Energy future

Topics:
- Reserves vs. Resources
- US production history
- Global oil supply
- Oil prices
- Non-conventional oil
How long will oil last?

- We don’t know exactly
- How do you measure something you can’t see?
- We are using oil faster than we are discovering it.
**Resources vs. Reserves**

- **Resource**
  - Petroleum believed to exist on the basis of geological parameters
- **Reserves**
  - Petroleum known to exist and which can be produced economically.

**US Oil Production History**

- The oil industry started in the USA
- The US is the biggest oil market
- The US is the best explored part of the world
- We can use the US history as an analogue for the rest of the world
Major Oil Fields in North America

Domestic Oil Production (2000)
Domestic Oil Production

USA - Lower 48

World Oil Discovery Rate, 1912-1992

Hubbert Curve is M. King Hubbert's weighted average of global oil discovered

SOURCE: Adapted from 1996 Masters, M., "Hubbert’s Curve" added by author
**Discoveries v. Consumption**

- Since 1970
  - Consumption 4
  - Discoveries 1
- 90% of today’s oil was discovered more than 30 years ago
What about the future?

- You can’t produce oil that you have not discovered yet
- This allows us to forecast future production

The area under the two curves must be the same
Oil consumption will grow with population and with rising standards of living in the Third World.
Will we run out of oil soon?

- No, there is a lot of oil out there.
- However, demand will eventually exceed production
- Then a shortage will develop and price will shoot up
- We are already experiencing this process

What about the market place?

- Price of oil is tied to short term supply and demand
- Price of oil is deeply tied to global politics
- The price of oil determines how much exploration is done at any given time
Why did the price increase this year?

- Global demand increased due to economic growth in China
- OPEC is producing at full capacity
- There were losses of disruptions of the supply chain
- Hurricanes in the Gulf, messy politics in Venezuela, unrest in Nigeria, war in Iraq, etc
AMOCO Tanker

OIL PROVED RESERVES

Billion barrels at end 1999

676
65
64
90
21
75
44

SOURCE: AMOCO MIDS 1999
NATURAL GAS PROVED RESERVES

Trillion cubic feet at end 1999

2003

1749

363

258

182

223

394

SOURCE: BP AMOCO WORLD ENERGY 2000

Oil Rig
The investment in Exploration has not paid off recently

- EXXONMobil exploration – “Wealth destruction”
- Shell - Cut their reserves estimate by 20%
- Most recent big discoveries are gas not oil
- Most recent big discoveries are in deep offshore water
Are you sure about this?

• NO
• Resource is much greater than reserves
• Global reserves are very poorly known
• Countries routinely over-estimate reserves
  • Iraq doubled its reported reserves in 1987 from 50 bbl to 100 bbl
  • Banks use oil reserves as collateral
  • Some companies over-estimate reserves to drive stocks up

Are you sure about this?

• Reserves depend on economics
• Reserves
  • Petroleum known to exist and which can be produced economically
• As price increases more expensive methods of extraction are possible
Non Conventional Petroleum Resources

- These could add a large amount to the resource base:
  - Tar sands
  - Shale oil
  - Gas hydrates
- As price increases technology to develop these resources becomes economical

Better efficiency will extend the life of the resource