



WP2 Identification and market analysis of most promising added-value products to be co-produced with fuels

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Tasks

- 2.1 Identification of products
- 2.2 Market and price analysis
- 2.3 Market survey of most interesting added-value co-products



Task 2.1

- This task identified 317 chemicals from recent literature and partners that can be derived from a biorefinery.
- This will be updated and extended during the remainder of the project
- In principle any chemical can be derived from biomass through a sequence of transformations and separations
- There are “key” chemicals that act as primary sources for families of chemicals and which are, therefore, of greater importance
- These key chemicals have a well established presence, well established production infrastructure and well established markets



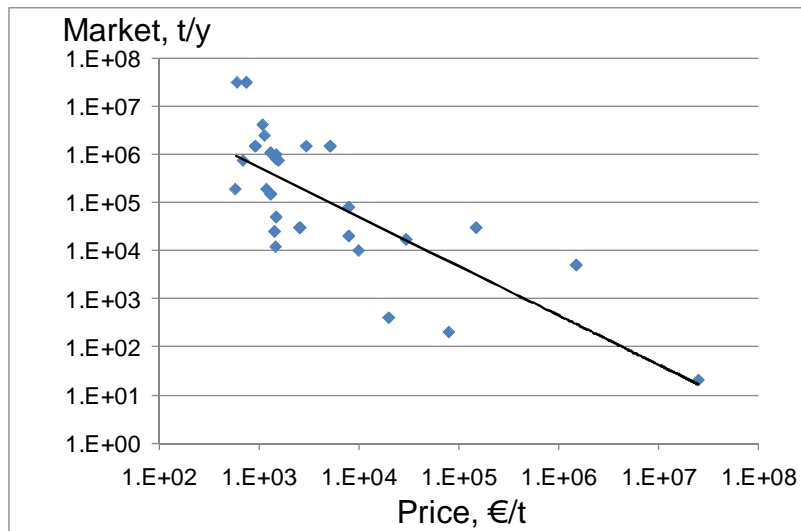
Chemical industry product family tree



Task 2.2

- A literature and web analysis has been made on current market prices and volumes of the materials and chemicals identified in Task 2.1
- Price data has been found for 97 of the 317 chemicals
- Market volume has been found for 57 of the 317 chemicals
- This will be updated and extended during the remainder of the project

Price – volume relationship



Most interesting products

Criteria for selection:

- The most interesting products are those with:
 - Established market
 - High value
 - Low production cost
 - Growth potential
 - Long term future
 - Internationally traded
- These will tend to be commodity or bulk chemicals

Task 2.3 Market survey

- Products agreed by Work Package leaders as significant are:
 - 1,2 propanediol
 - Animal feed
 - CO₂
 - Diesel
 - DME
 - Epichlorhydrin
 - Ethanol
 - Gasoline
 - Kerosene
 - Lactic acid
 - Lignin
 - Methanol
 - Power
 - Protein
 - Pyrolysis oil
 - Tar

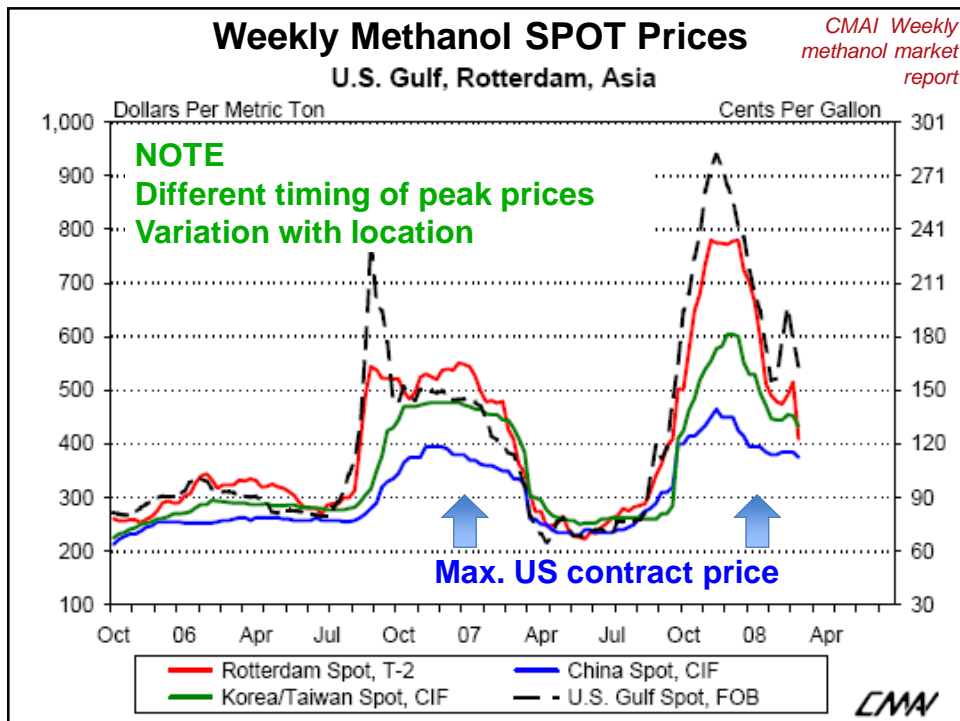
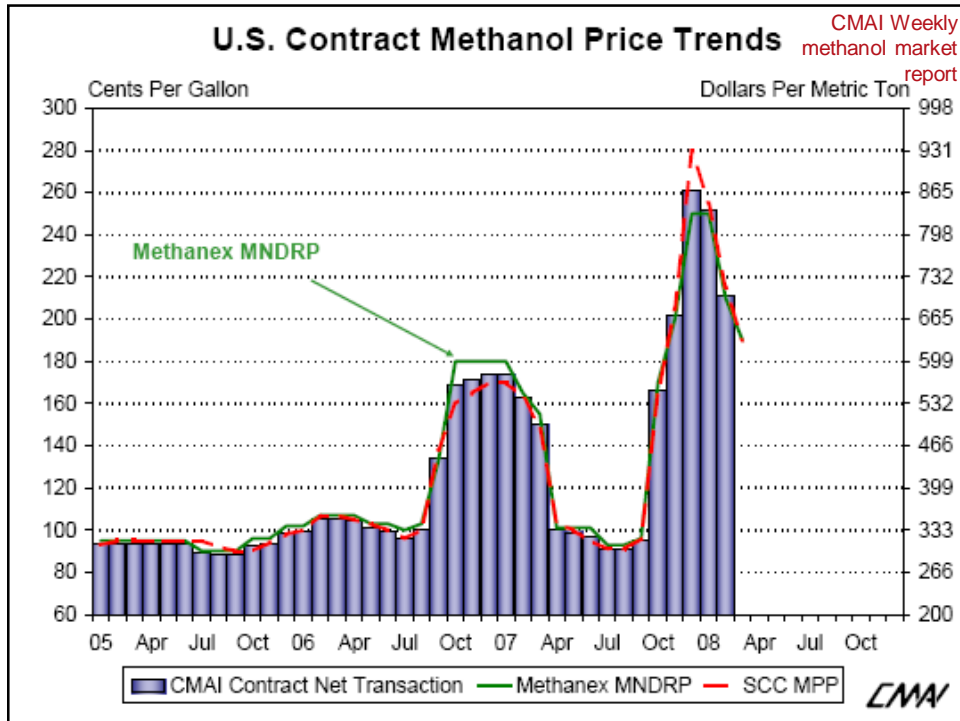
Market study contents

Each product is reviewed in terms of:

- Summary
- Technical Data
- Uses, Manufacturers and Market Location
- **Costs and Prices**
- **Market Volume and Future Trends**
- Producers
- Applications
- Future Trends
- References

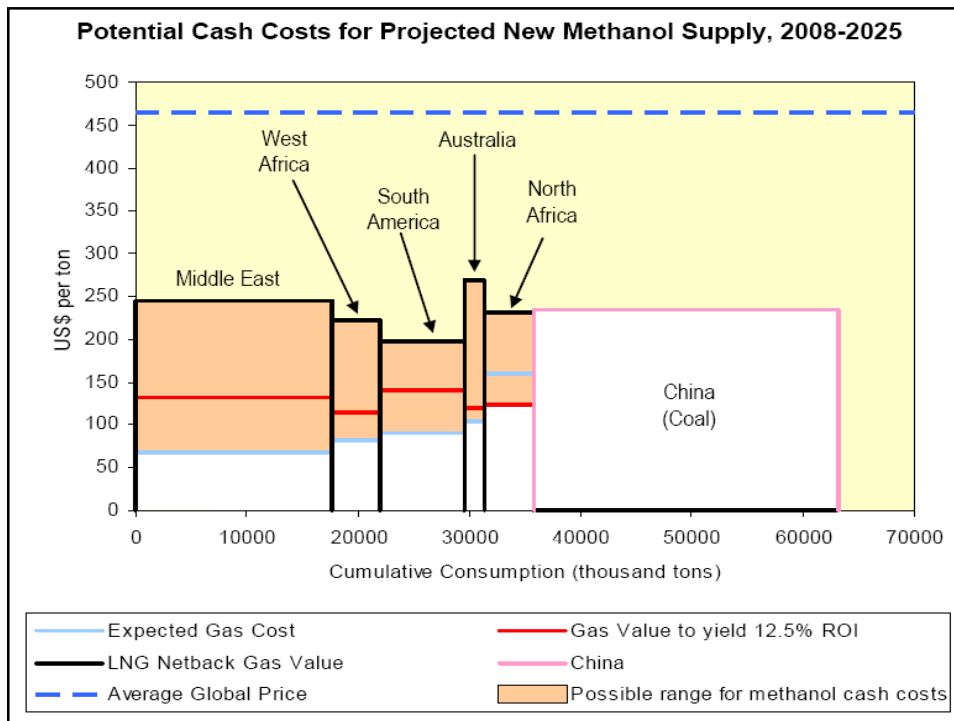
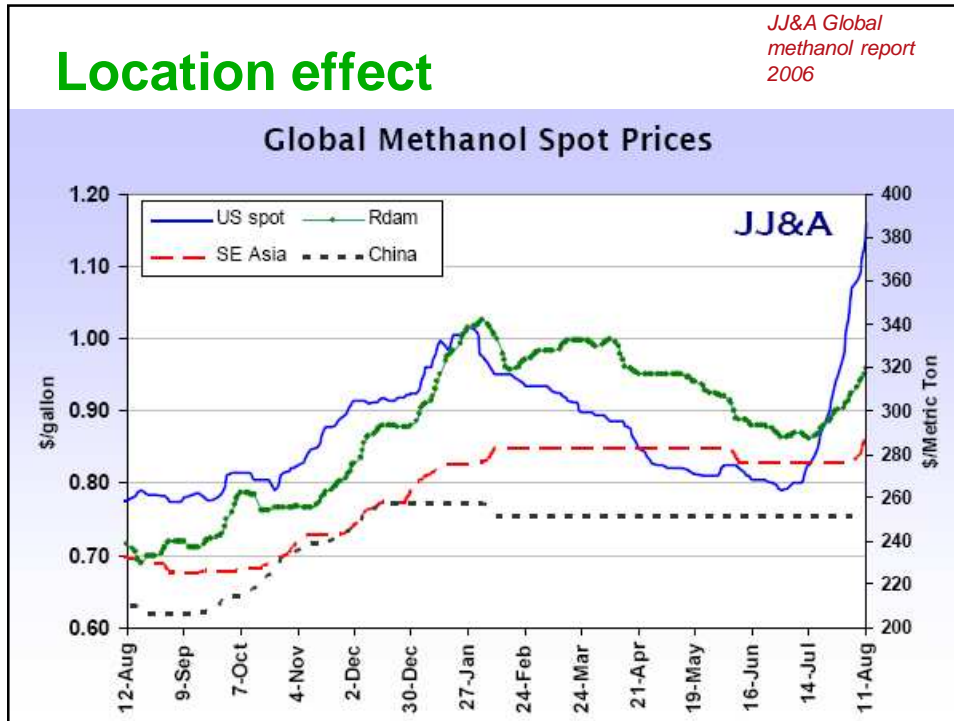
Cost and price e.g. methanol

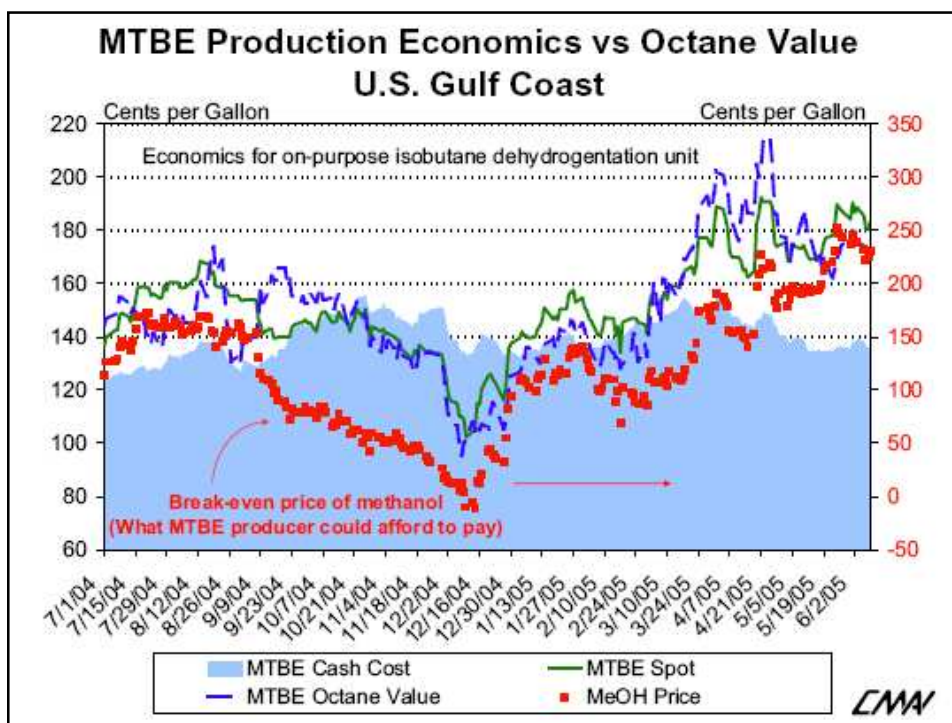
- The **cost** of methanol is composed of three main elements:
 - feed cost (natural gas)
 - capital related costs
 - minor operating costs such as labour.
- The **price** of methanol depends on supply or availability and demand but cannot be sustained at a price below the cost of production



Location effect

JJ&A Global methanol report 2006





Product prices - conclusions

- Spot or contract prices do not provide a good indication of either short term or long term price trends and do not match each other
- Price depends on:
 - Oil and gas costs for petrochemicals
 - Competition between producers
 - Supply and demand balance
- Small supply and demand fluctuations can have a major impact on prices
- Political drivers can have a major impact on prices and commercial activity
- Prices cannot be reliably predicted even for ½ year
- Fuel prices need to be clearly defined and exclude taxes
- Fiscal incentives need to be separated out

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Cost and price prediction

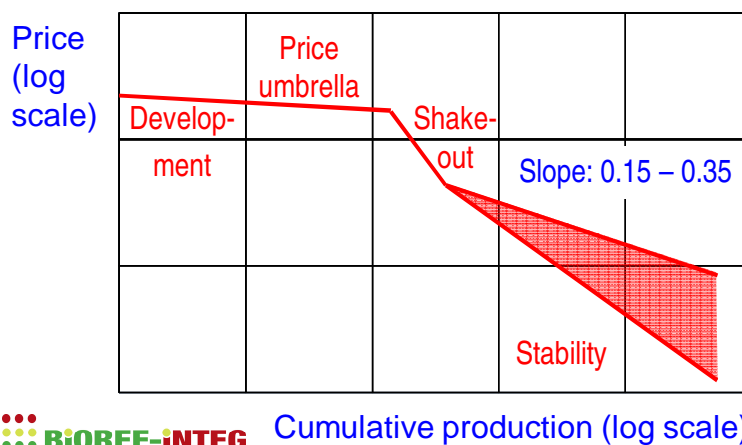
There are several methods for predicting prices and costs:

1. **Learning curves.** This is a well established but empirical relationship.
2. **Trend extrapolation** based on historical data. This requires good data going back say 20 years for a 20 year future prediction
3. **Cost estimation** based on analogy, empiricism, or process complexity and conversion efficiency.



1 Learning curves

Boston Consulting Group in the 1970s analysed chemical prices and found a relationship between cumulative production and price that always followed this pattern



Ethanol costs

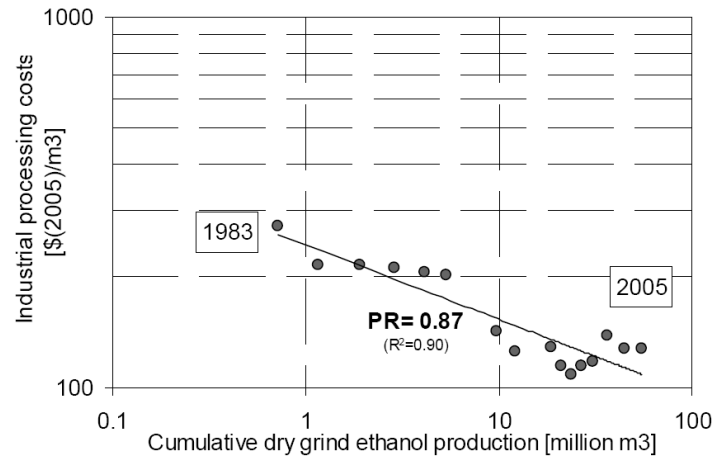
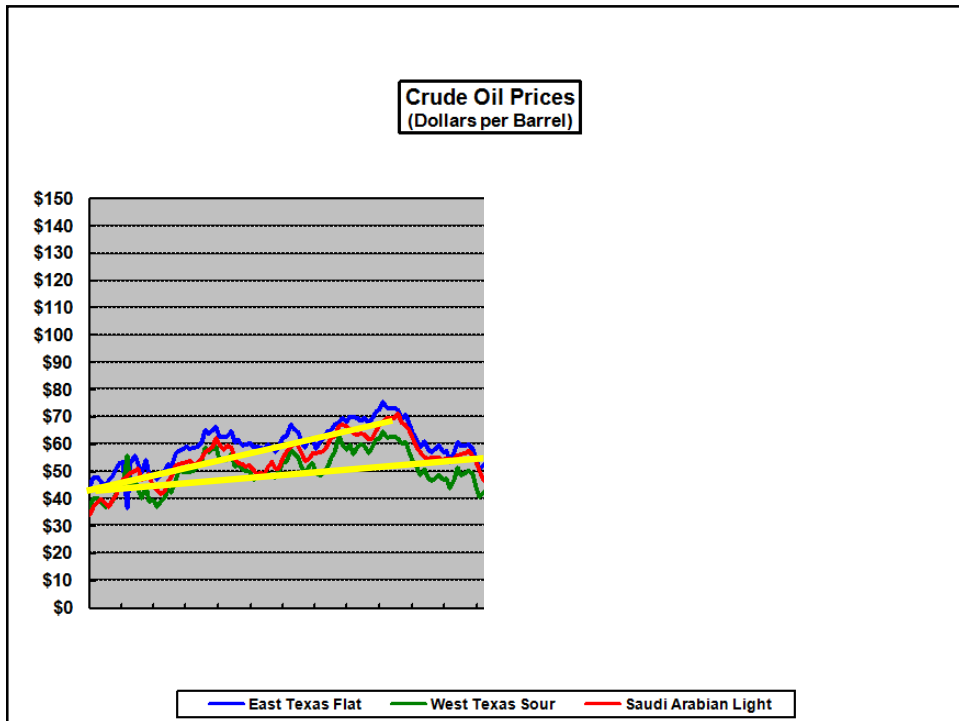
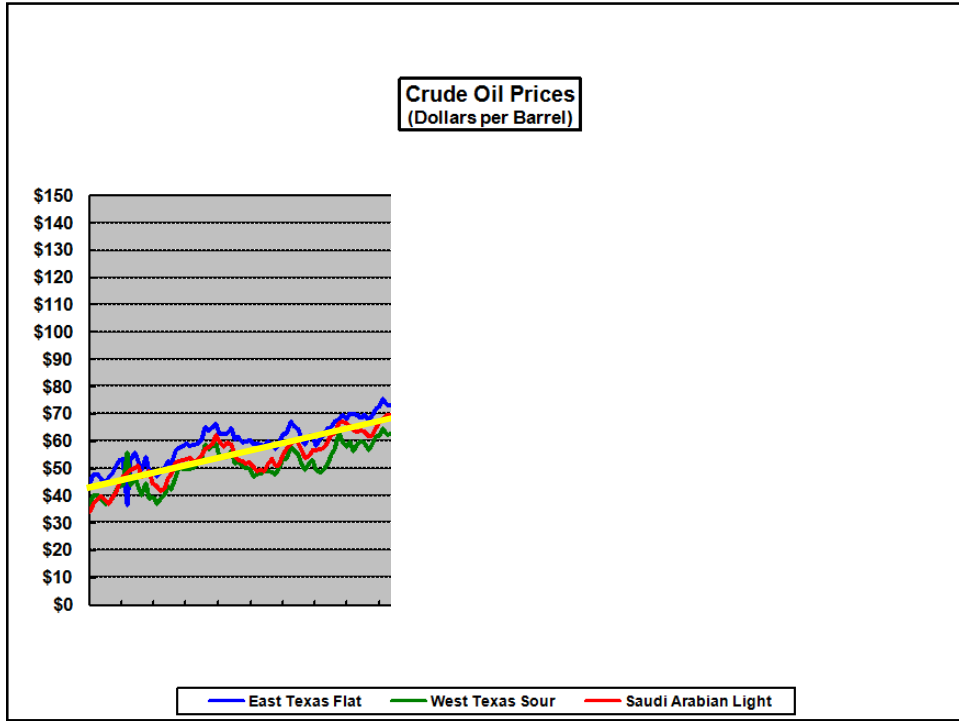


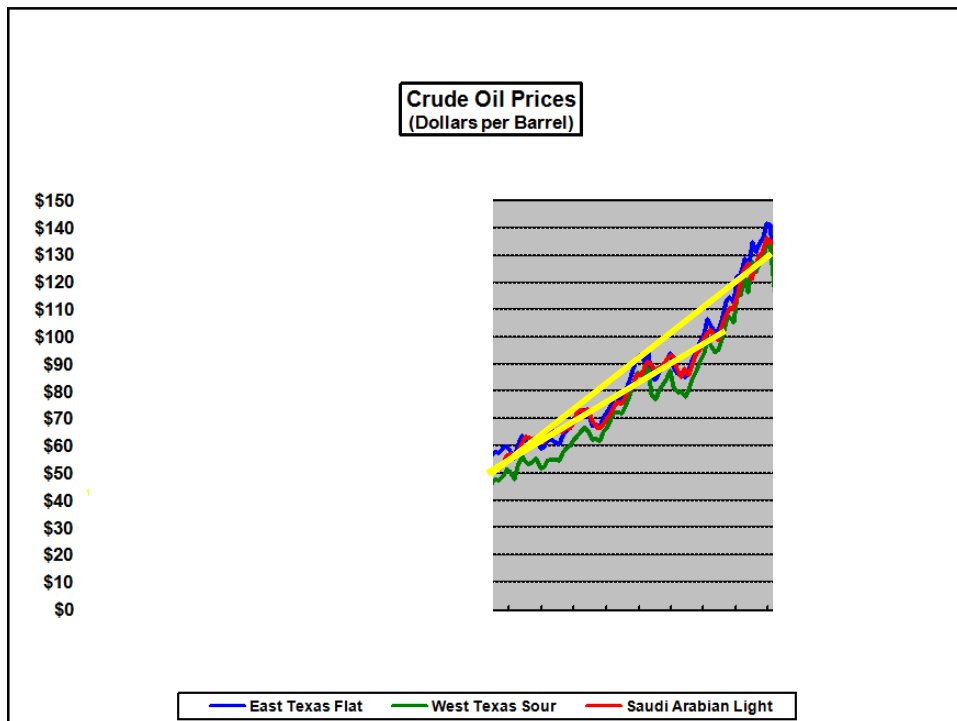
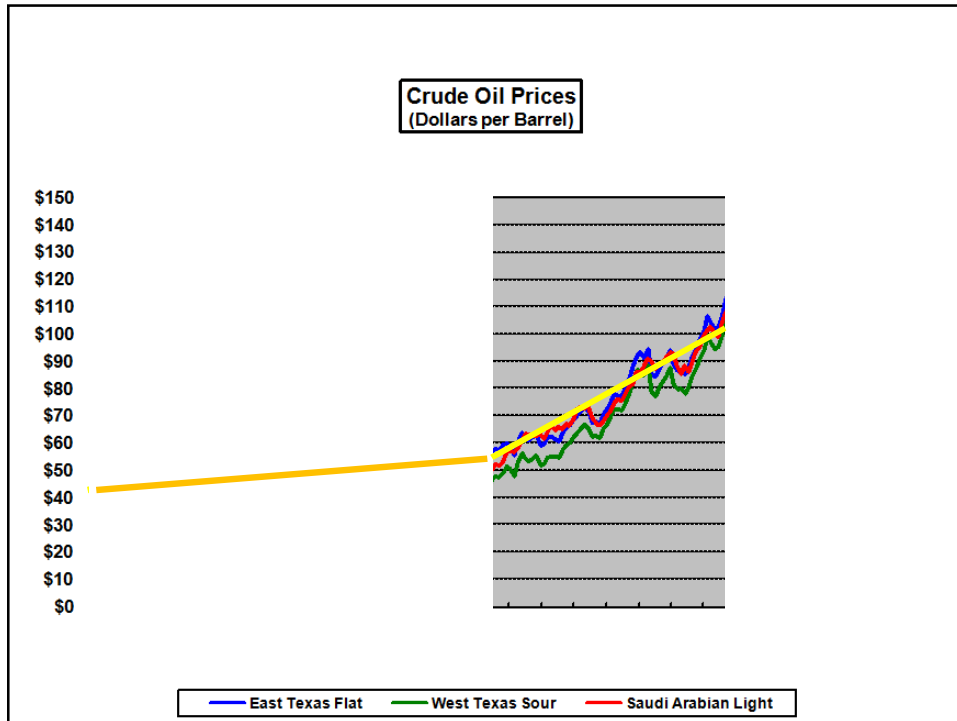
Figure 6: Experience curve on ethanol processing costs 1983-2005 (excluding corn and capital costs).

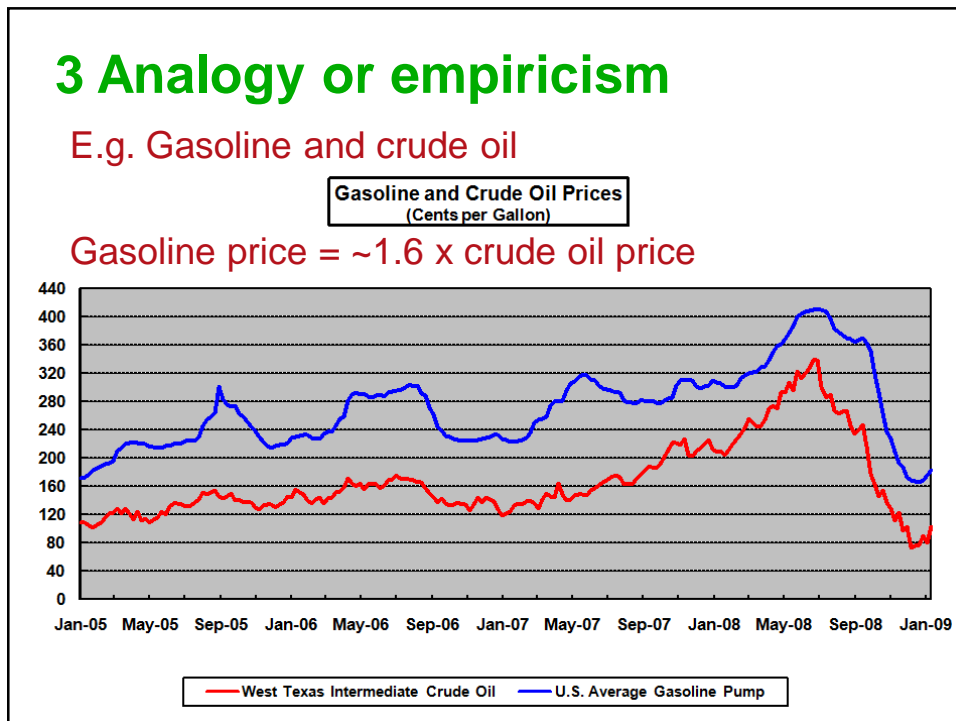
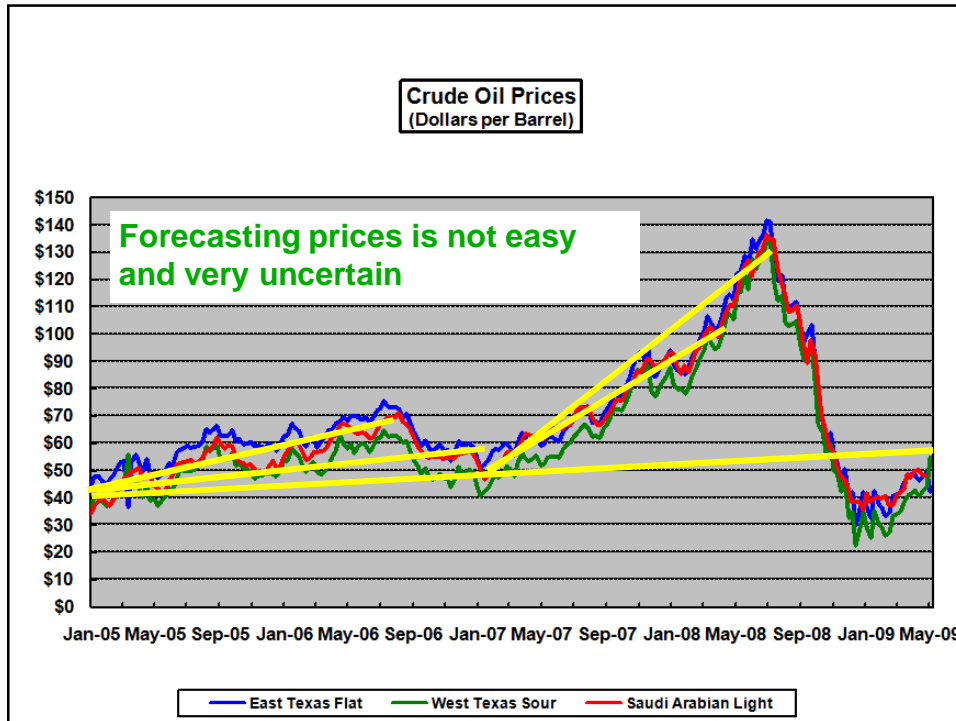
Hettinga A, et al. Utrecht Univ.

2 Trend extrapolation

- Trend extrapolation is based on historical data
- It requires good data going back say 20 years for a 20 year prediction.
- The time period and models used will significantly affect the result.

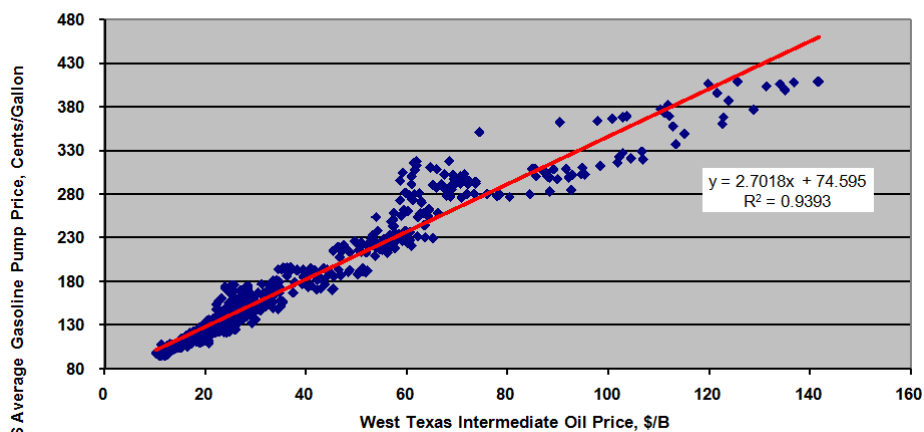






Gasoline and crude oil

US Average Gasoline Pump Price vs. Oil Price



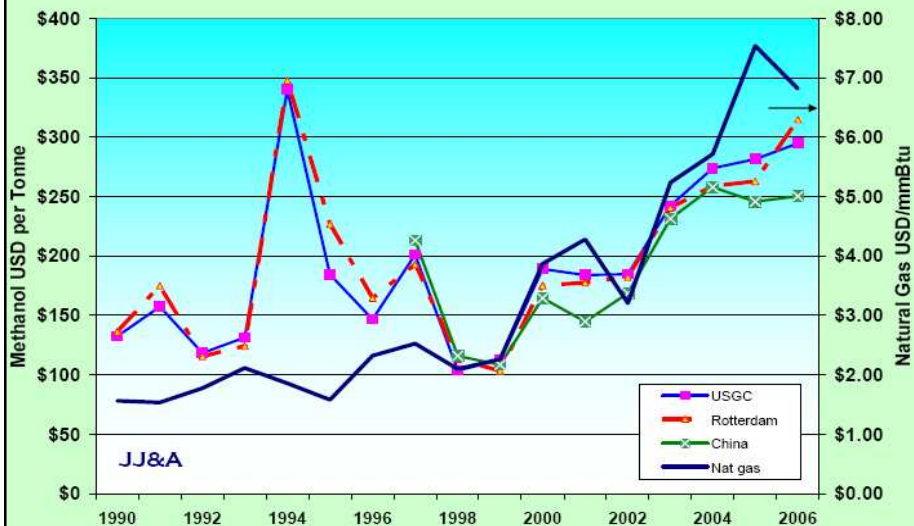
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Feed & Product relationship

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Methanol and Natural Gas Prices

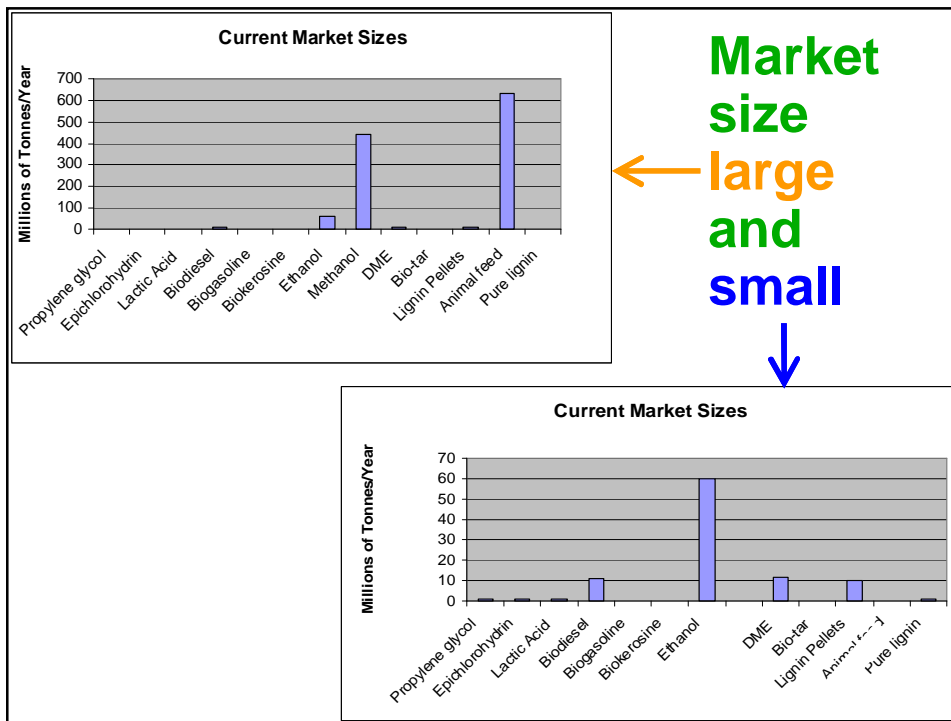
Note:
2006 data through July



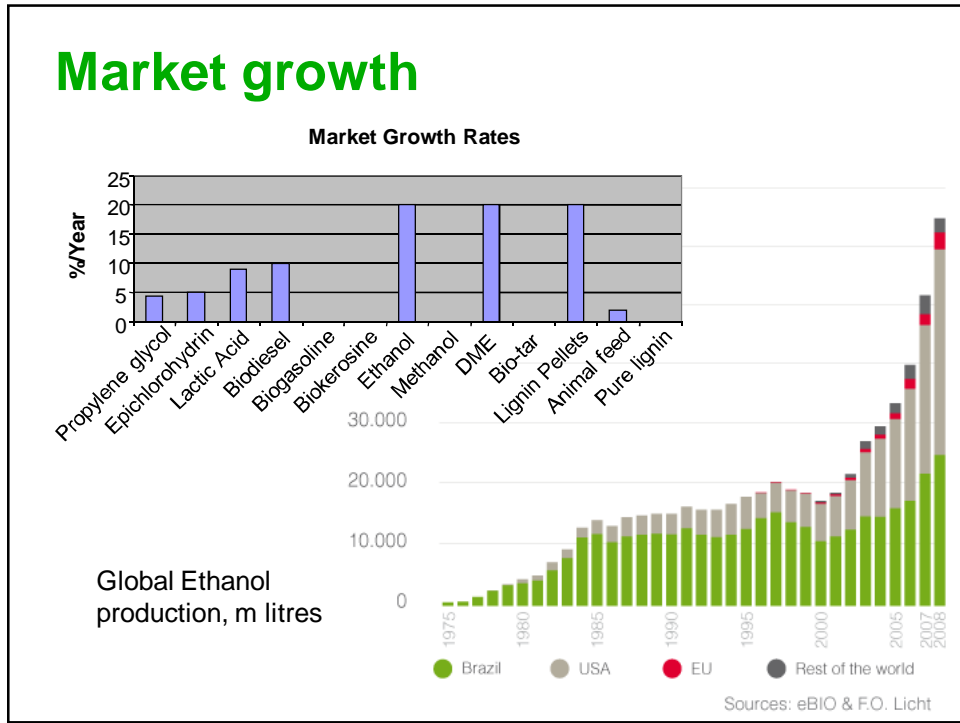
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Current chemicals

- Almost all chemicals prices are related to oil and gas price to a greater or lesser extent
- The higher the product value, the less significant the effect of oil or gas price.
- For commodity petrochemicals, the effect of oil and gas price is significant.
- A relationship between crude oil / natural gas and product price is possible for many fuel products and some commodity chemicals.



Market growth



Thank you