Recitation

Recitation 9

Agenda

- Production Planning for Non-renewables
- Paper Outlines
- Team Time

Production Planning

- Suppose you own a well containing exactly 1,000 barrels of oil. Each barrel can be produced for $30. You have complete flexibility as to when to produce the oil.

  o Currently the price of oil is $103 per barrel

  o Price in

- If you knew future oil prices, how would you decide when to produce your oil?

	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030$
Oil base case	130.7	136.6	142.7	148.3	155.0	163.0	171.3	179.7	188.1	196.5	204.5	212.8	221.2	229.6	238.0	246.3	254.3	262.2	269.9

Classic Hotelling Theory

- Owners of non-renewable resources will only produce a supply of their product if it will yield more than instruments available to them in the market (specifically bonds and other interest bearing securities)

- What does this assume?

    o Owners of non-renewable resources are motivated by profit

    o Markets are efficient

- Why is this useful?

    o Helps economists predict the price of oil and other non-renewable resources

Production Planning

What do you make of this?

If oil prices rise at prevailing interest rates, there would be no restrictions on supply

If oil prices rise faster than prevailing rates, there's no incentive to produce today

Illustration

- If all the oil in the world is produced from oil wells exactly like yours, what will happen to the price of oil?

- $(Pt - MC)/(1 + R)t = (P_0 - MC) > 0$; $(P - MC)$ rises at interest rate

- If LHS > RHS, lowers output today, which raises price today...

- P > MC with competition; today's output lowers later revenue

- When should you produce your oil?

  o Doesn't matter

- What if a monopoly has 99.5% of all oil, MC = $30?

- $(MR - MC)$ rises at rate R; P typically rises more slowly, so produce NOW

Validity of Hotelling Theory

Reasons Hotelling doesn't Hold

- Uncertainty: Future demand, supply are not known.

- Exploration: Reserves can be found (not for sure!).

- Depletion: Costs of finding, extracting likely to rise as more is produced from any given area (e.g., US)

- Innovation: Technologies for finding, extracting improve over time – a race with depletion

- Inflexibility: Simple model over-states flexibility in output choice – relatively little for oil, so get SR volatility

- Cartel Behavior: OPEC behavior is complicated

- Politics: Why else drill way offshore when it is much cheaper to produce in the Middle East?

- Key notion of intertemporal choice is still relevant, though!

Short-Term Oil Price Drivers

Supply: How much is available: OPEC vs. non OPEC

   o   OPEC oil accounts for approximately 35m of the 80m barrels released onto the global market each day.

Demand: How much is demanded

Operations: How much it costs to get oil from the ground

**US Dollars:** Oil is priced in dollars – how the USD is doing

   o   Oil is priced in dollars so movements in that currency also impacts on crude. The weaker the dollar, the higher the dollar price of oil because it takes more dollars to buy a barrel.

Oil Speculators: Trading

Long-Term Oil Price Drivers

- Economics of non-OPEC supply

- OPEC investment and production decisions

- Economics of unconventional liquid supply

- World demand for oil

- Many of the long-term global trends point to steady increases in the price of oil.

- Reserves are finite so the commodity is slowly becoming scarcer ' something that pushes the price up.

- The explosion of development in countries like China and India has created more demand as those and other developing regions industrialize.

- The bearish argument is that technological new energy developments - solar, wind, etc - should begin to reduce the world's dependence on this "black gold".

Oil Price Scenarios
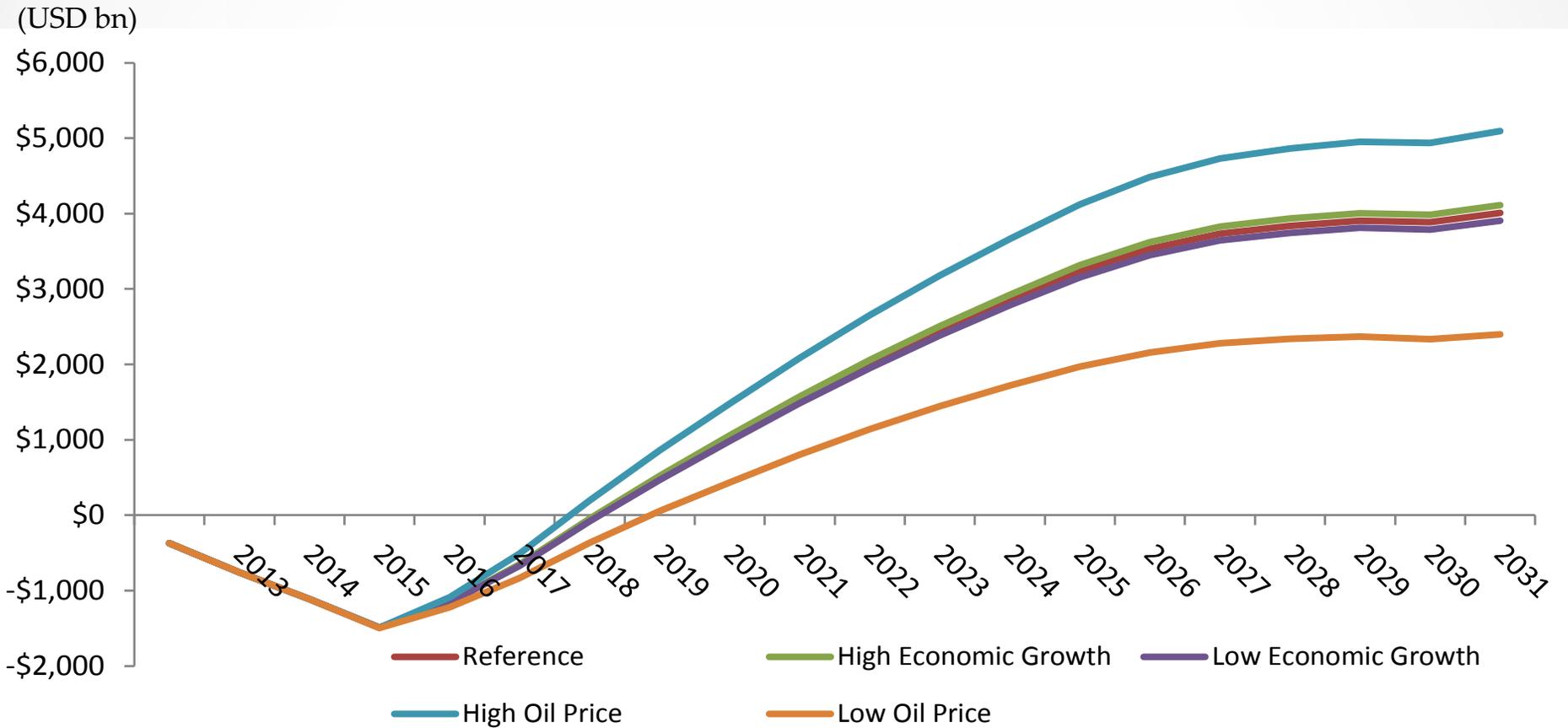
(USD bn)

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High Oil Price	150.5	163.2	173.2	180.5	193.5	204.0	214.9	225.7	236.5	247.4	258.1	269.3	278.0	289.1	300.2	311.9	322.8	333.5	343.3
Low Oil Price	122.4	120.9	120.0	119.1	114.6	115.5	116.5	117.8	118.9	120.3	121.7	123.4	125.1	127.2	129.6	131.5	133.9	136.5	138.8

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