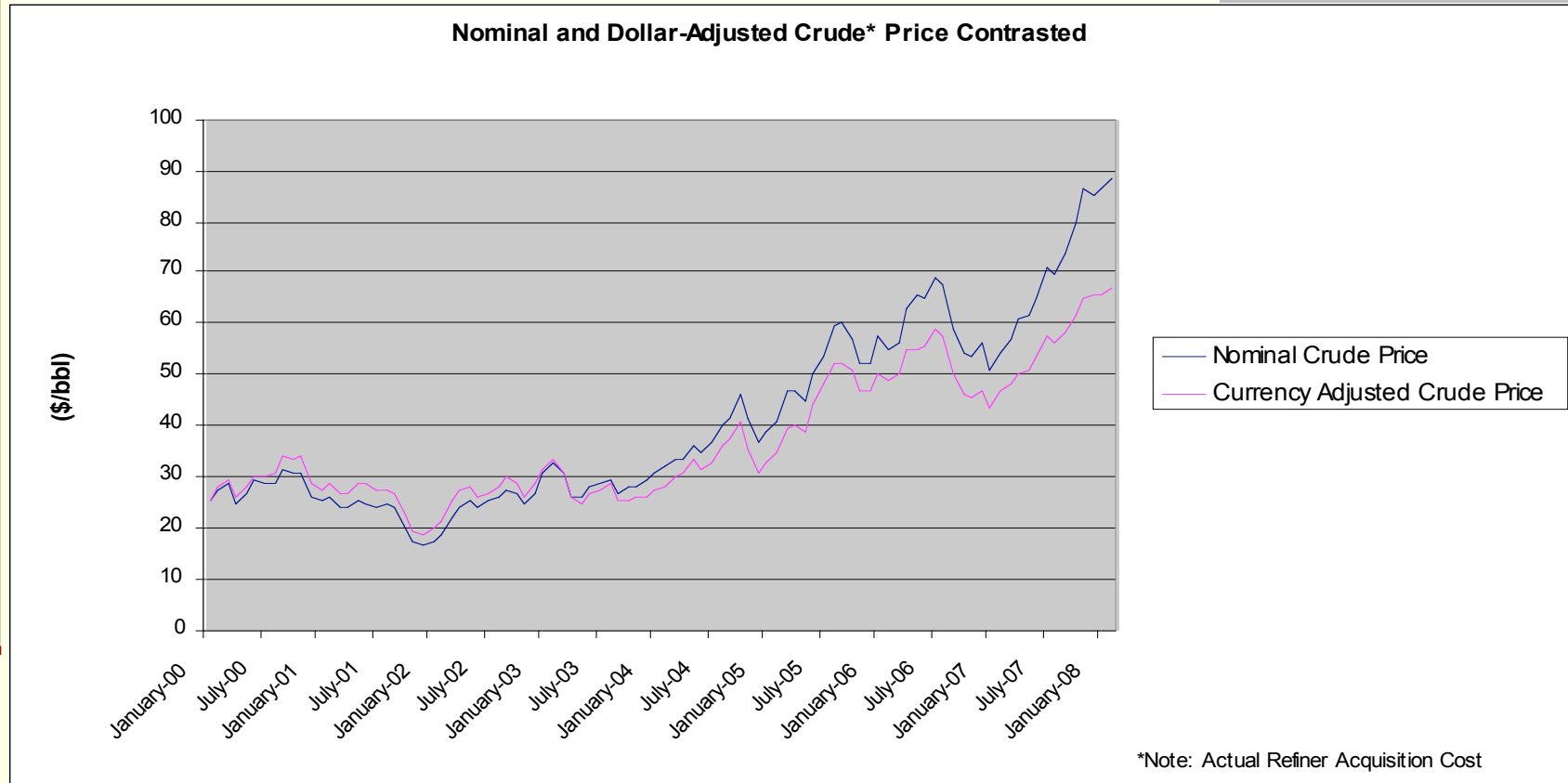
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# Declining Dollar Value Relative to Foreign Currency Basket

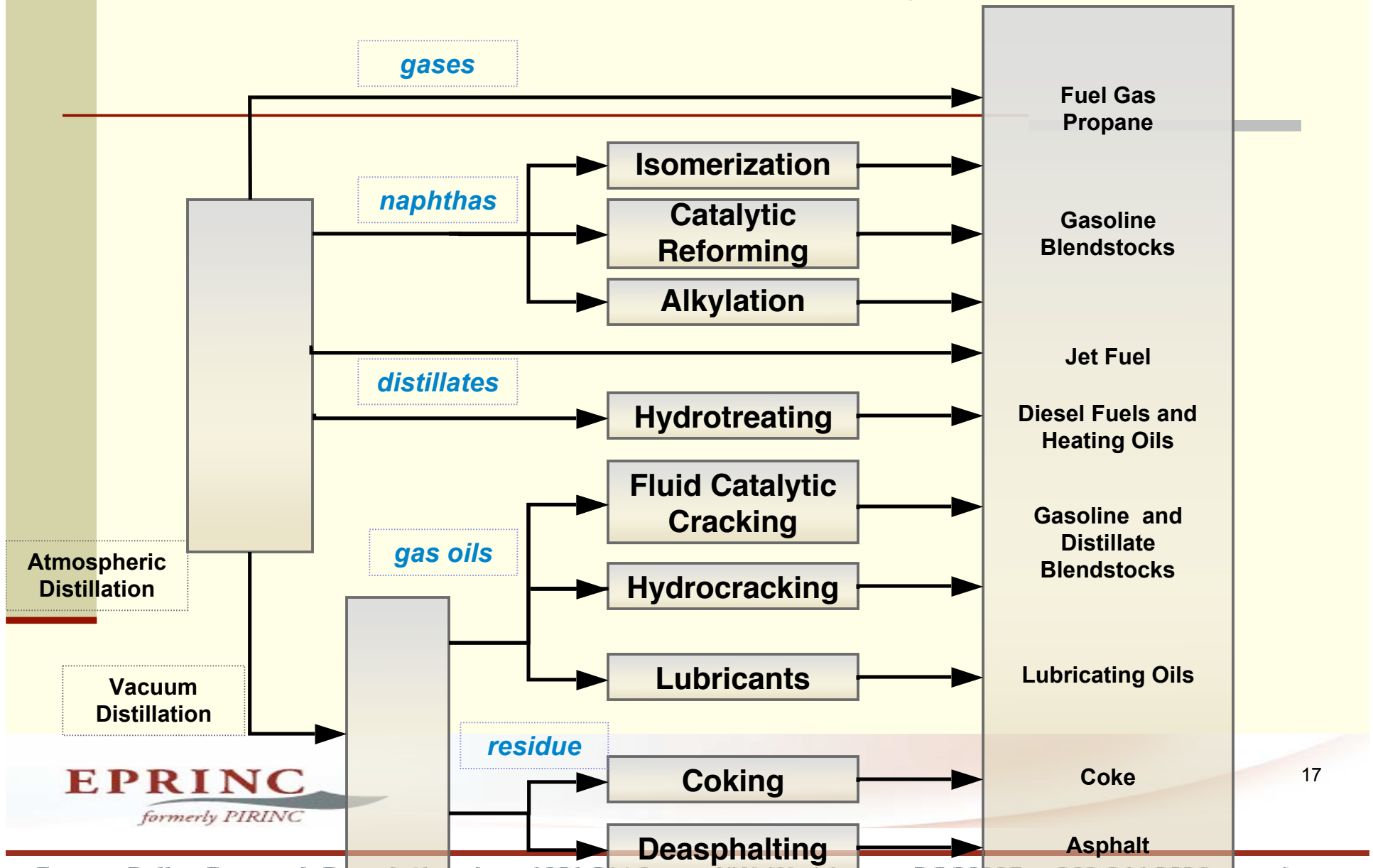


# Nominal and Dollar- Adjusted Crude Prices





# 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

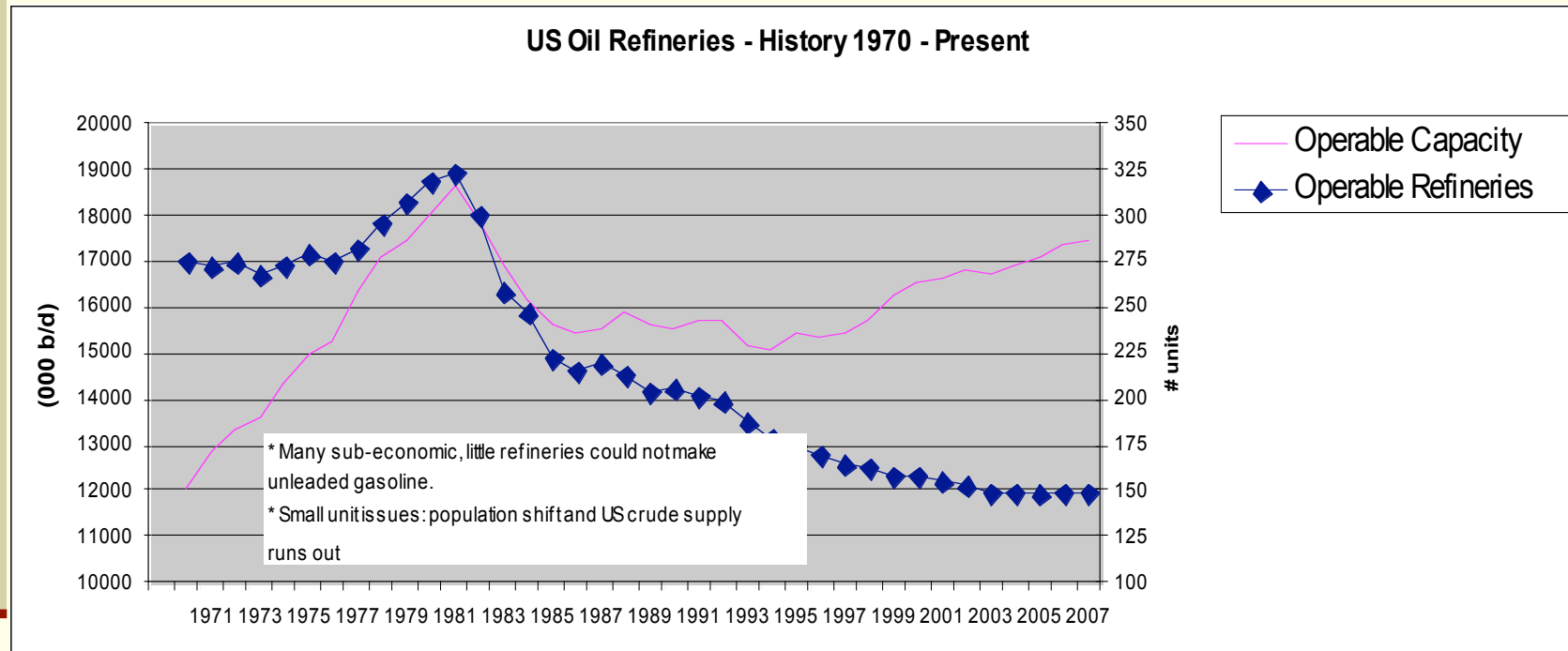
-  Make ultra-low sulfur diesel (ULSD)

-  Make across-the-board sulfur reduction

-  Adjust to declining crude quality

-  Reduce refinery site emissions

# U.S. Oil Refineries History: 1970 - Present

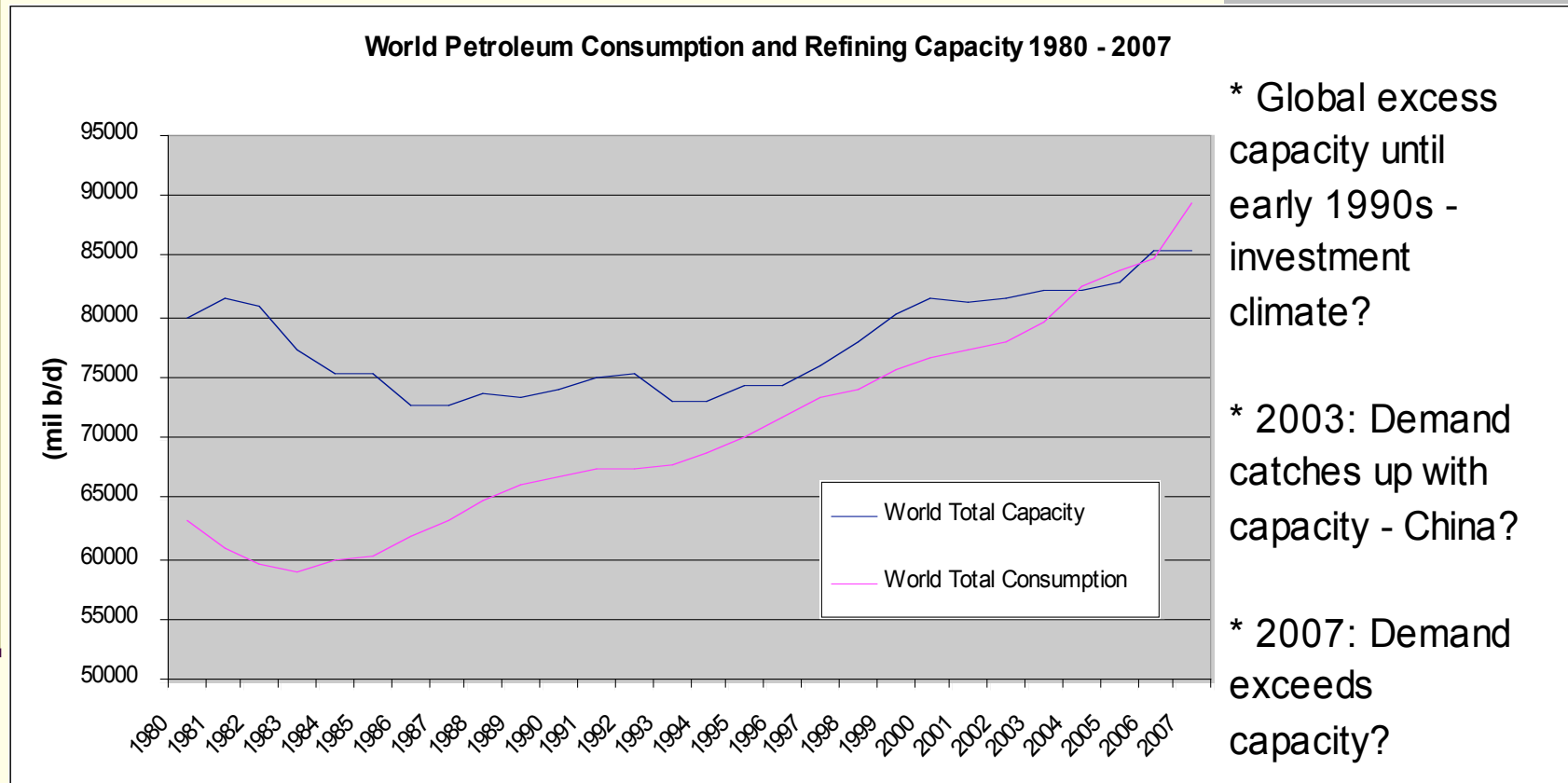


# U.S. Oil Refineries History: 1970 - Present

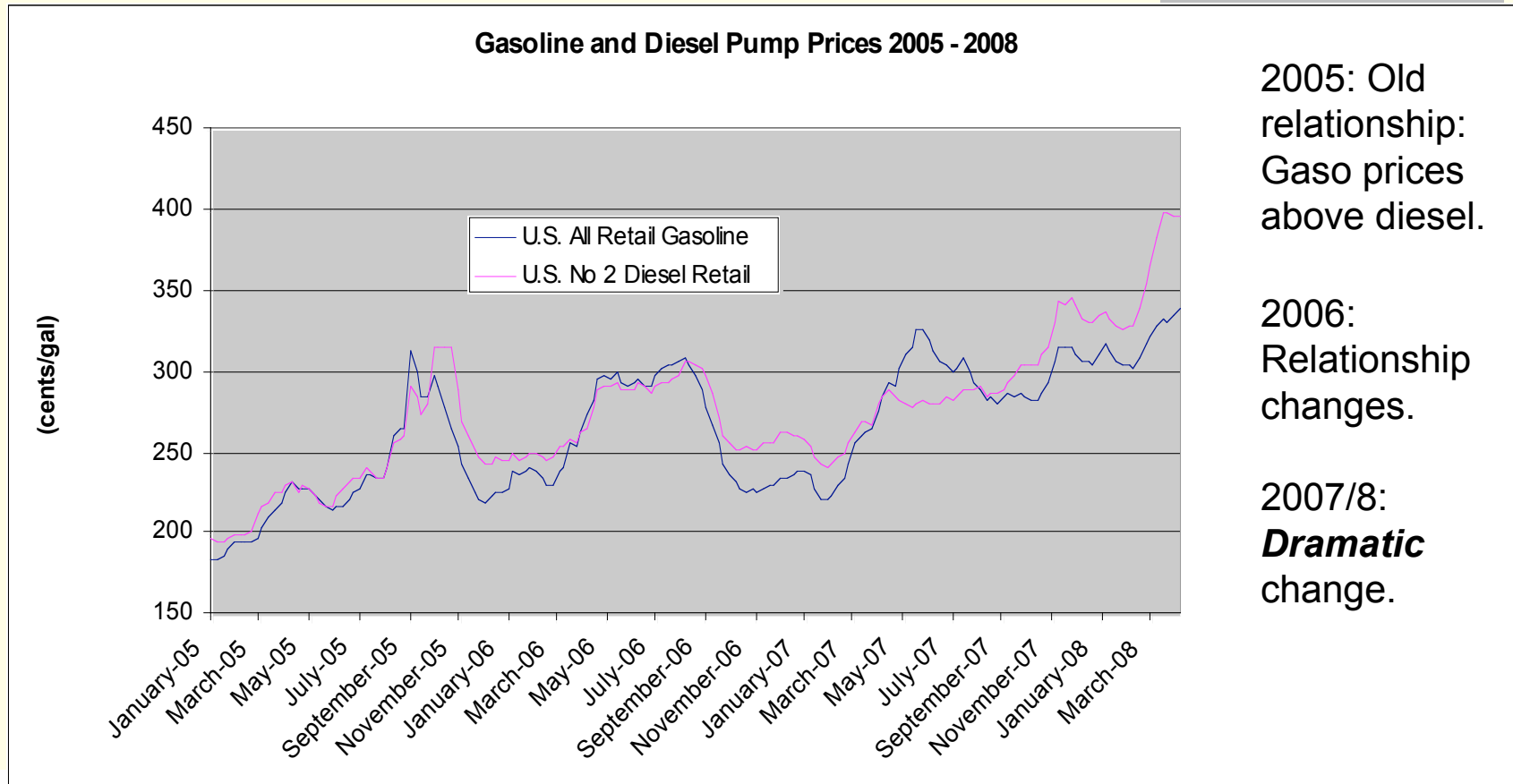
- 1970s: The Small Refiner Bias in the 1973 price control program encouraged the building of excess small refineries.
- 1979: Price controls end.
- 1980-1990: Rationalization of refining.
  - Closure of small, uneconomic units - adversely impacted by population and crude supply shifts.
  - Capacity at 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



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

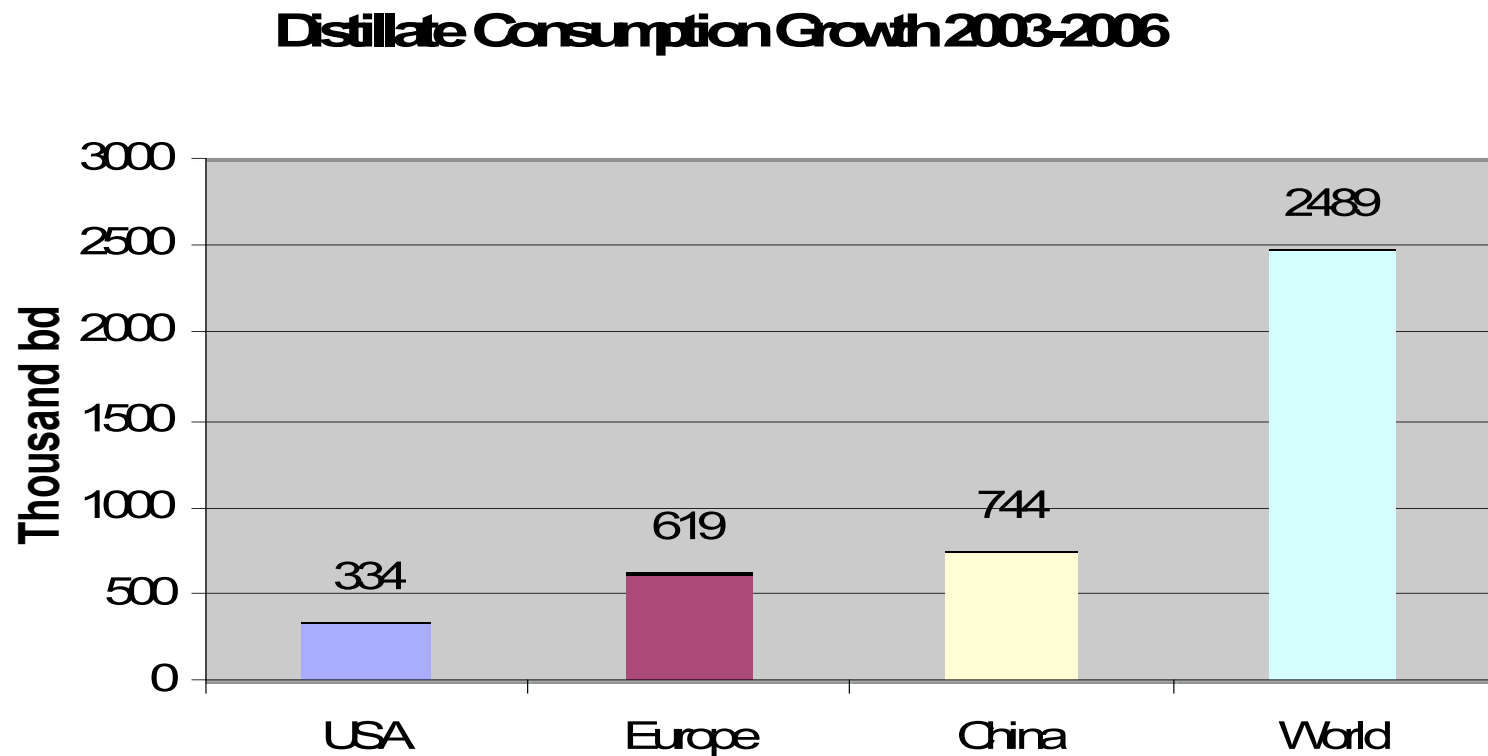


2005: Old relationship: Gaso prices above diesel.

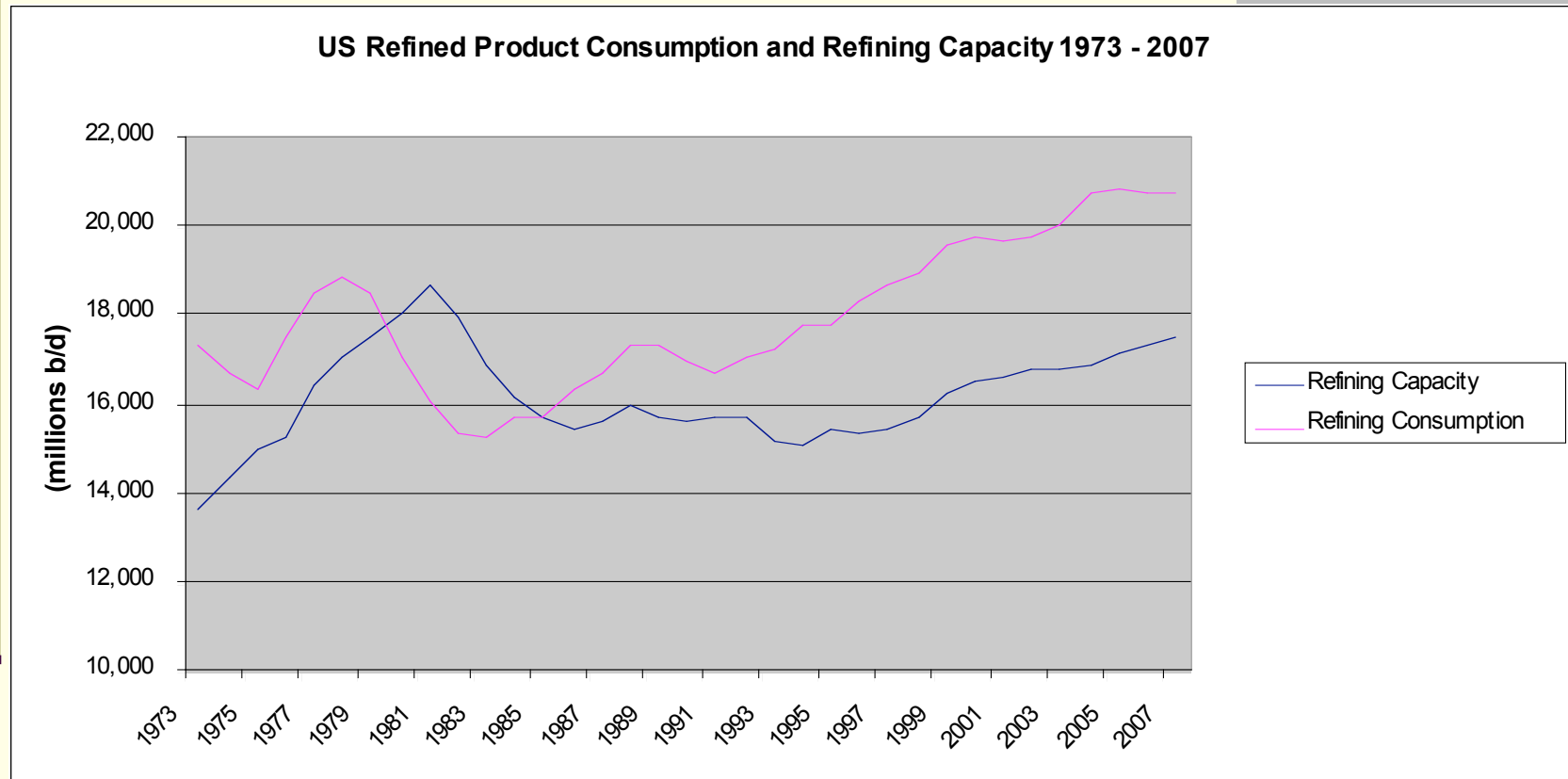
2006: Relationship changes.

2007/8: **Dramatic** change.

# Global Distillate Consumption Growth: 2003 - 2006

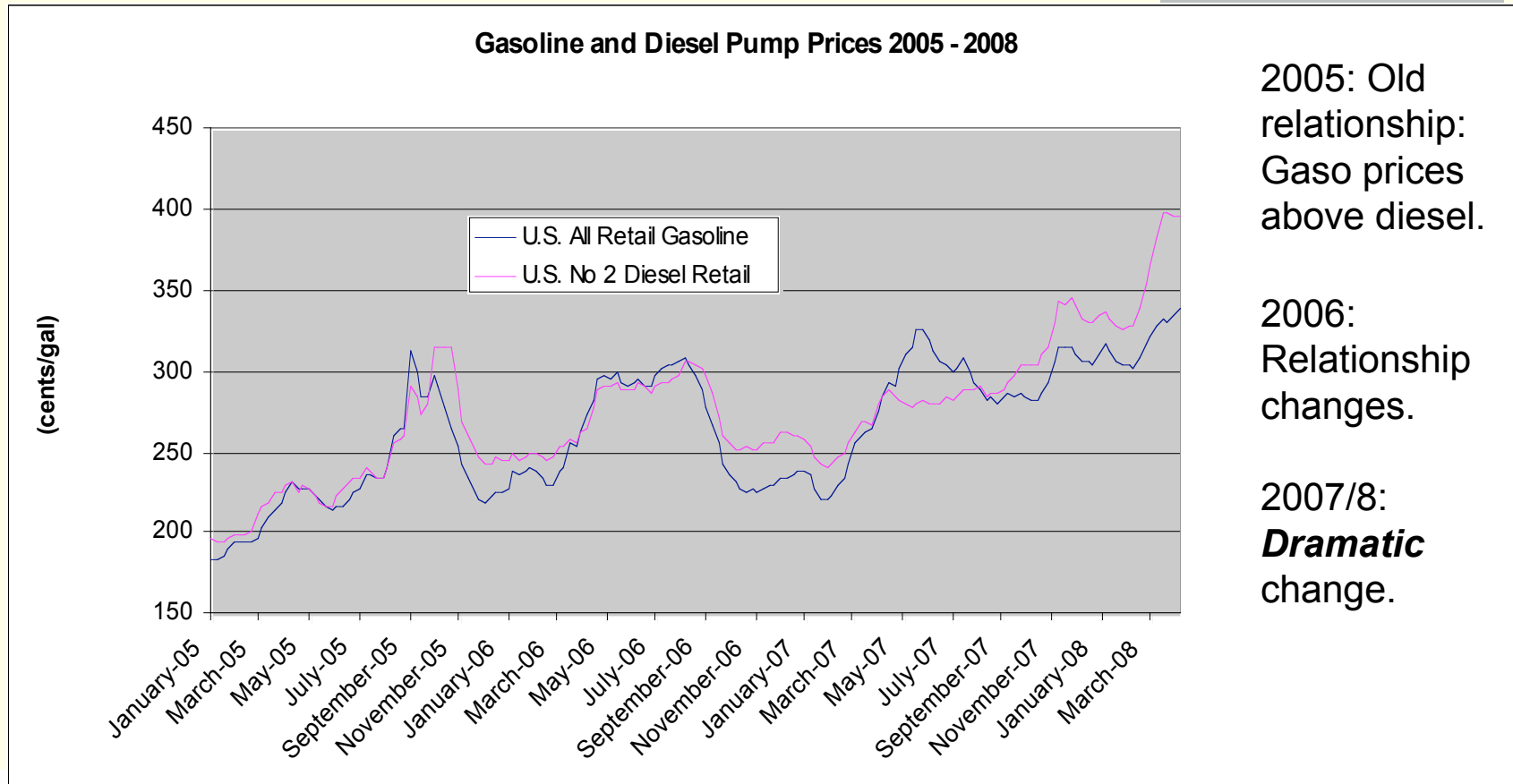


# U.S. Refined Product Consumption and Refining Capacity: 1973 - 2007





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

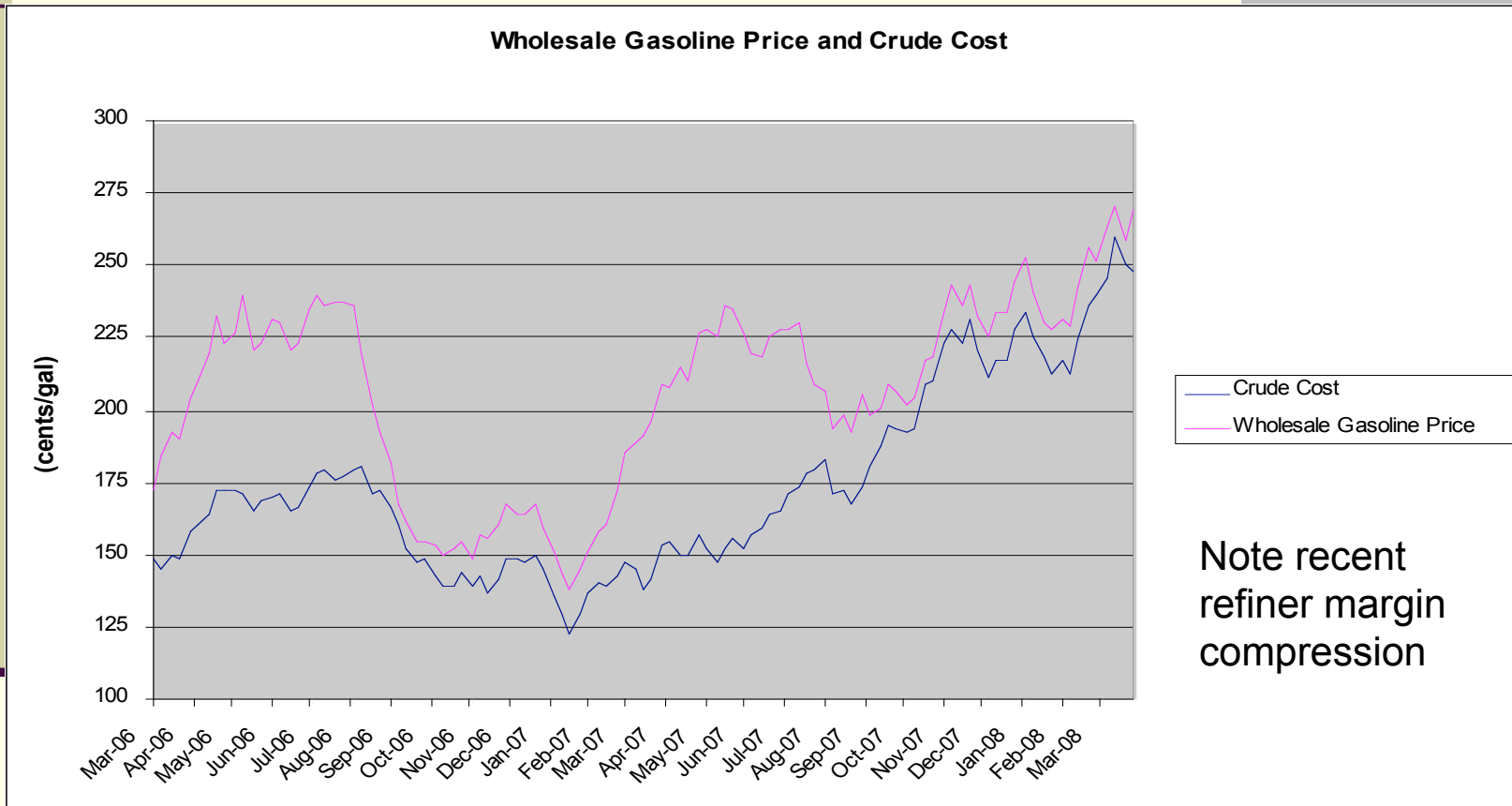


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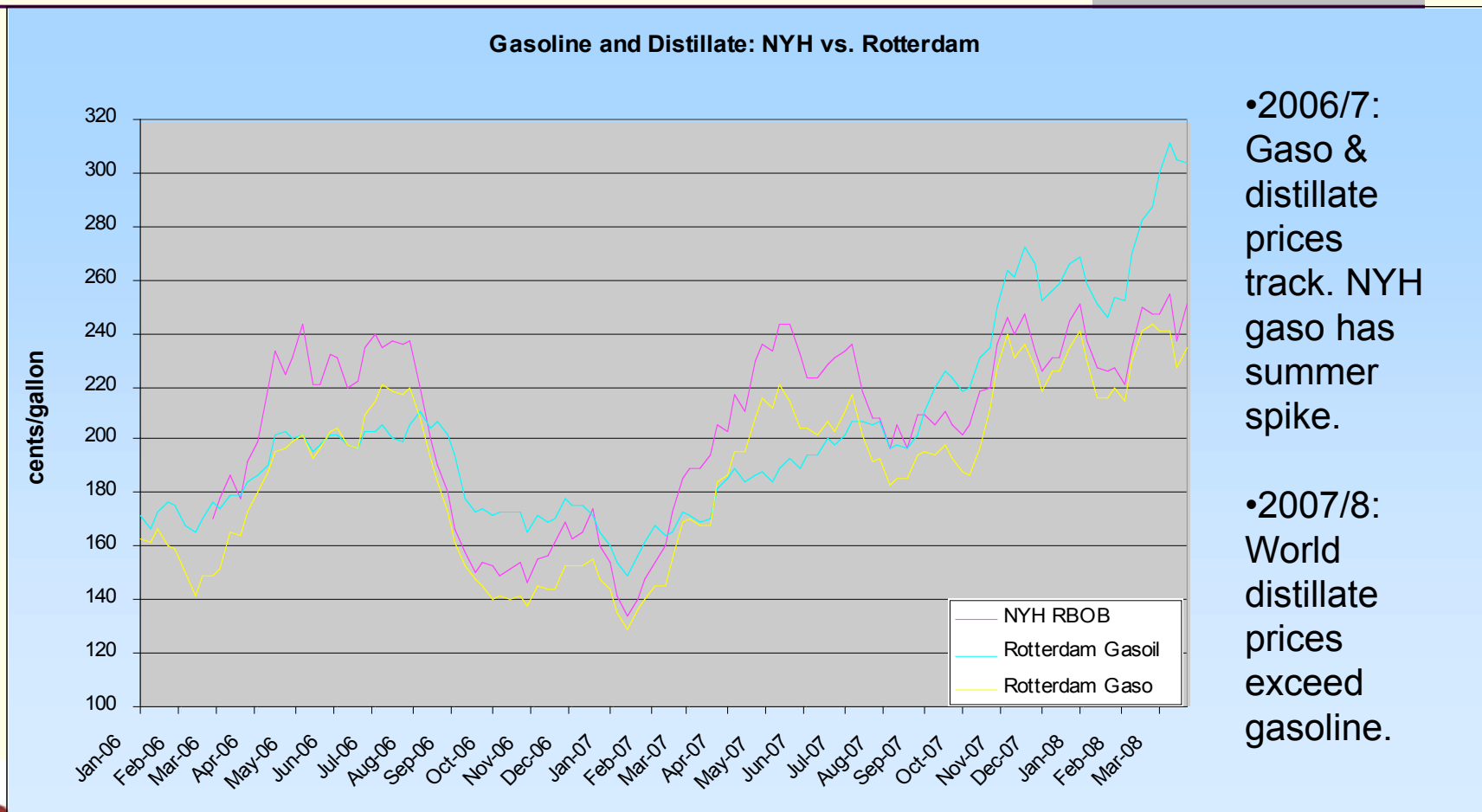
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# U.S. Wholesale Gasoline Price and Crude Cost: 2006 - 2008



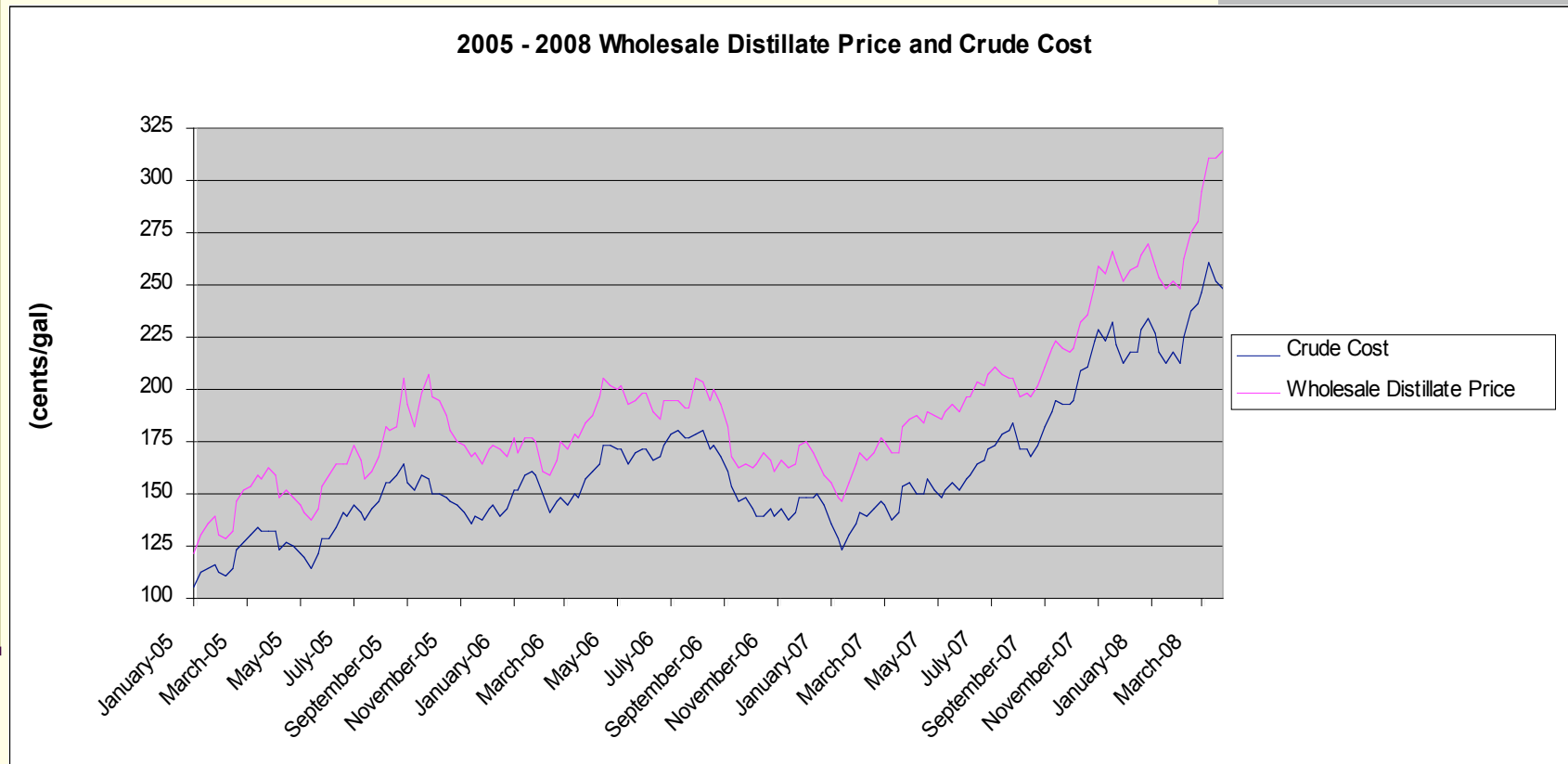
# Gasoline and Distillate Prices: NYH vs. Rotterdam 2006 - 2008



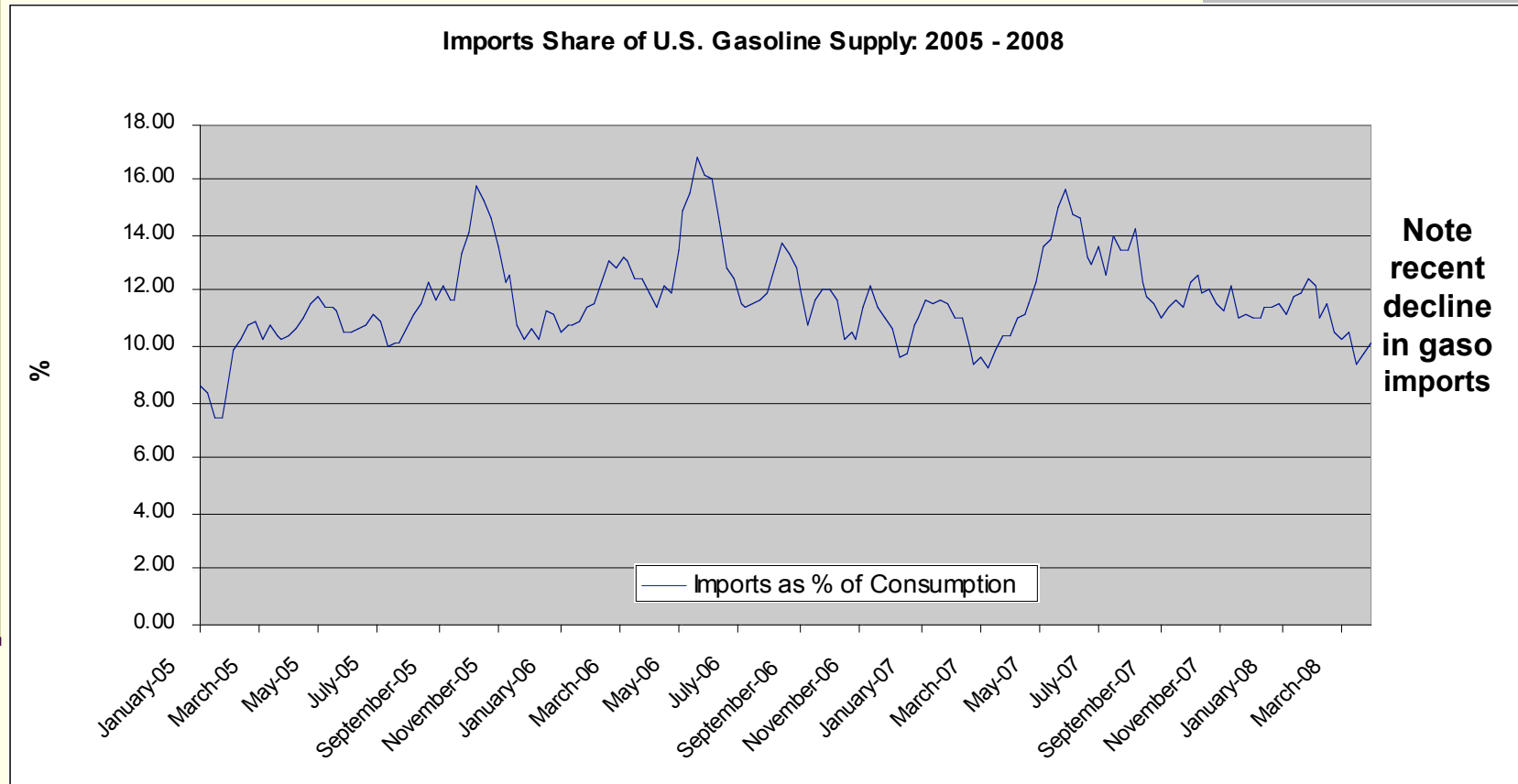
- 2006/7: Gaso & distillate prices track. NYH gaso has summer spike.
- 2007/8: World distillate prices exceed gasoline.



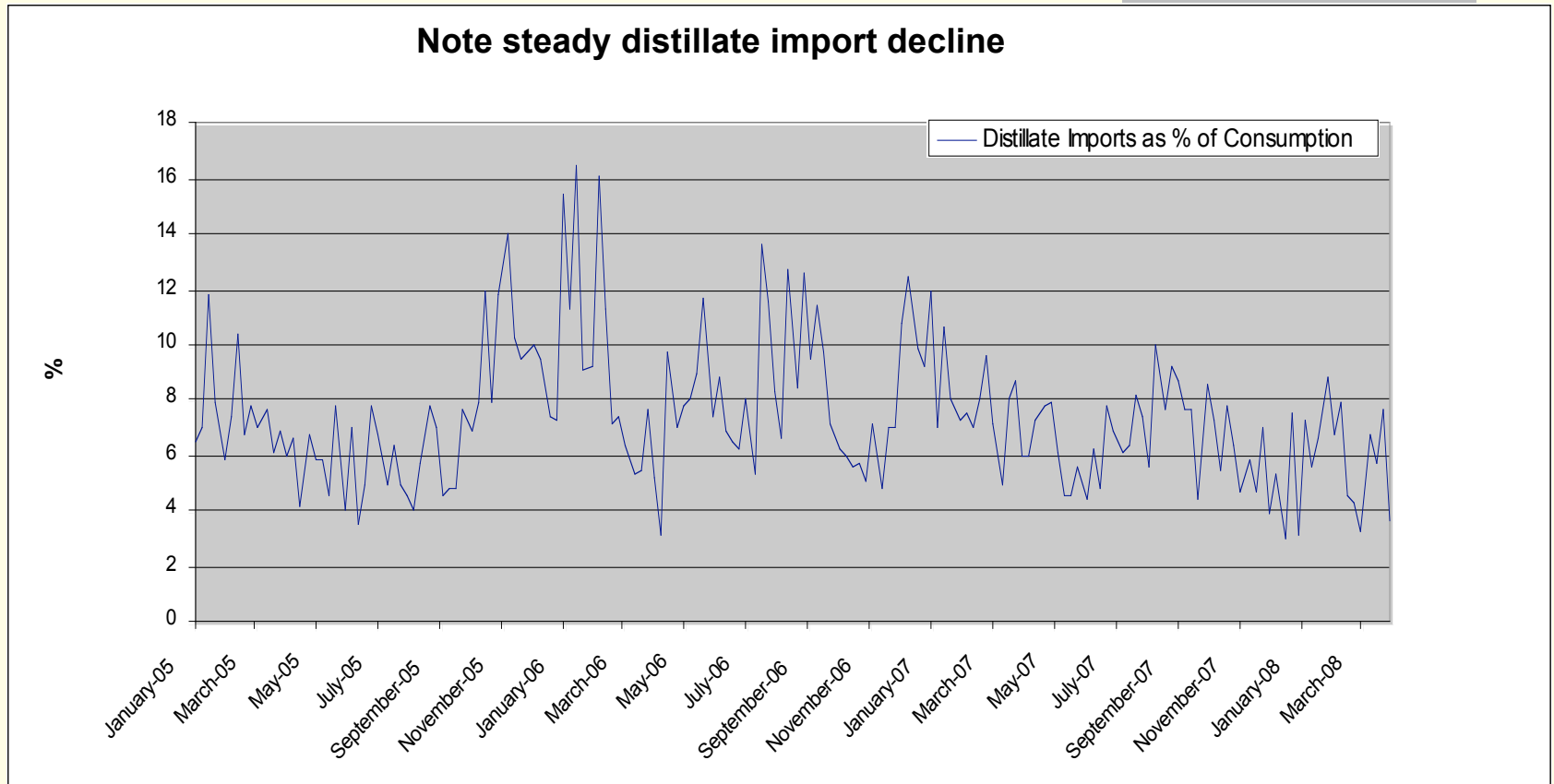
# U.S. Wholesale Distillate Price and Crude Cost: 2005 - 2008



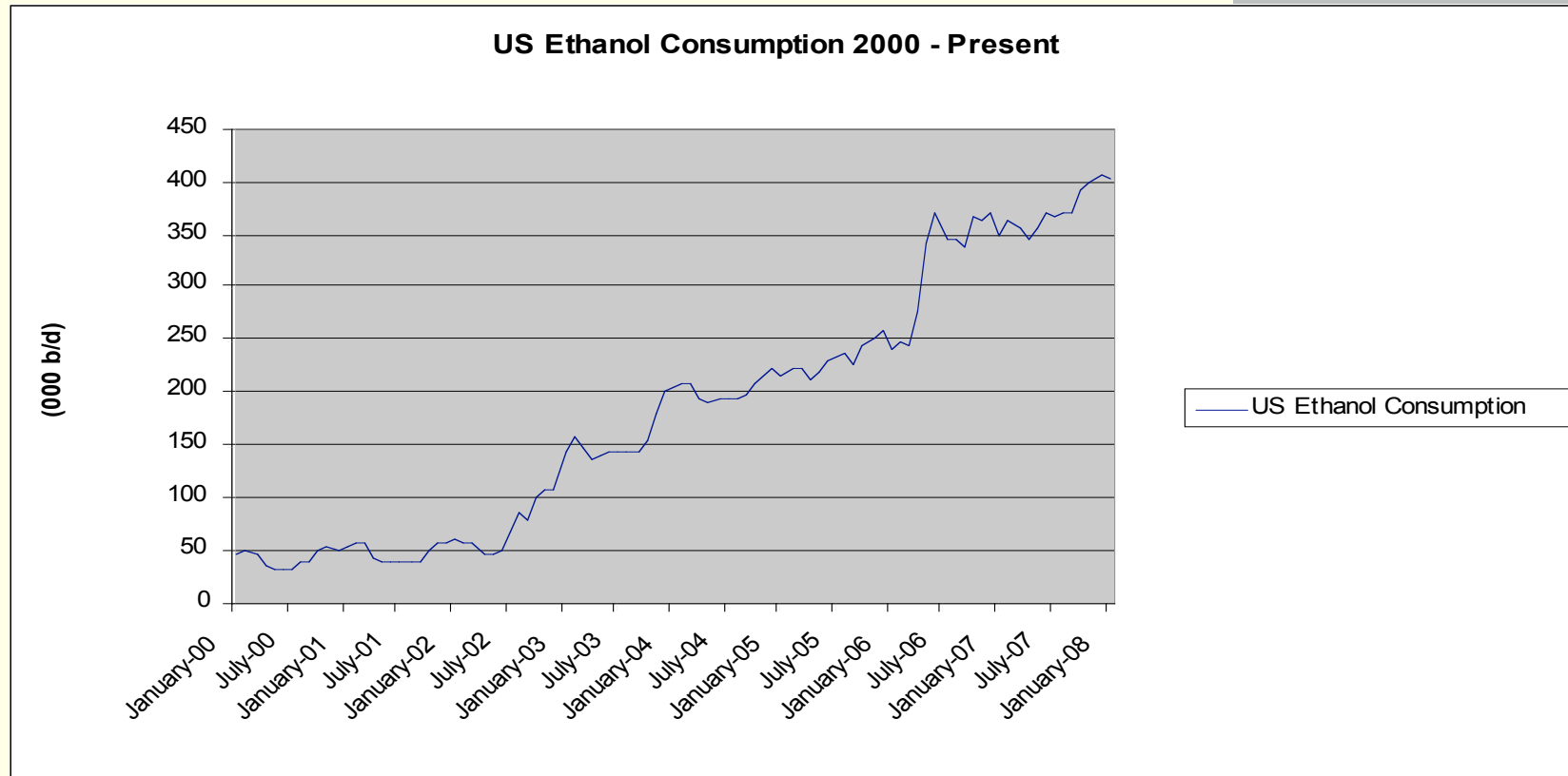
# Gasoline Imports as Percentage of Consumption: 2005 - 2008



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



# US Ethanol Consumption: 2000 - Present

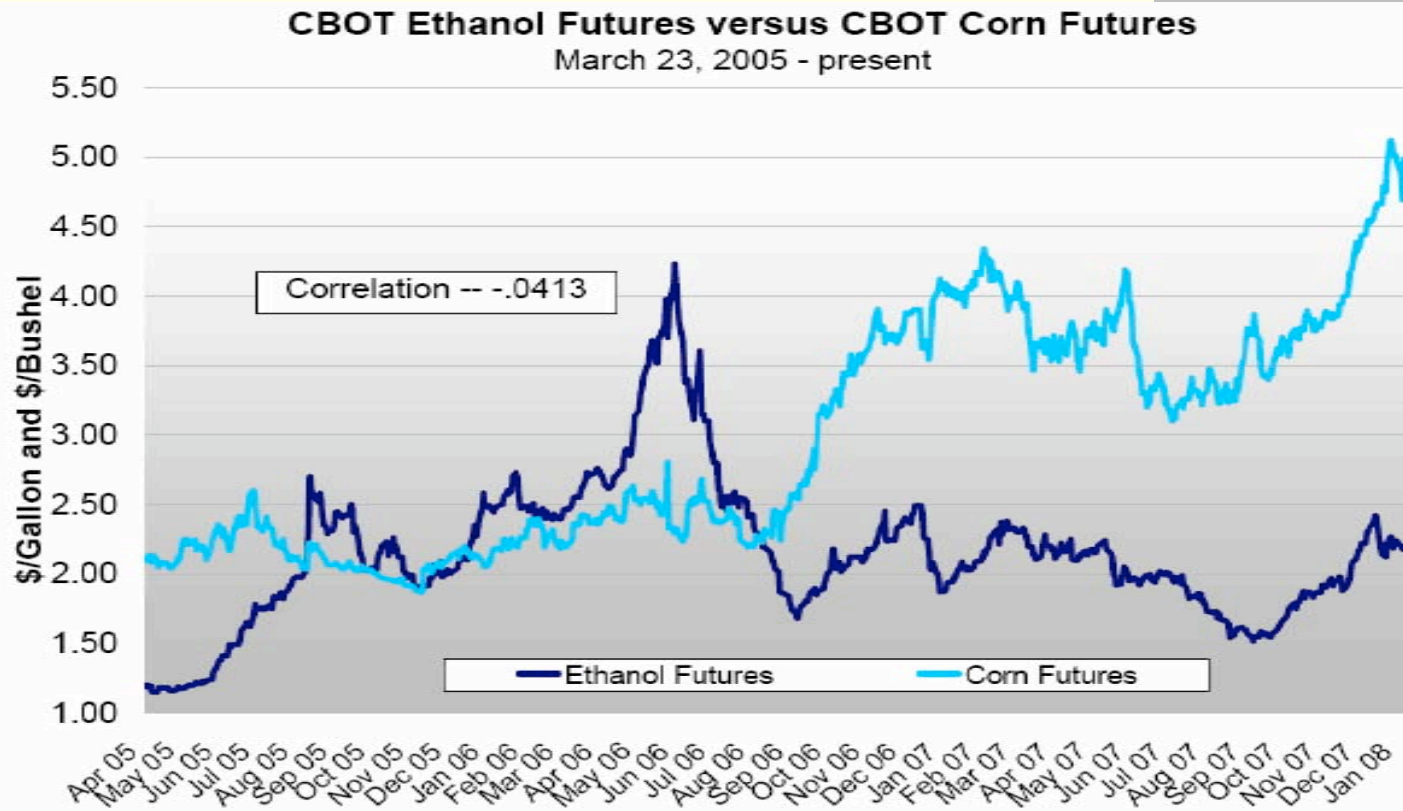


# US Ethanol Consumption: 2000 - Present

- 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



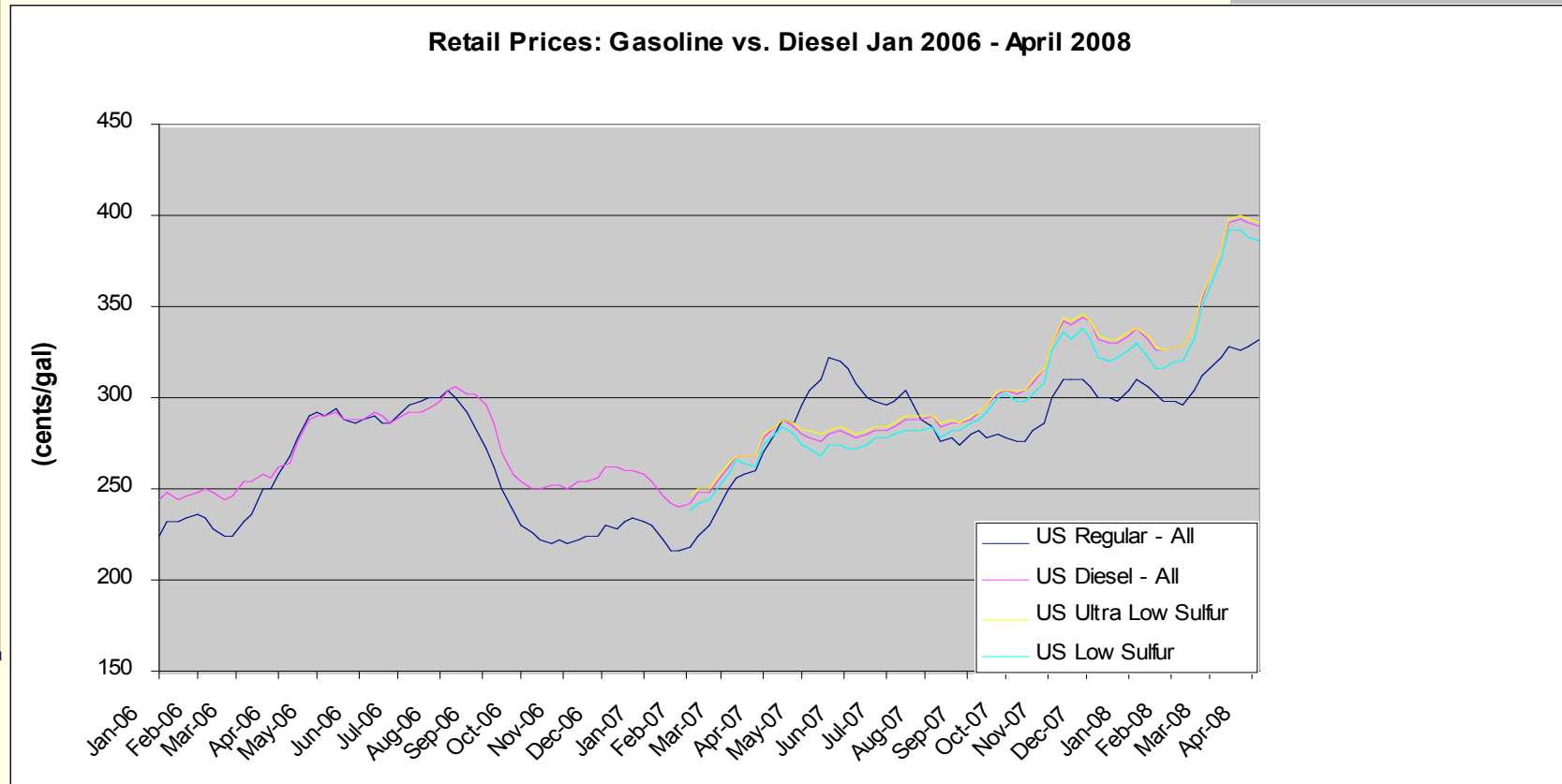
# Ethanol Production Cost (\$/Gal)

**Ethanol Production Cost (\$/gal.)**

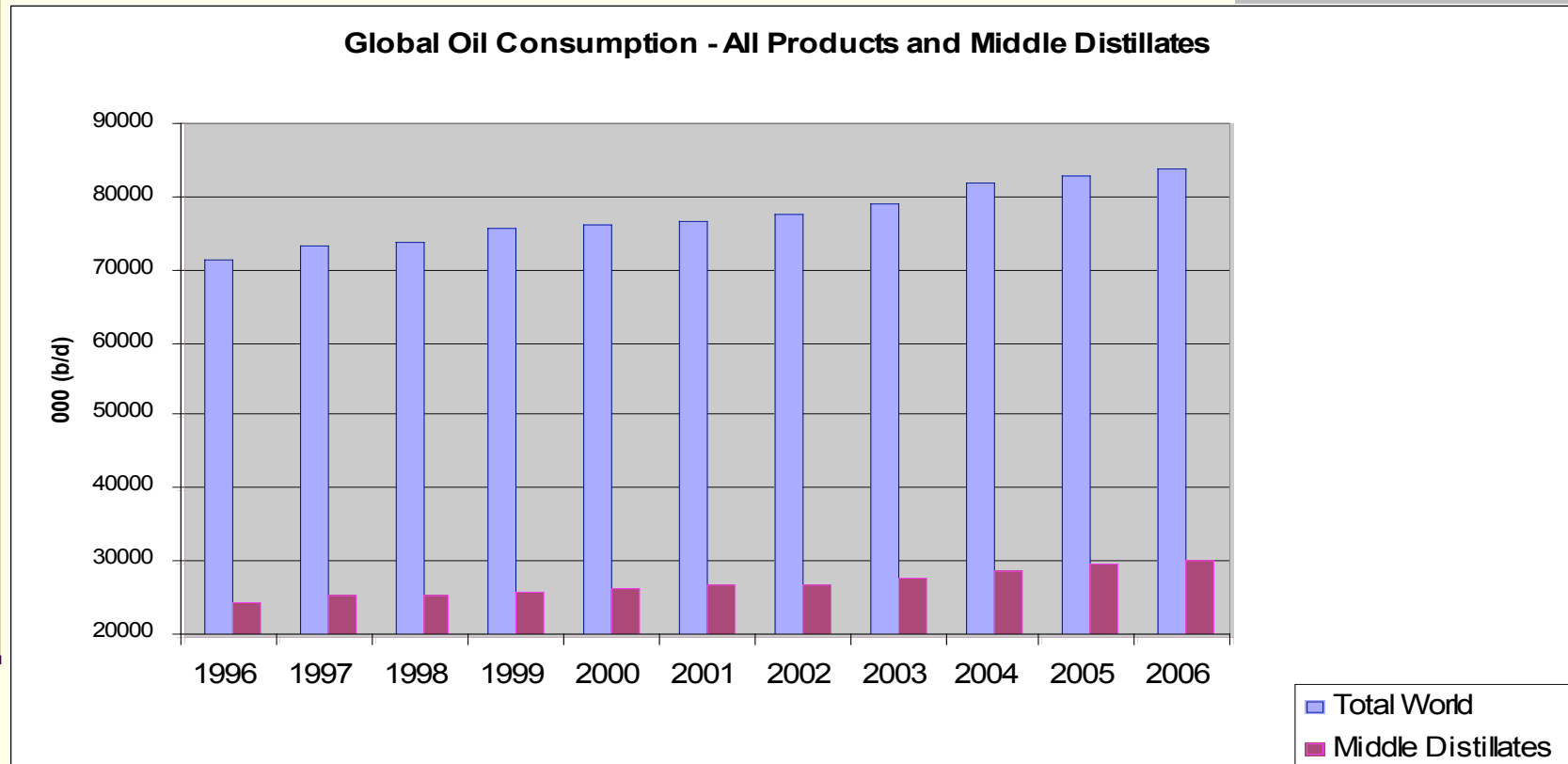
<b>Cost</b>	<b>Wet Mill</b>	<b>Dry Mill</b>
<b>Natural Gas</b>	<b>0.30</b>	<b>0.30</b>
<b>Miscellaneous Inputs</b>	<b>0.56</b>	<b>0.52</b>
<b>Corn (\$6/bu)</b>	<b>2.31</b>	<b>2.14</b>
<b>Co-product credit</b>	<b>-1.03</b>	<b>-0.41</b>
<b>Subtotal</b>	<b>2.14</b>	<b>2.55</b>
<b>Remaining To Cover Fixed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

Sources: Simmons & Company International; EPRINC Calculations

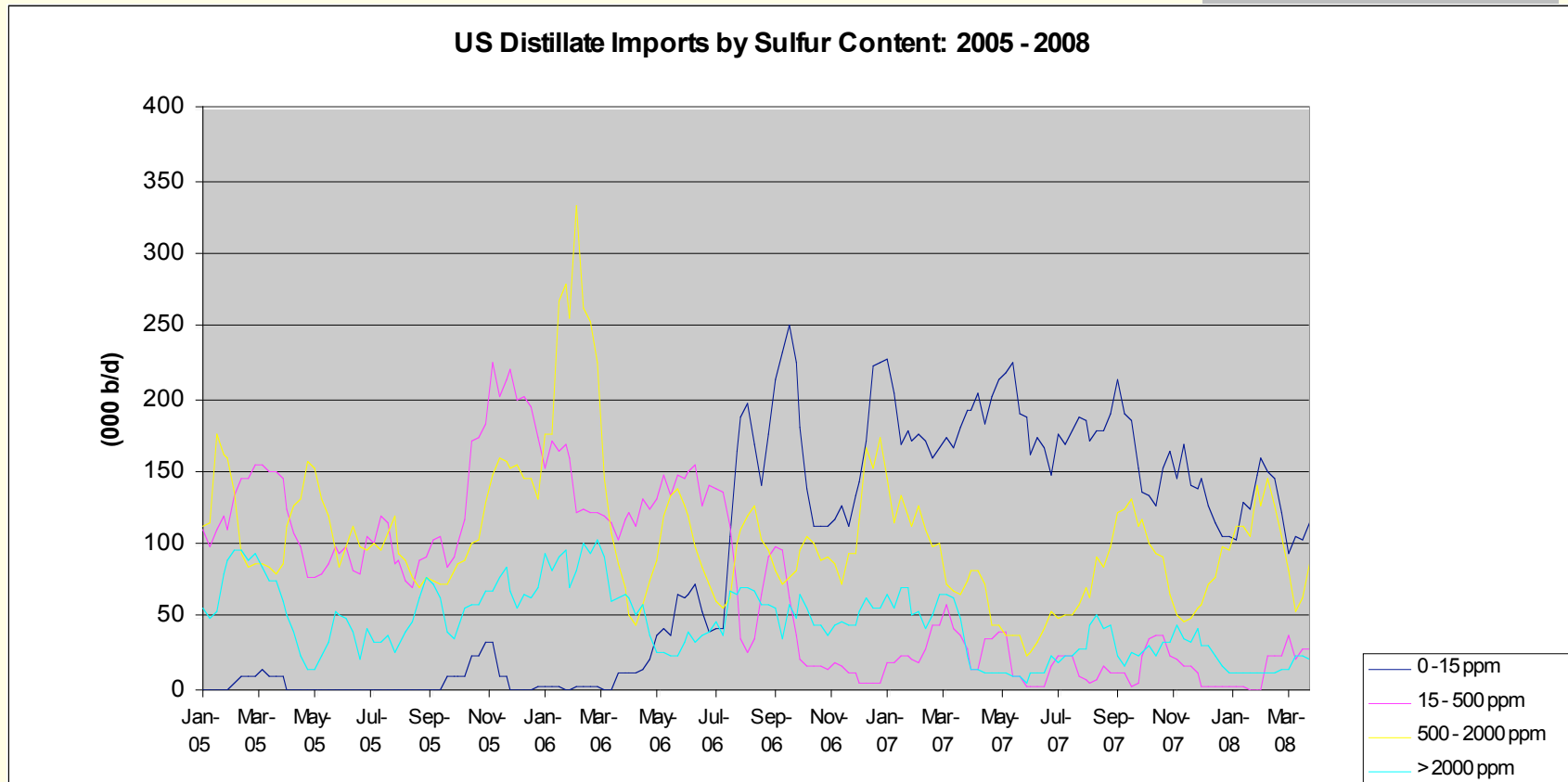
# U.S. Retail Prices: Gasoline vs. Diesel 2006 - 2008



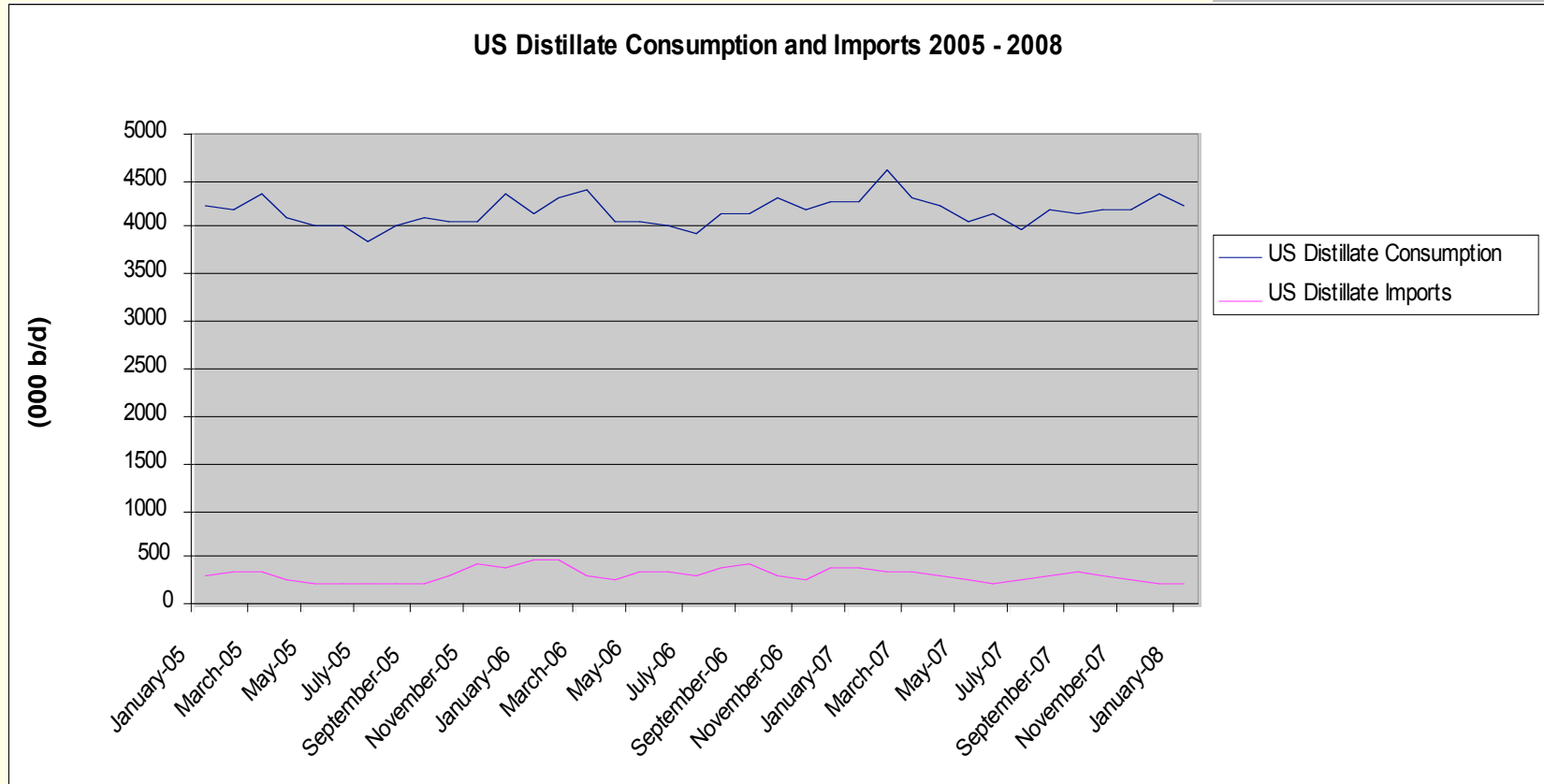
# Global Oil Consumption – All Products and Middle Distillates



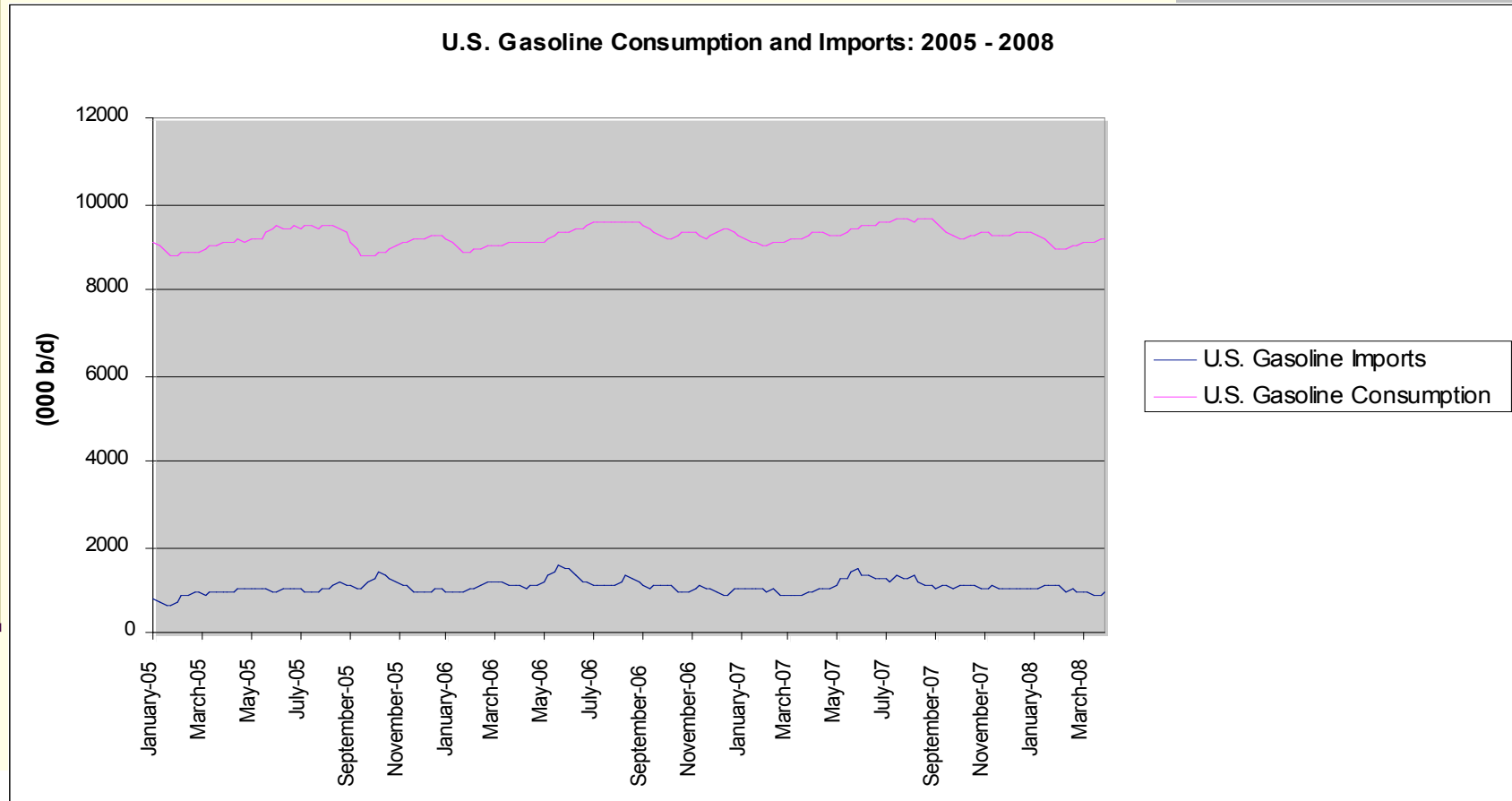
# U.S. Distillate Imports by Sulfur Content: 2005 - 2008



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



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



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