


Where is the Oil Shortage? The Anti-Hubbert View

Michael C. Lynch
President, SEER, Inc.
lynch@energyseer.com



THE NEW SCIENCE?

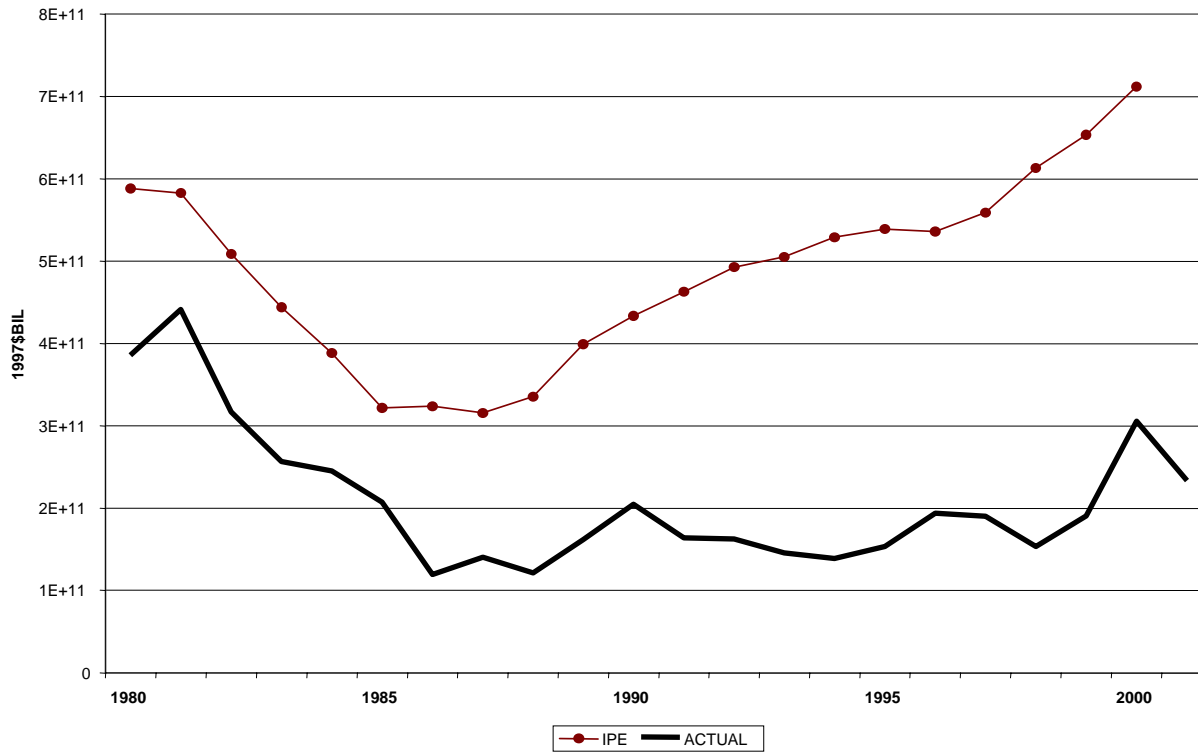
- M King Hubbert a great geophysicist
 - And right about 1970 peak in US
- New modelers are geologists
- Discoveries represent geologic processes
- Therefore, models are now scientific
 - Robust, valid, reliable, etc.
 - Critics are “faith healers” (CJC)

IN REALITY

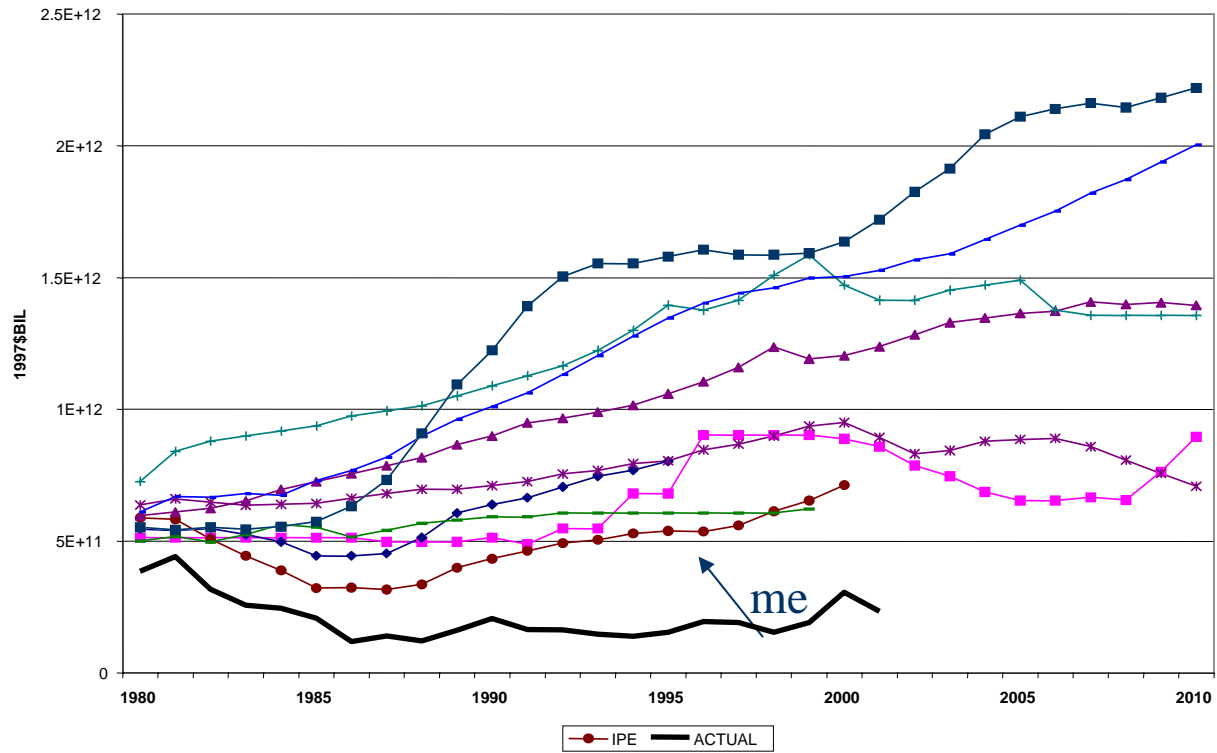
- FORECASTING
 - Not only geology, but business, economics and politics
- AND BAD FORECASTING
 - $Q/(CUM(Q))$ declines!!!!
 - Curve-fitting
- Just like the 1970s
 - Only not as bad

MEA CULPA

MY 1980 FORECAST OF OPEC REVENUE



...IN CONTEXT



FOUR SCHOOLS

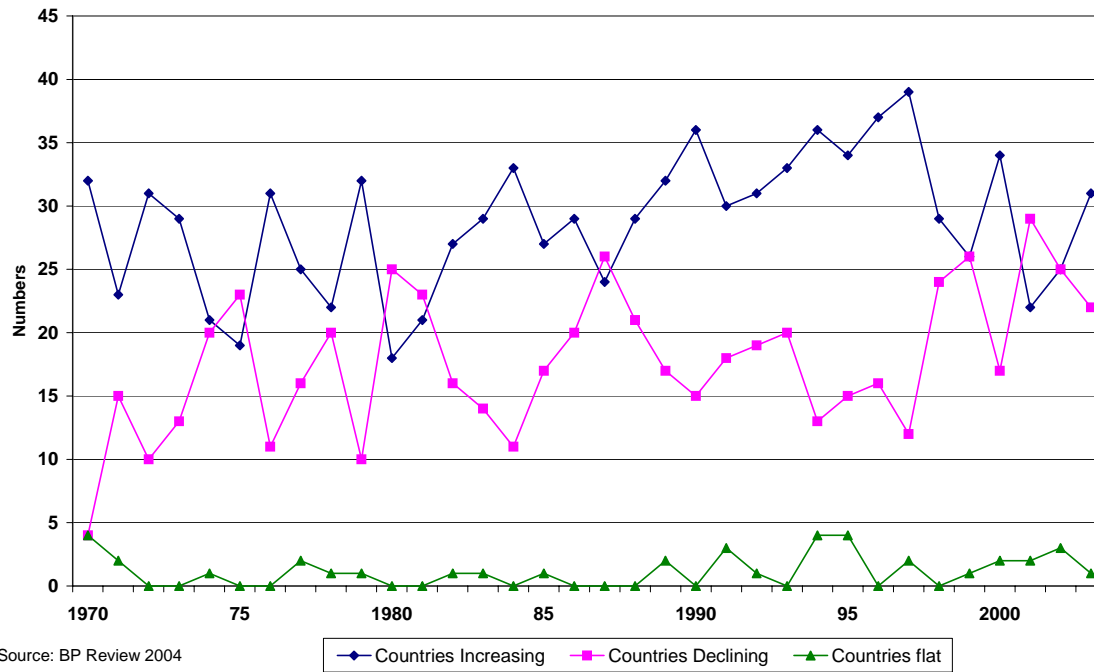
- Explicit Hubbertists
 - Campbell, (Deffeyes) Laherrere
- Vague Alarmists
 - Groppe, Simmons
- Empirical Models
 - PFC
- “I read there’s a problem”
 - Goodstein, Leeb, Roberts

PFC ENERGY

- Respected Firm
- Non-Hubbert modeling
- General warning
 - Most producing countries past peak
- Near-term Peak for Non-OPEC

PEAK IS NOTHING NEW

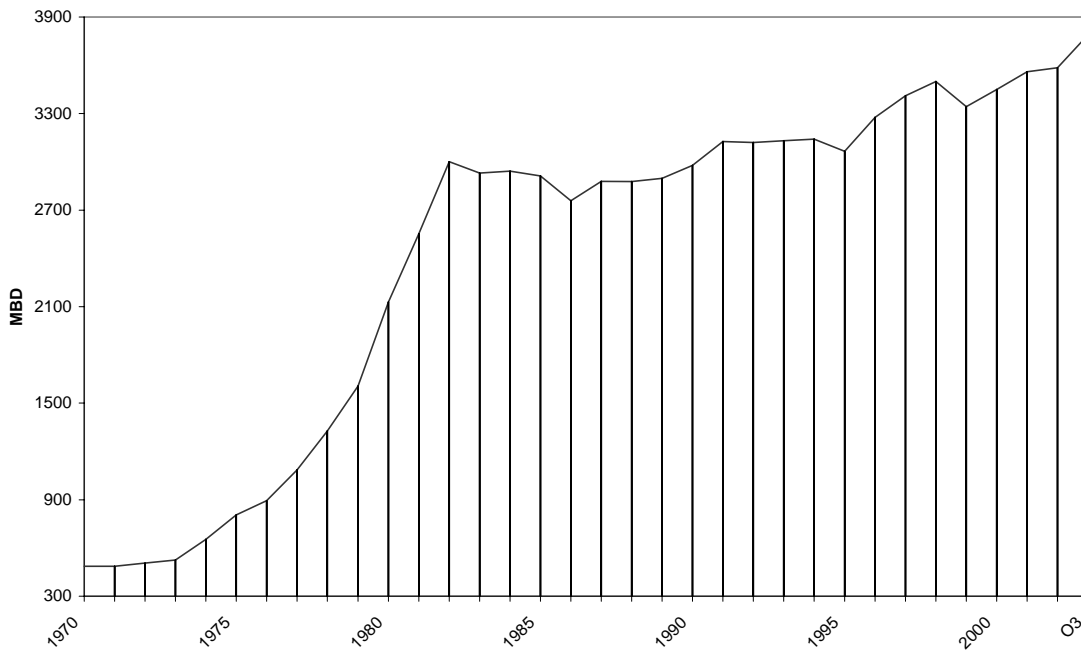
Evolution of International Oil Production 1970 - 2003



Source: BP Review 2004

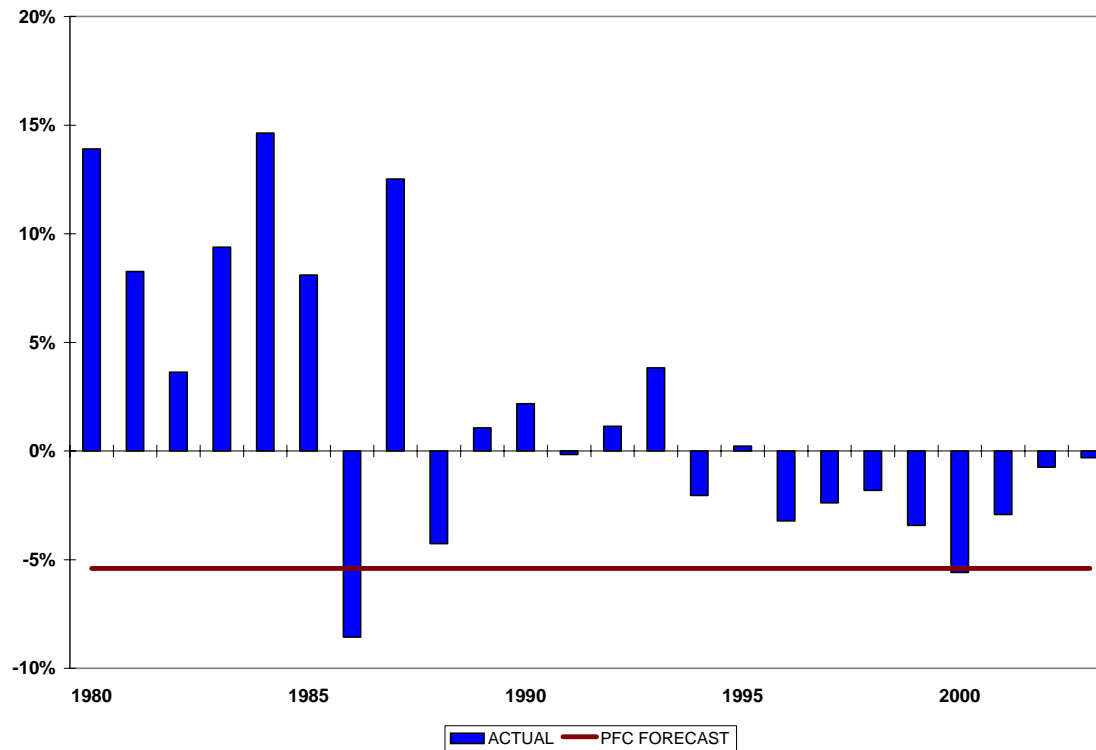
PEAK IS IN THE EYE OF THE BEHOLDER

Mexico: Historical Production of Petroleum 1970 - 2003



Source: BP Statistical Review 2004

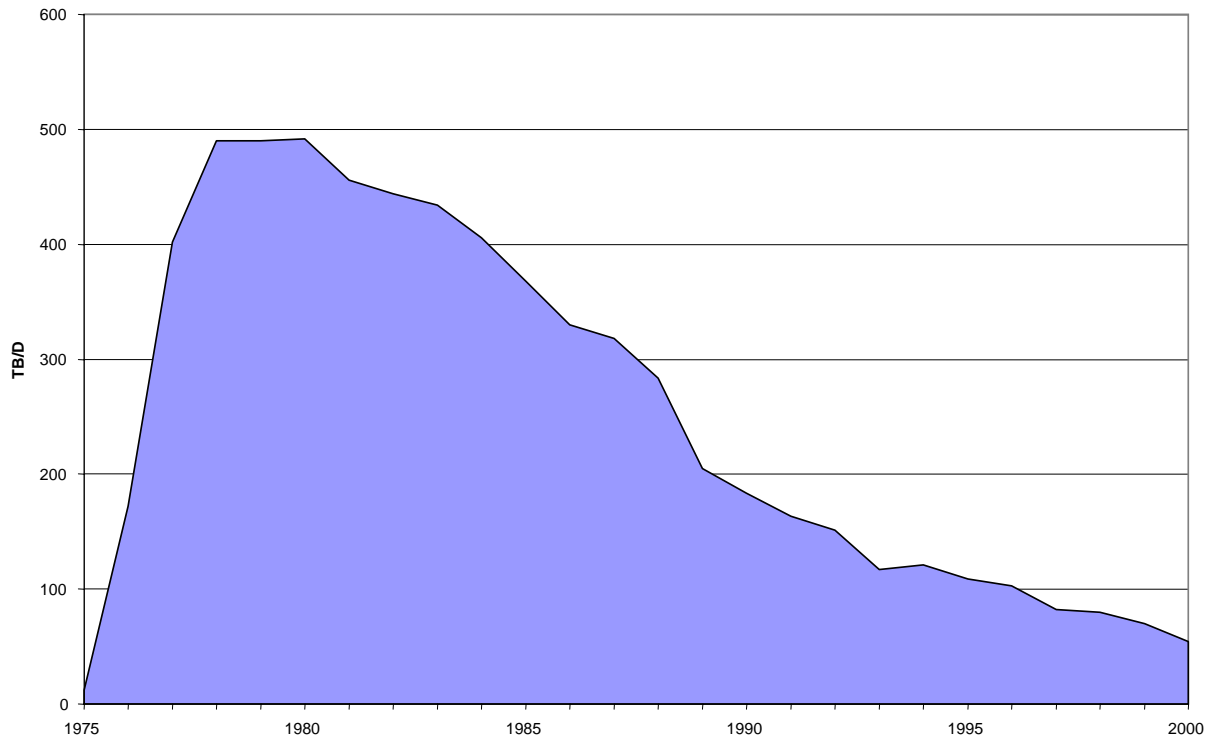
CONSERVATISM AT WORK: EGYPTIAN FORECAST (rate of change)



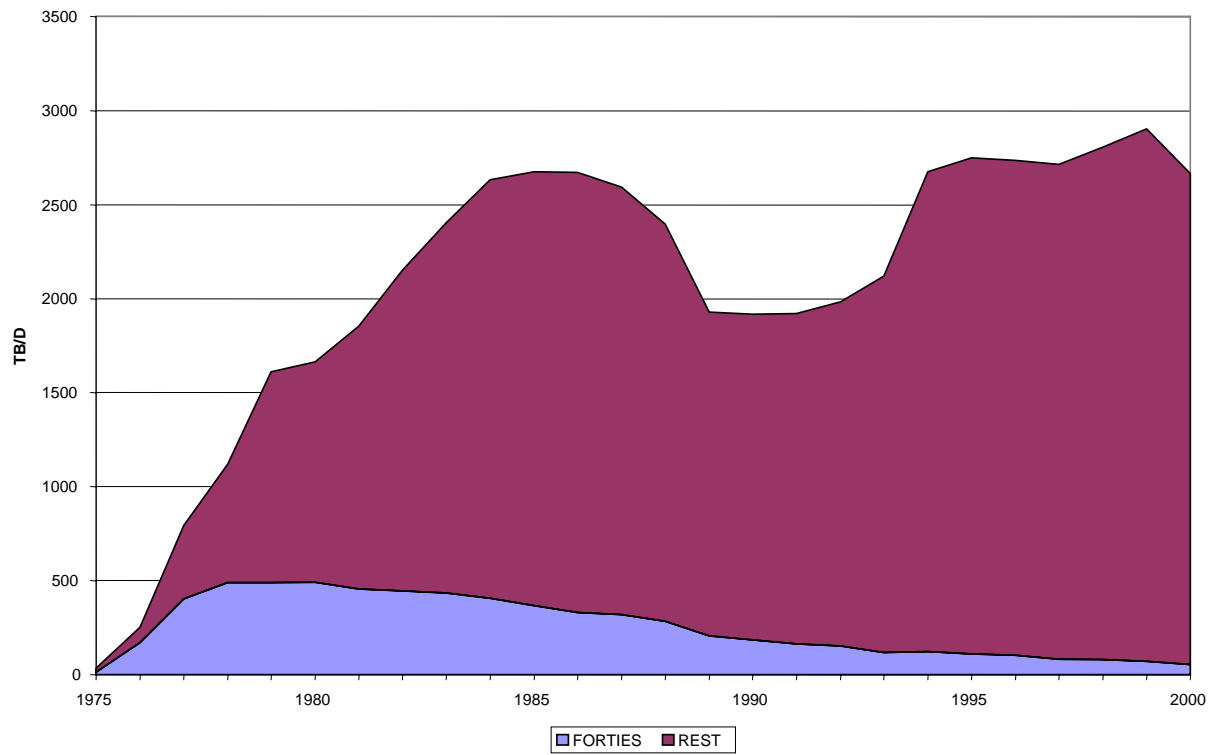
TEEN ANGST

- RESOURCES ARE FINITE
- DEPLETION MAKES IT HARDER
 - RUNNING FASTER TO STAY IN PLACE
- SMALLER FIELDS, MORE DIFFICULT LOCALES
- WHO'S AFRAID OF VIRGINIA WOOLF?

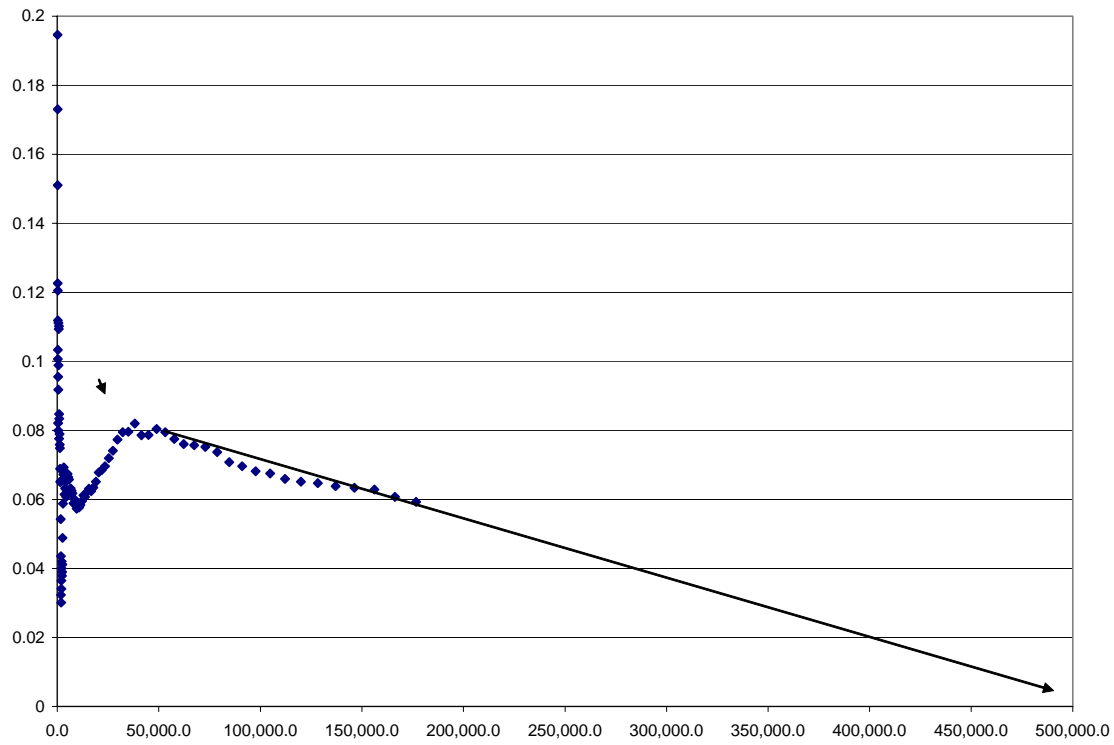
NO PLAN B: FORTIES PRODUCTION “THE GOLD STANDARD”



...IN CONTEXT



THE DEFFEYES APPROACH



ACCEPTED FACTS

- M KING HUBBERT WAS GREAT SCIENTIST
- PLANETARY RESOURCES EFFECTIVELY FINITE
- DEPLETION OCCURS, MUST BE OFFSET
- RAISING PRODUCTION IS A CHALLENGE

ACCEPTED FACTS: BUT

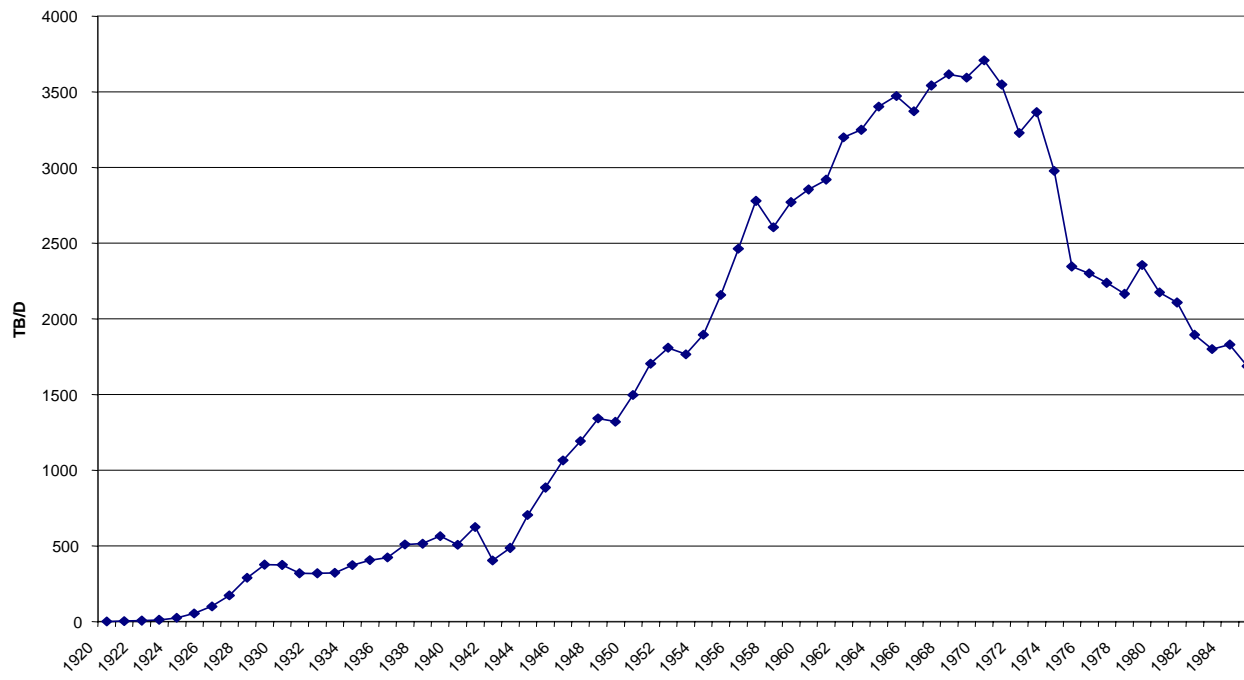
- M KING HUBBERT WAS GREAT SCIENTIST: NOT ALWAYS RIGHT
- PLANETARY RESOURCES EFFECTIVELY FINITE: NOT NECESSARILY CONSTRAINING RIGHT NOW
 - COAL, COPPER, ETC. ALSO FINITE
- DEPLETION OCCURS, MUST BE OFFSET: HAS BEEN FOR A LONG TIME
- RAISING PRODUCTION IS A CHALLENGE: DITTO, BUT WHAT DOES THIS MEAN?
 - MORE MONEY FOR CONSULTANTS

NATURAL SCIENCE APPROACH OR CURVE-FITTING?

- EXTRAPOLATE DISCOVERIES TO ESTIMATE URR?
 - CJC/JHL ETC: YES
- OTHER GEOLOGISTS:
 - ONLY FOR HOMOGENOUS BASIN, MAYBE
 - NOT FOR POLITICAL REGIONS (NATIONS)
- WORLD PRODUCTION IS A DEMAND CURVE
- FIELD SIZES DUE TO GEOLOGY, THUS SCIENTIFIC
 - DISCOVERY DUE TO EXPLORATION
 - POLITICS, ECONOMICS, SCIENCE AND TECHNOLOGY AS WELL AS GEOLOGY

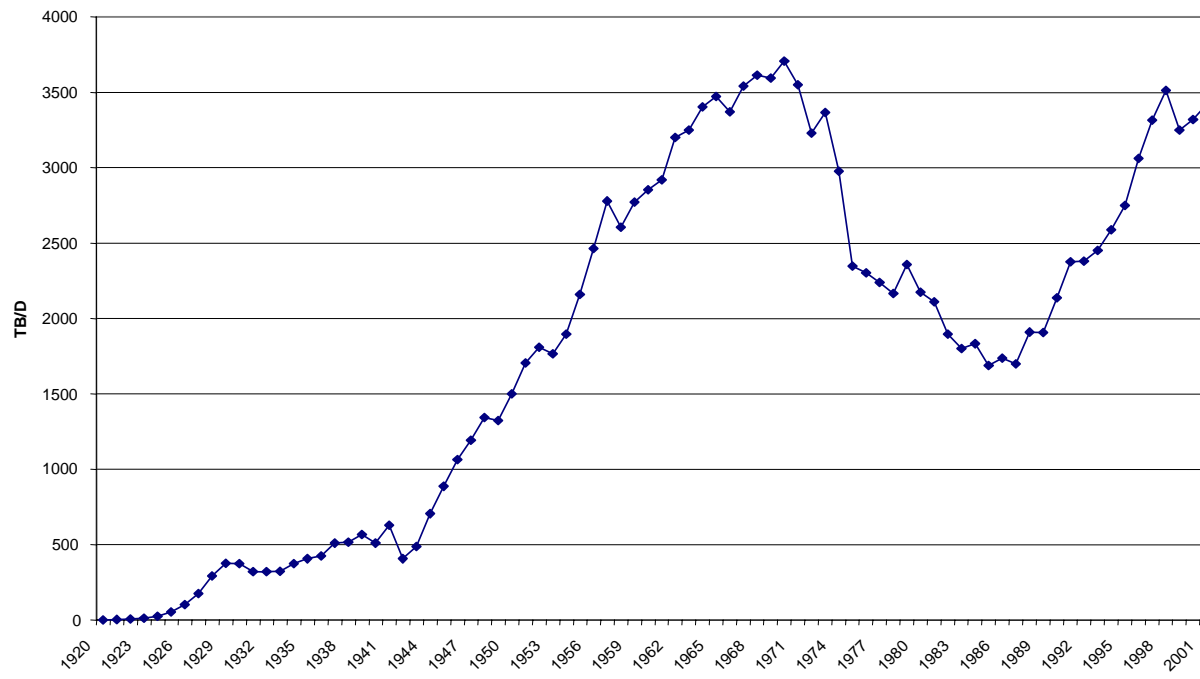
DOES POLICY MATTER?

VENEZUELAN BELL CURVE



...YES

VENEZUELAN BELL CURVE



REAL ISSUES

- CAN RELIABLE, STABLE URR ESTIMATES BE GENERATED?
- DO CREAMING CURVES PROVIDE RELIABLE EVIDENCE OF URR?
- ARE FIELD SIZE ESTIMATES STABLE?
- NEED 3 TO DO 2 AND 1

REAL ISSUES: CAMPBELL, LAHERRERE, ETC.

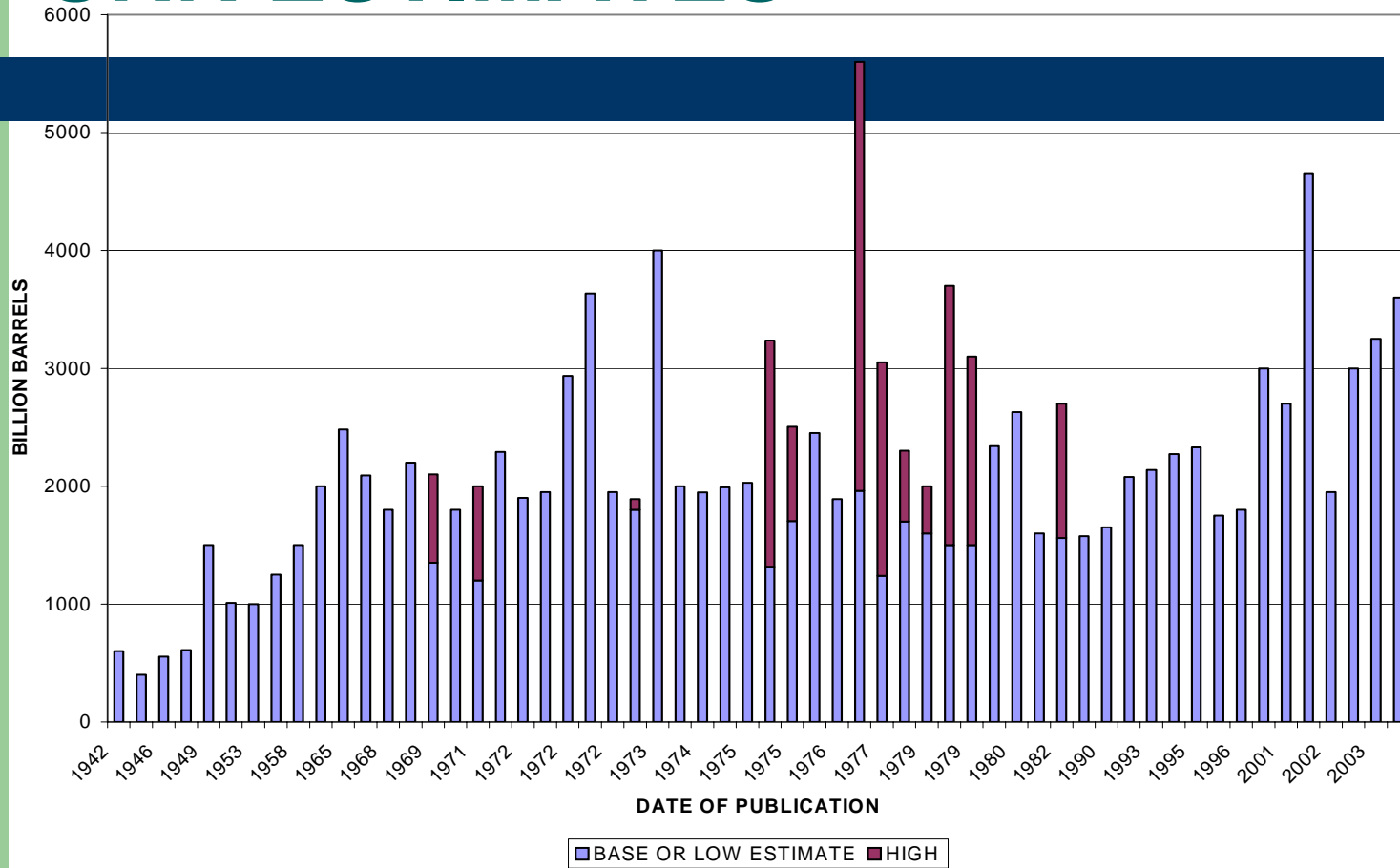
- CAN RELIABLE, STABLE URR ESTIMATES BE GENERATED?
 - YES
- DO CREAMING CURVES PROVIDE RELIABLE EVIDENCE OF URR?
 - YES
- ARE FIELD SIZE ESTIMATES STABLE?
 - YES

REAL ISSUES

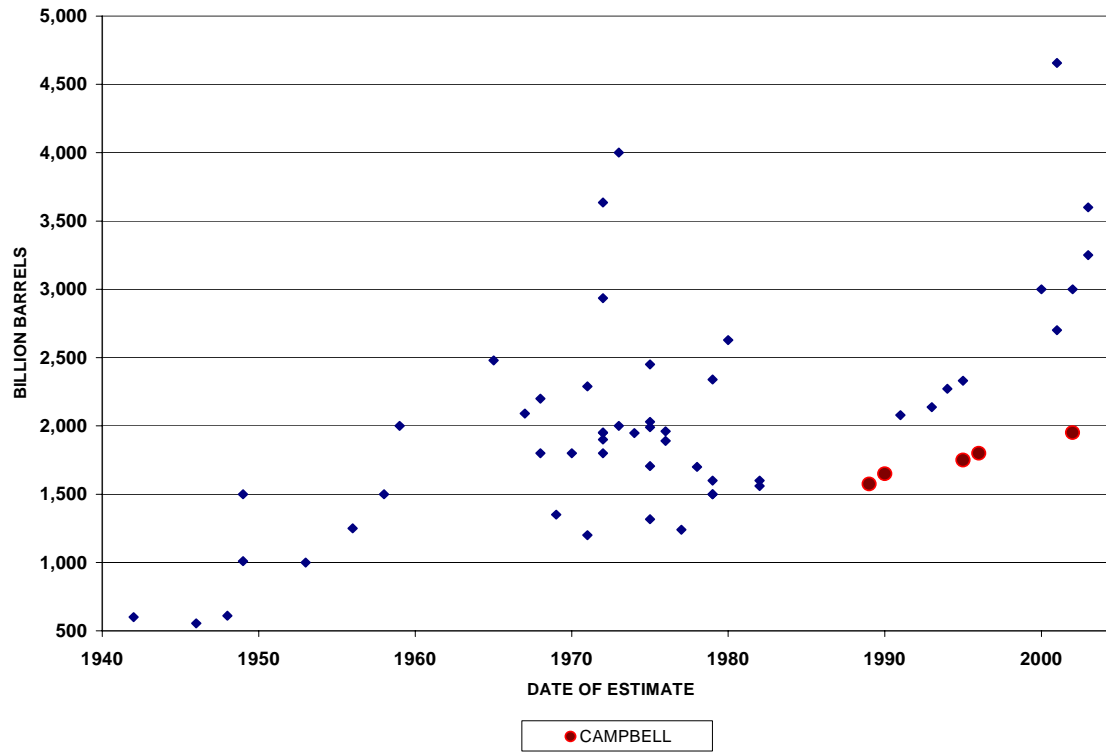
(Optimists' Response)

- CAN RELIABLE, STABLE URR ESTIMATES BE GENERATED?
 - NO, FUNCTION OF PRICE, TECHNOLOGY, ETC.
- DO CREAMING CURVES PROVIDE RELIABLE EVIDENCE OF URR?
 - NO, POLITICAL CREAMING CURVES
- ARE FIELD SIZE ESTIMATES STABLE?
 - NO

URR ESTIMATES



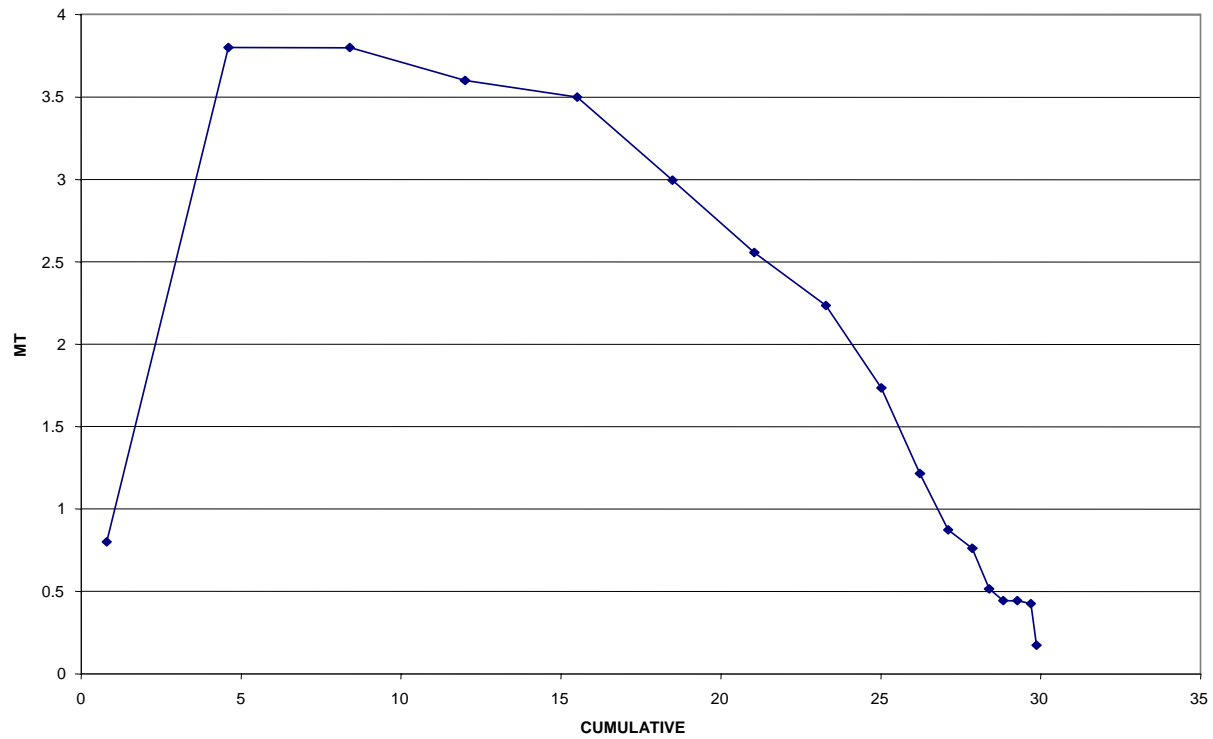
URR ESTIMATES (OVER TIME)



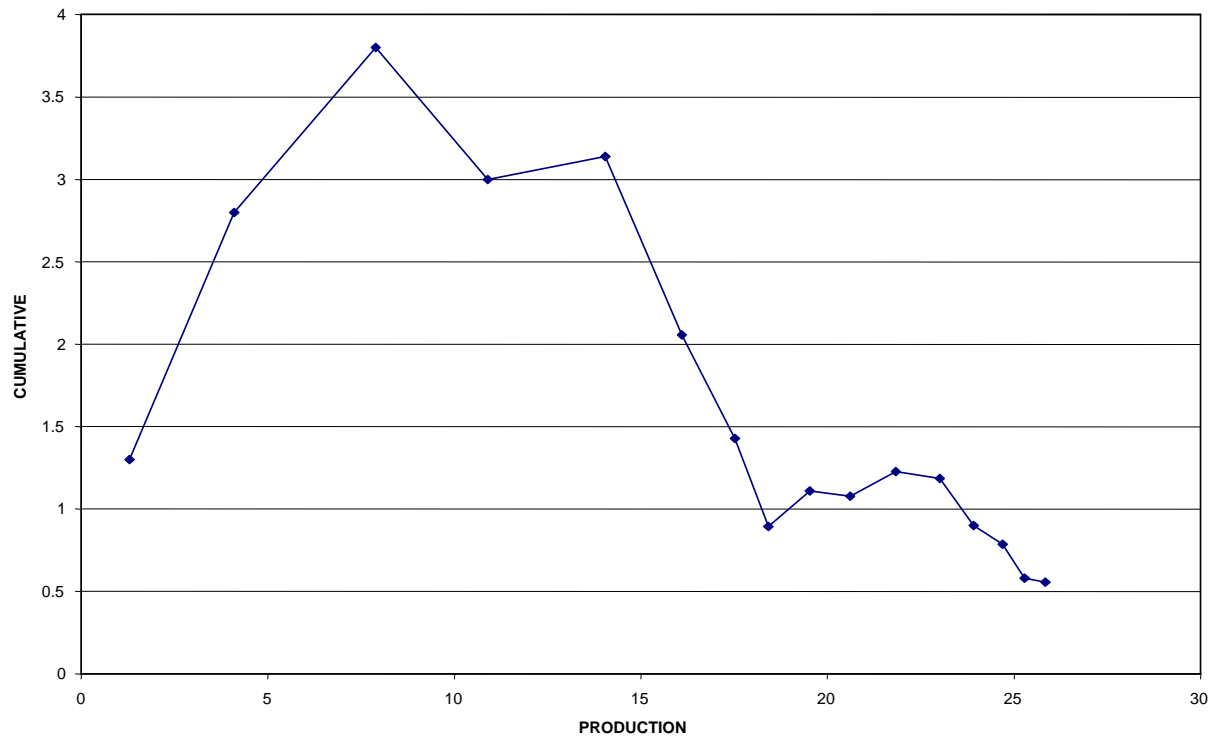
FIELD SIZES

- CJC/JL CLAIM RESERVE GROWTH AN ARTIFACT OF SEC RULES, US CONSERVATISM
 - TECHNOLOGY ACCELERATES PRODUCTION DOES NOT ADD RESERVES
 - IHS ENERGY DATABASE IS 2P, NO GROWTH
 - PRODUCTION/CUM PROD YIELDS SIZE
- NO SIGNIFICANT EVIDENCE PROVIDED
- GROWTH OBSERVED IN NUMEROUS PLACES
- OTHERS SAY IHS ENERGY DATA SHOWS GROWTH, INCLUDING IHS ENERGY

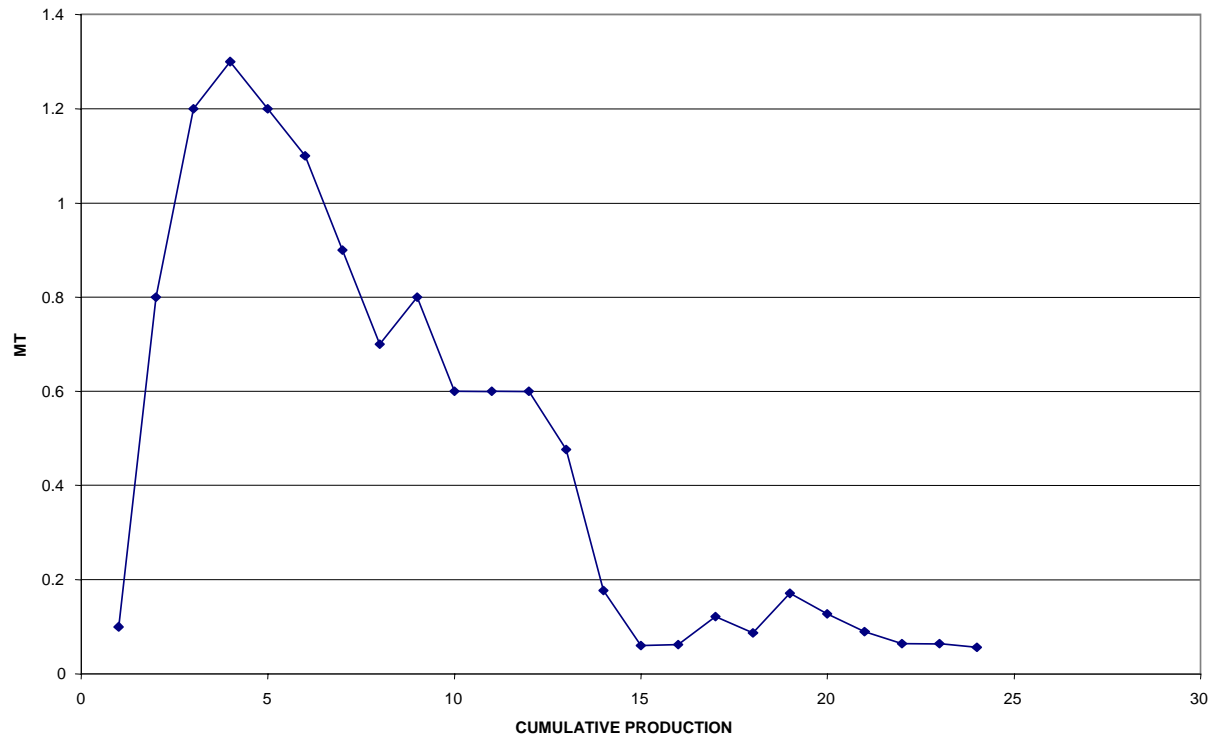
MAUREEN FIELD, UK: HEADING FOR AN ASYMPTOTE



BUT ALSO MULTIPLE ASYMPTOTES: HUTTON



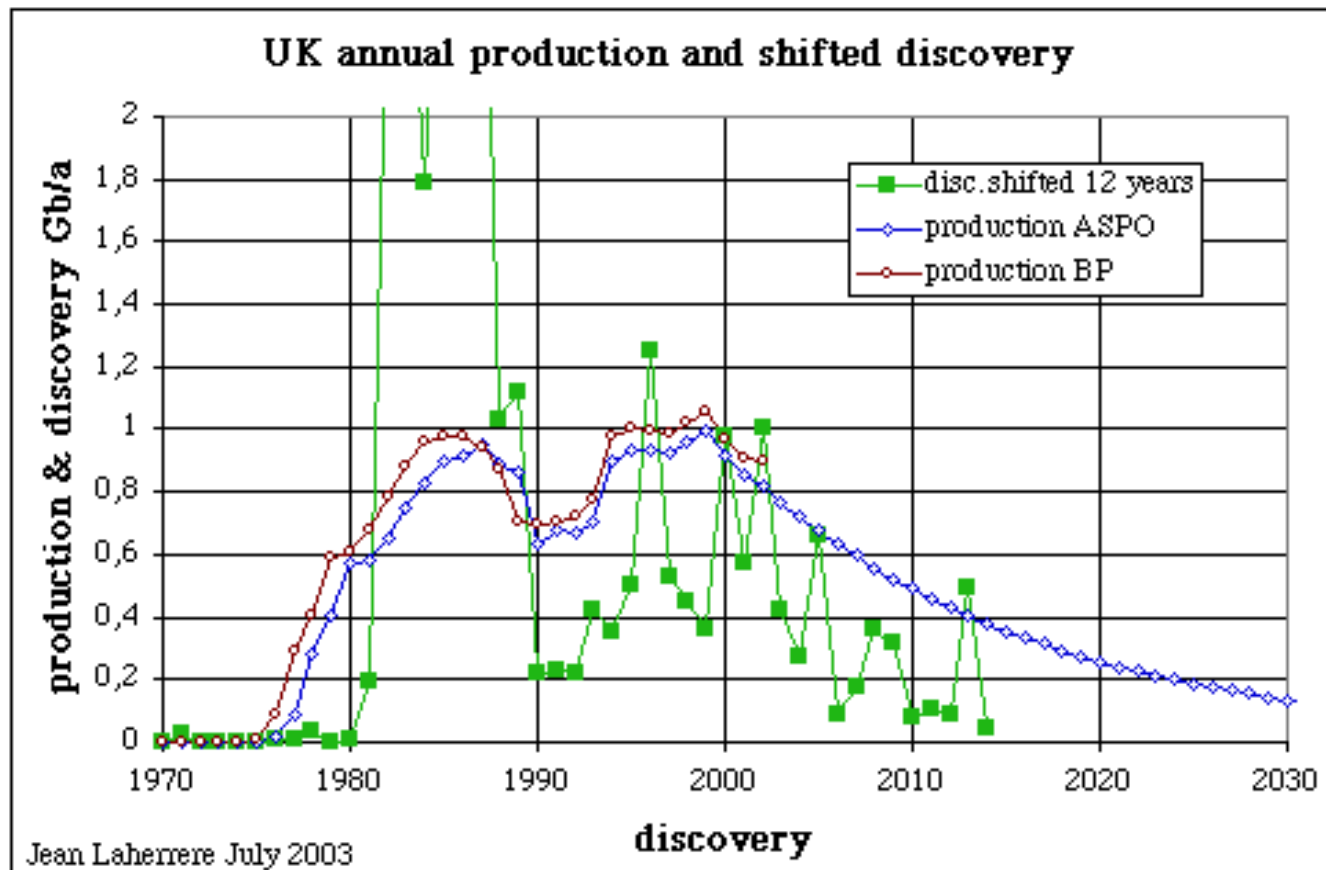
FALSE ASYMPTOTE: MONTROSE



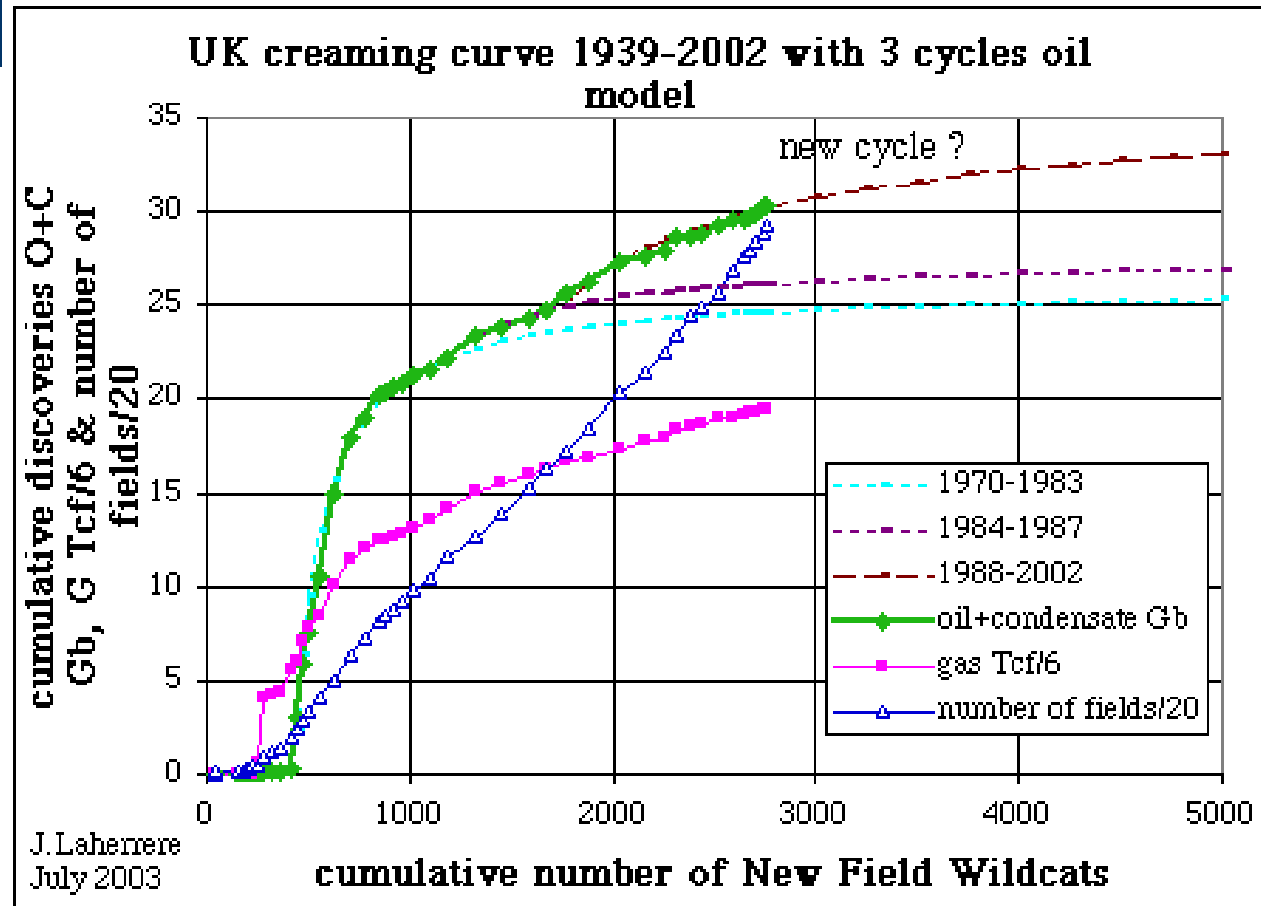
CREAMING CURVES

- CJC/JHL CLAIM CREAMING CURVES SHOW CLEAR EVIDENCE OF ASYMPTOTE
- PROOF NOT OFFERED
- 'EYEBALLING' CHARTS AND EXTRAPOLATING

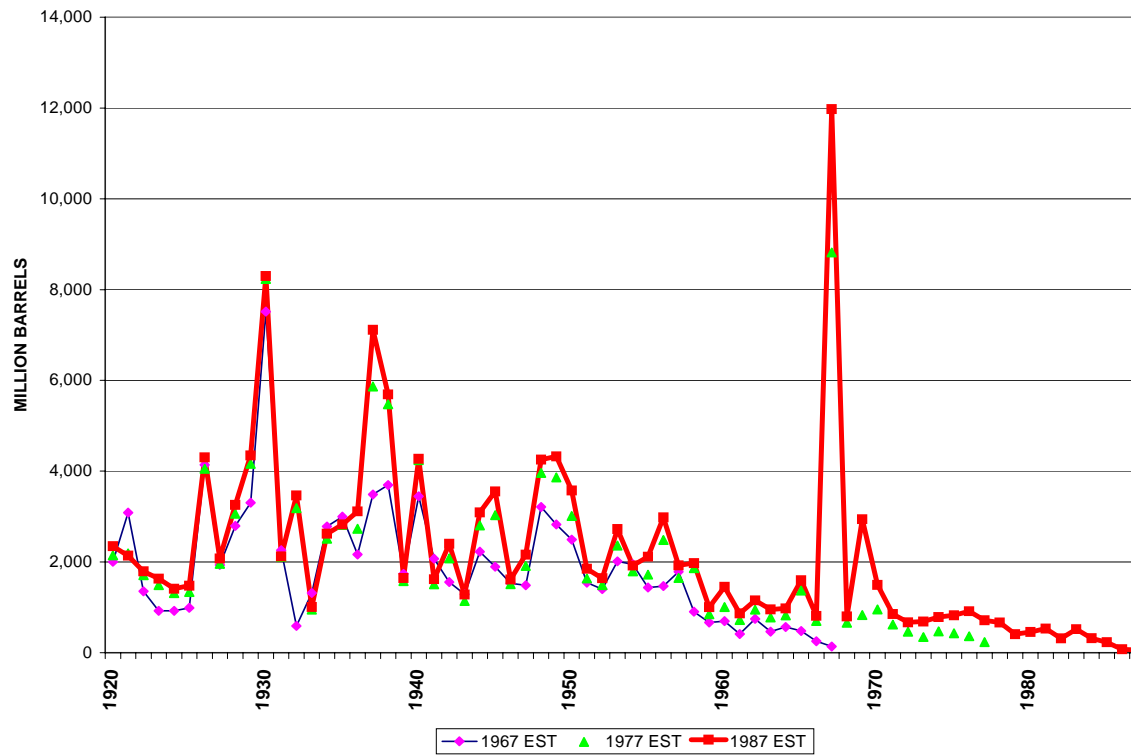
JHL CREAMING CURVE (1)



JHL CREAMING CURVE (2)



US CREAMING CURVES

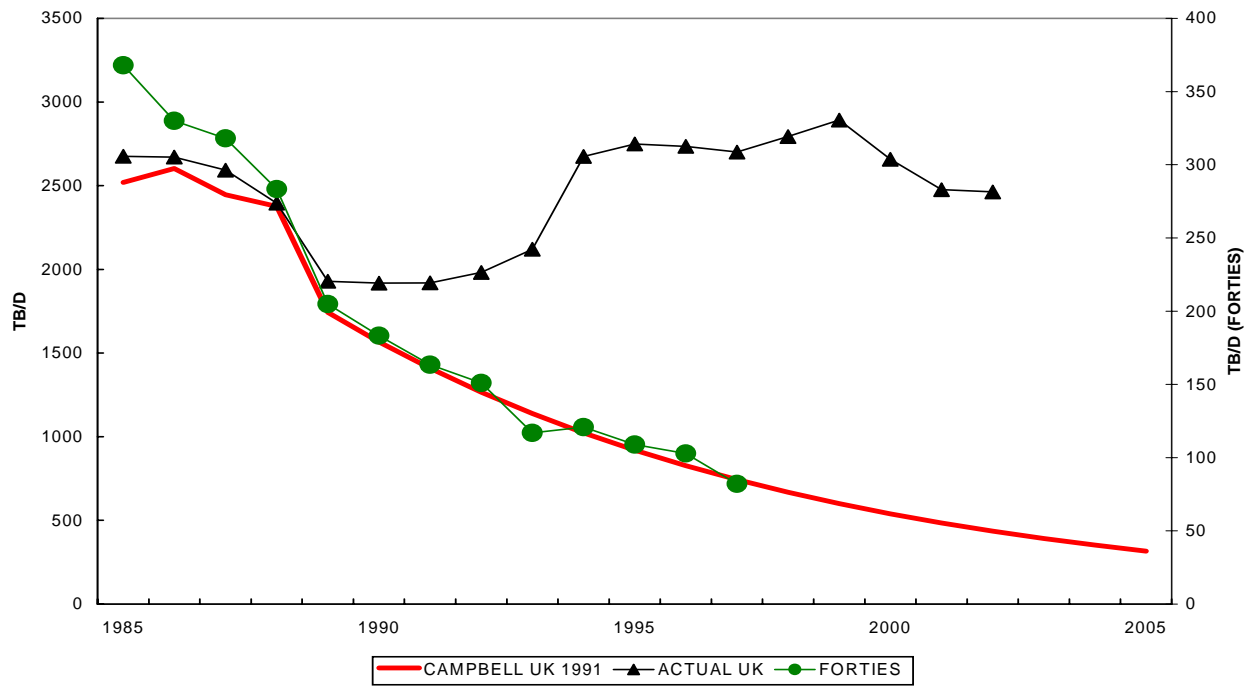


TEST OF THE THEORY (1)

UK NORTH SEA

- WELL UNDERSTOOD PROVINCE
- PEAK CLEARLY ESTIMATED
- ALL BIG FIELDS DISCOVERED
 - SMALL FIELDS DON'T MATTER
- RECOVERY CAN'T BE INCREASED BY NEW TECHNOLOGY

RESULTS



TEST OF THE THEORY 2: STABILITY/ACCURACY OF URR ESTIMATES

- **CAMPBELL HAS INCREASED HIS URR ESTIMATES BY 400 + BILLION BBLS**
- **PEAK HAS MOVED OUT REPEATEDLY**
 - 1989, 1992, 1998, 2000, ETC.
- **HALF OF COUNTRIES EXAMINED IN 1997 NOW HAVE FOUND MORE THAN CJC PROJECTED THEY WOULD EVER HAVE—BY HIS OWN ANALYSIS**

CONCLUSIONS

- HUBBERT METHOD IS NOT SCIENTIFIC BUT CURVE-FITTING
- PESSIMISTS ARE MISINTERPRETING POLITICAL & ECONOMIC FACTORS LIKE THE SUPPRESSION OF ACTIVITY IN THE MIDDLE EAST AS SCARCITY
- MORE DRILLING, EFFORT, MONEY NEEDED, BUT NO SIGN OF RESOURCE SCARCITY
- VOLATILITY IS ANOTHER MATTER