

OPEC Spare Capacity and Oil Prices

KAPSARC
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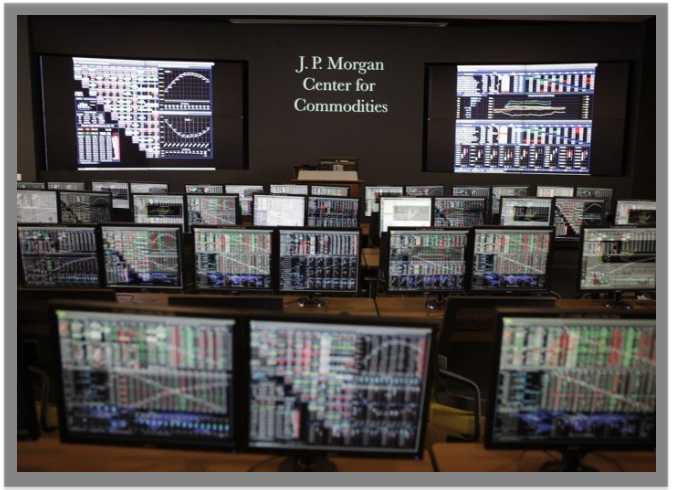
I. A Futures Trader's Context for Analyzing Spare Capacity

II. The Study of Spare Capacity

III. Can a Spare Capacity Cushion be Retained?

IV. The Markets Need U.S. Shale to Preserve the OPEC(+) Spare Capacity Cushion

IV. Conclusion



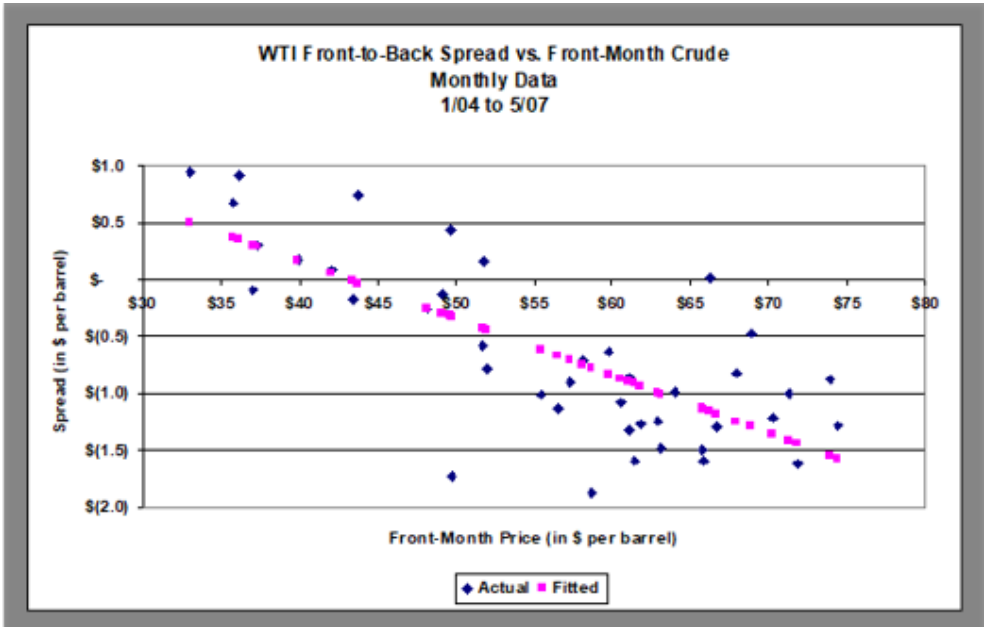
*The opinions expressed during this presentation are the personal opinions of the presenter and do not necessarily reflect those of other organizations with which the presenter is affiliated, including the J.P. Morgan Center for Commodities at the University of Colorado Denver Business School. The information contained in this presentation has been assembled from sources believed to be reliable, but is not guaranteed by the presenter. The presentation's conceptual framework benefited from detailed discussions with Jan-Hein Jesse, Founder, Josco Energy Finance & Strategy Consultancy (The Netherlands).

I. A Futures Trader's Context for Analyzing Spare Capacity

A. When There is Sufficient Spare Capacity

Inventories Can Be Low

The markets have been able to tolerate relatively low oil inventories when there has been sufficient swing capacity that could be brought on stream relatively quickly in case of any supply disruption.



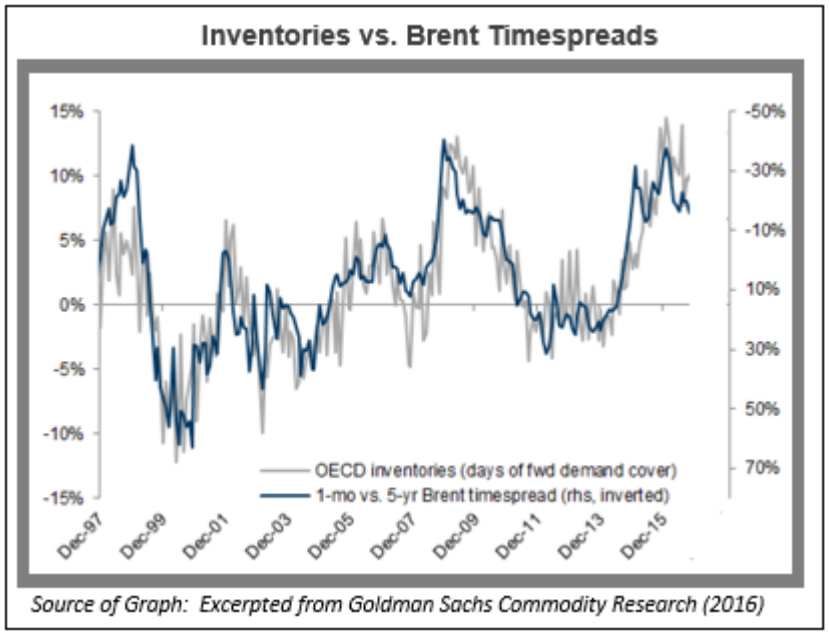
Otherwise, precautionary inventory holdings have been crucial, and markets have thereby traded in ever deep contango, even with oil prices rallying.

Source of Graph: Till (2008)

I. A Futures Trader's Context for Analyzing Spare Capacity

B. And When Inventories are Low

Oil Futures Markets Tend to Trade in Backwardation



Source of Graph: Excerpted from Goldman Sachs Commodity Research (2016)

Notes on Graph: OECD Commercial Stocks (Excluding U.S. NGLs) in Days of OECD Demand Coverage vs. 3-Year Average (LHS) vs. 1-Month to 5-Year Brent Timespreads (%, RHS, Inverted).

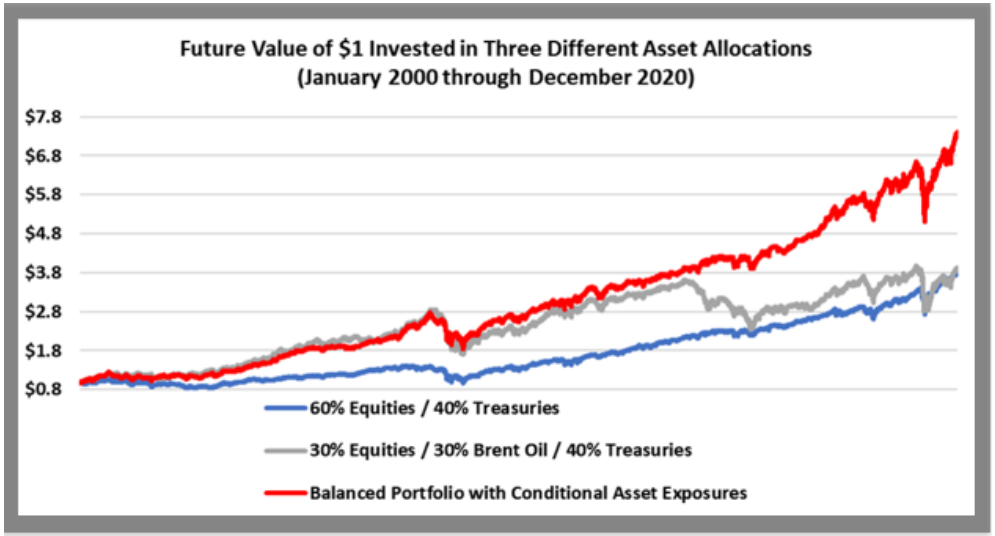
I. A Futures Trader's Context for Analyzing Spare Capacity

C. And When Oil Futures Markets Trade in Backwardation

Opportunities Have Arisen for Superior Portfolio Construction

Dynamically allocating to Brent futures contracts when Brent is in backwardation has produced improved asset allocation results.

This is illustrated in the "Balanced Portfolio with Conditional Asset Exposures" (red line).



Given the causal chain from spare capacity … to inventory holdings … and then to futures curve shape and finally … to diversified portfolio returns, a study of spare capacity is clearly warranted, which, in turn, leads to a deeper understanding of oil market dynamics.

Source of Graph: Till (2021)

II. The Study of Spare Capacity

A. "The Quest for Price Stability"

McNally (2020): "Oil production and consumption exhibit very high short-term insensitivity or 'inelasticity' to price changes."

As noted in Pierru *et al*. (2018), "Hamilton (2009) proposed a short-run global demand elasticity of −6%, but noted that it might be higher or lower."

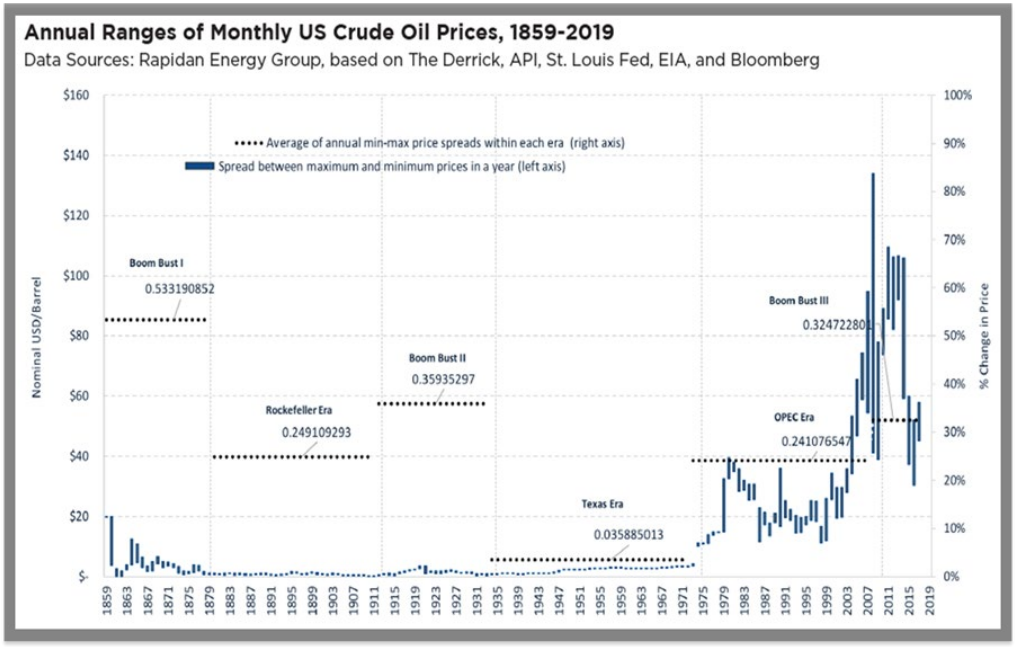


If that short-run global demand elasticity holds, "[t]his implies that an event that removed 6% of global oil supply would cause oil prices to double in order to eliminate the resulting demand surplus and rebalance the market. Oil supply is also inelastic or unresponsive to short-term price changes," explained McNally (2020).

II. The Study of Spare Capacity

A. "The Quest for Price Stability" [Continued]

"History has shown that the only true prescription for limiting oil's volatile price cycle is through a 'swing producer' who is able and willing to adjust production quickly, and if necessary, for a long period of time to prevent supply-demand imbalances that would otherwise trigger harmful price instability."



Source of Graph: McNally (2020)

II. The Study of Spare Capacity

B. "The … Value of OPEC's Spare Capacity to the Global Economy"

OPEC (2010): "The Organization will continue making investments to expand its production capacity to not only meet perceived demand for its crude, but also maintain an adequate level of spare capacity."



The IMF (2005) has referred to the "maintenance of adequate spare capacity as a public good" because of the role that spare capacity had played in reducing the volatility of oil prices.

II. The Study of Spare Capacity

B. "The … Value of OPEC's Spare Capacity to the Global Economy" [Continued]

Pierru *et al.* (2020): "[G]iven an estimate of the elasticity of global demand for oil, a counterfactual history of price is obtained by calculating the price adjustments that would have been required for the market" to equilibrate supply and demand in the face of shocks – had OPEC not employed its spare capacity.

OPEC's Spare Capacity Reduces Oil Price Volatility



Source of Graph: Almutairi et al. (2021)

II. The Study of Spare Capacity

B. "The … Value of OPEC's Spare Capacity to the Global Economy" [Continued]

Almutairi *et al*. (2021): "The value of OPEC's buffer is determined by its ability to reduce the losses in the world's GDP resulting from supply shortfall …" Based on comparisons to the counterfactual scenario of OPEC not having used its spare capacity to offset shocks, OPEC's spare capacity is estimated to have generated $193.1 billion in annual economic benefits for the global economy.

Counterfactual Monthly Volatility (Assuming OPEC's Spare Capacity is Not Used to Offset Shocks)

Period	Commodity boom September 2001–October 2014	OPEC's market-share campaign November 2014–December 2016	OPEC+ January 2017–February 2020
Historical volatility	8.6%	12.5%	7.2%
Counterfactual volatility	14.6%	12.1%	16.4%

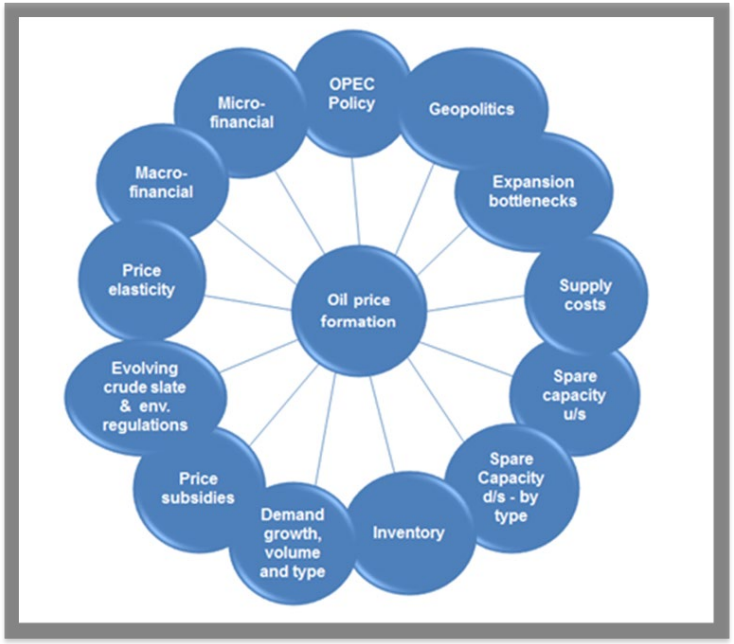
Source of Table: Almutairi et al. (2021)

II. The Study of Spare Capacity

C. The Identification of *When* OPEC Spare Capacity Has Especially Mattered

1. Oil Prices "Feed Off Multiple Influences"

But Are There Times When OPEC Spare Capacity is the Most Important Factor for Driving Oil Prices?



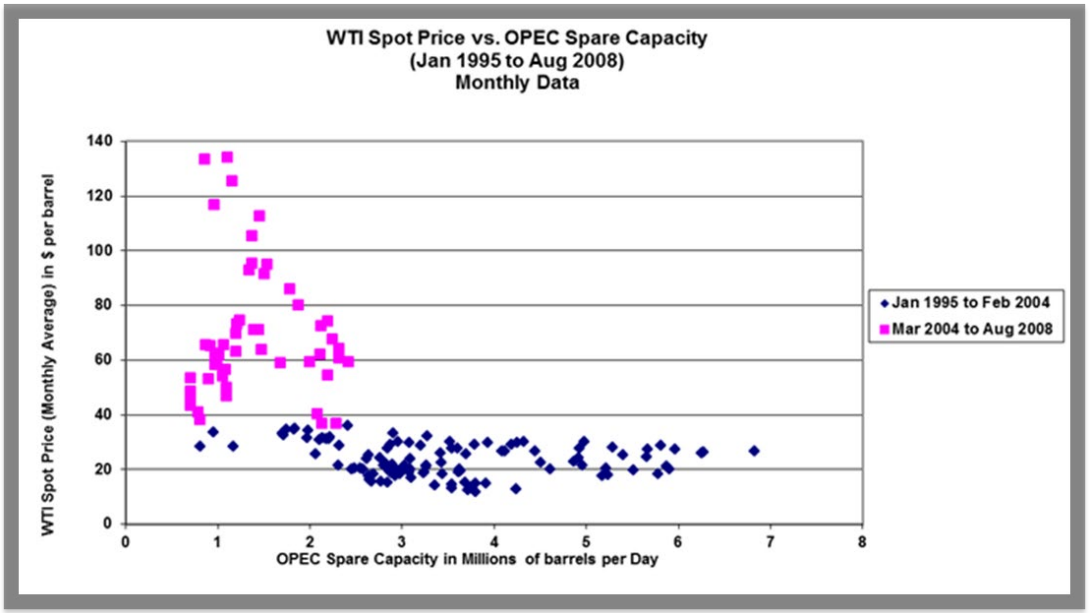
Source of Diagram: Büyükşahin (2011)

II. The Study of Spare Capacity

C. The Identification of *When* OPEC Spare Capacity Has Especially Mattered

2. The Collapse of Oil Spare Capacity in 2008

When OPEC Excess Capacity Levels Has Reached Pinch-Point Levels, the Price of Crude Oil Has Responded by Exploding



Notes: Presenting data in this fashion is based on Büyükşahin et al. (2008), which has a similar, but not identical, graph. Their graph, instead, shows "Non-Saudi crude oil spare production capacity" on the x-axis.

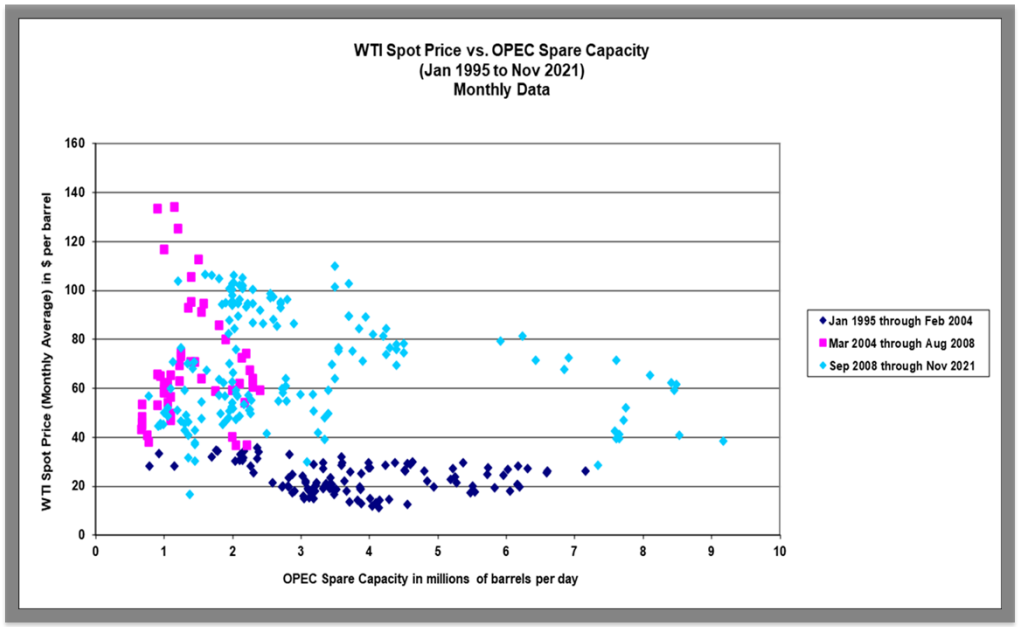
Source of Graph: Till (2015)

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3. Structural Break After 2008

Not Immediately Clear What the Relationship is between Oil Prices and OPEC Spare Capacity



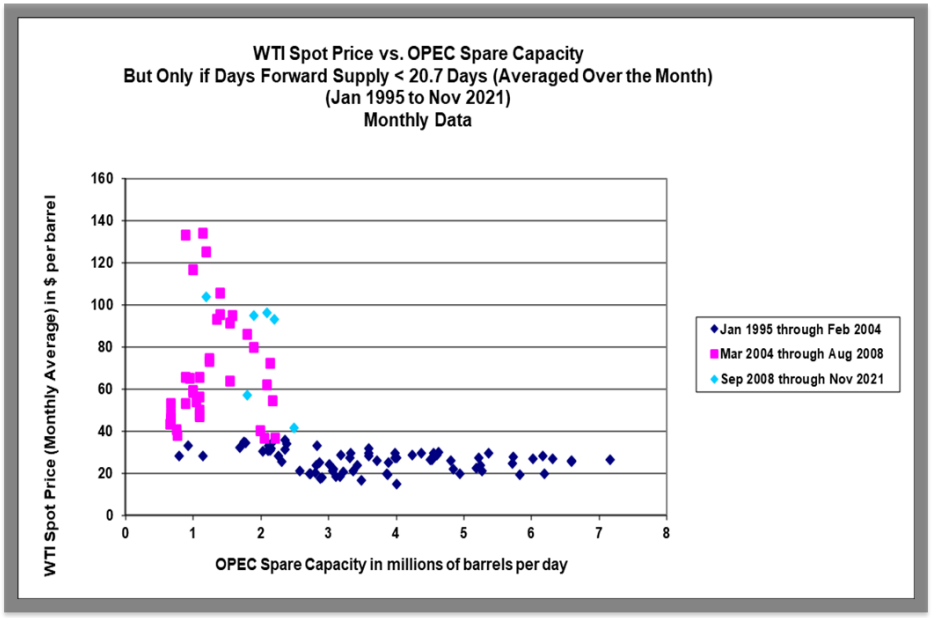
Source of Graph: Updated in 2021 from Till (2015)

II. The Study of Spare Capacity

C. The Identification of *When* OPEC Spare Capacity Has Especially Mattered

4. The Conditions under which a Generalized Economics-of-Price-Volatility Relationship Has Applied to Crude Oil

OPEC Spare Capacity Has Mattered When Oil Inventories are Low



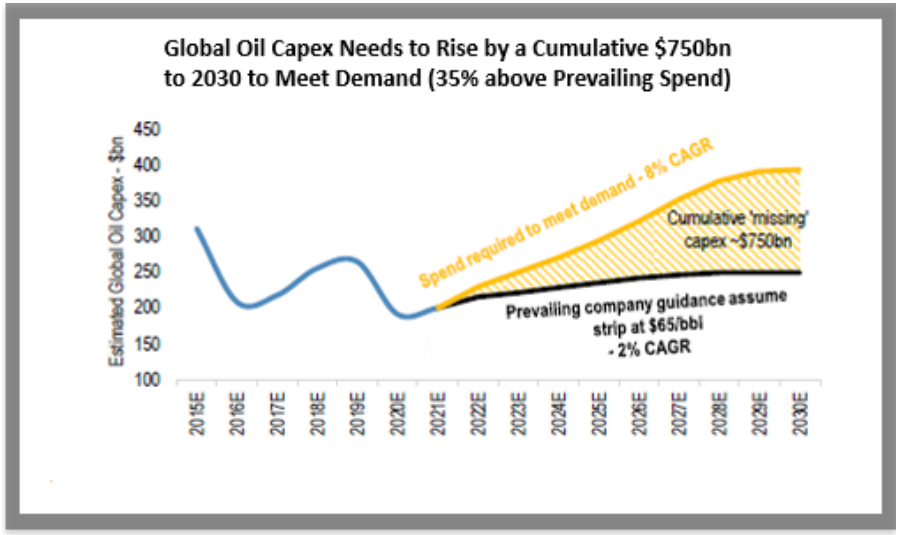
Source of Graph: Updated in 2021 from Till (2015)

III. Can a Spare Capacity Cushion be Retained?

In Question Because of the Possibility of a Structural Supply Deficit

A. Lack of Capex Spending

HFI Research (2021): "Lack of capex spending and insufficient supply growth outside of OPEC and U.S. will lead … to a structural supply deficit," citing Goldman Sachs Commodity Research.



Egan (2021): "The central problem … is that while OPEC nations have plenty of oil in the ground, they don't have the capital and logistics to deliver it quickly[;] there is a $750 billion gap in terms of global oil capital spending," noted J.P. Morgan's Head of Oil and Gas Research.

Source of Graph: J.P. Morgan Global Research (2021)

III. Can a Spare Capacity Cushion be Retained?

In Question Because of the Possibility of a Structural Supply Deficit

A. Lack of Capex Spending [Continued]

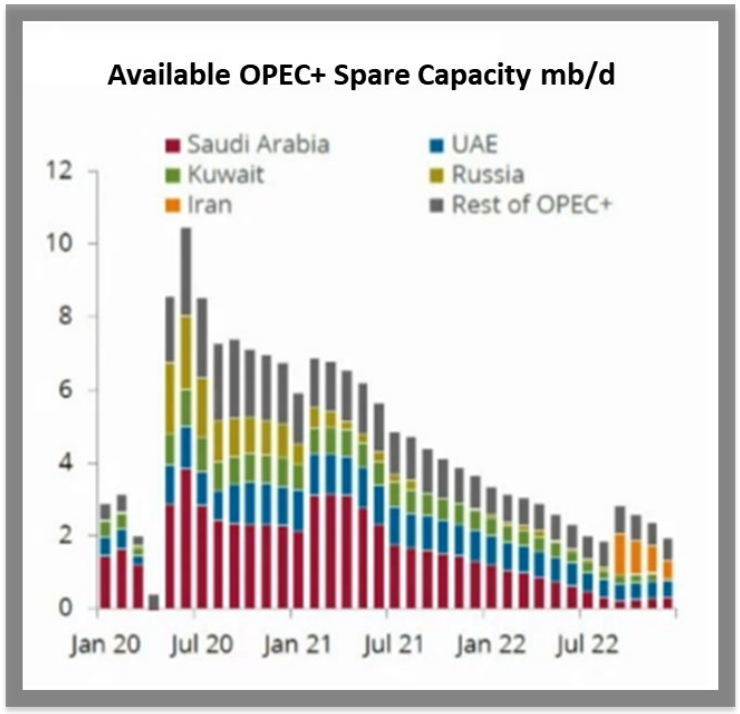


Ghaddar (2021): "'Shrinking global spare capacity underscores the need for increased investments to meet demand further down the road,'" … [the International Energy Agency] said, after … demand cratered during the pandemic, prompting many producers to push back or scrap plans to add capacity."

III. Can a Spare Capacity Cushion be Retained?

B. "The Focus is Shifting to Spare Capacity in 2022"

1. "OPEC+ … Spare Capacity [is] Increasingly Concentrated in a Handful of [Member] Countries"



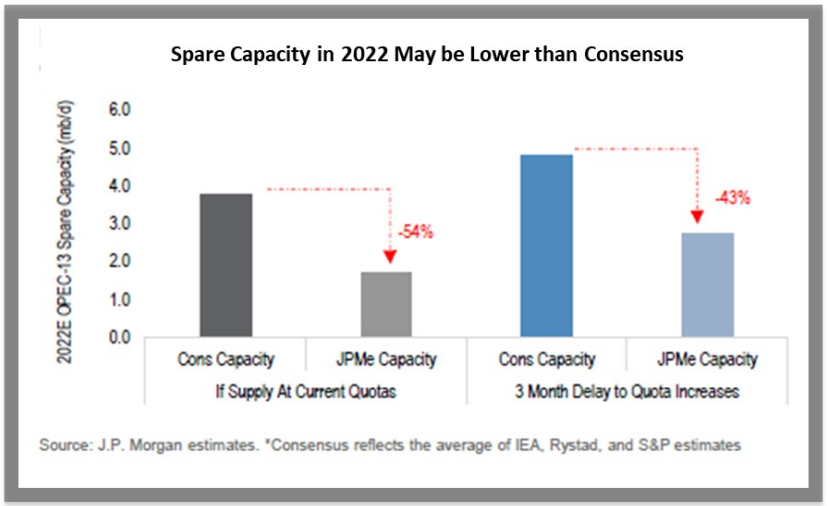
Source of Graph: Energy Aspects (2021)

III. Can a Spare Capacity Cushion be Retained?

B. "The Focus is Shifting to Spare Capacity in 2022"

2. "OPEC+ … Capacity 'Overhang' Not [What is Expected:] … Supply Additions to Slow in 1H22"

Egan (2021): "Look back at history. When we're in a scenario where the market goes, 'We don't have spare capacity,' that's where you see overshoots," recalled J.P. Morgan's Head of Oil and Gas Research.



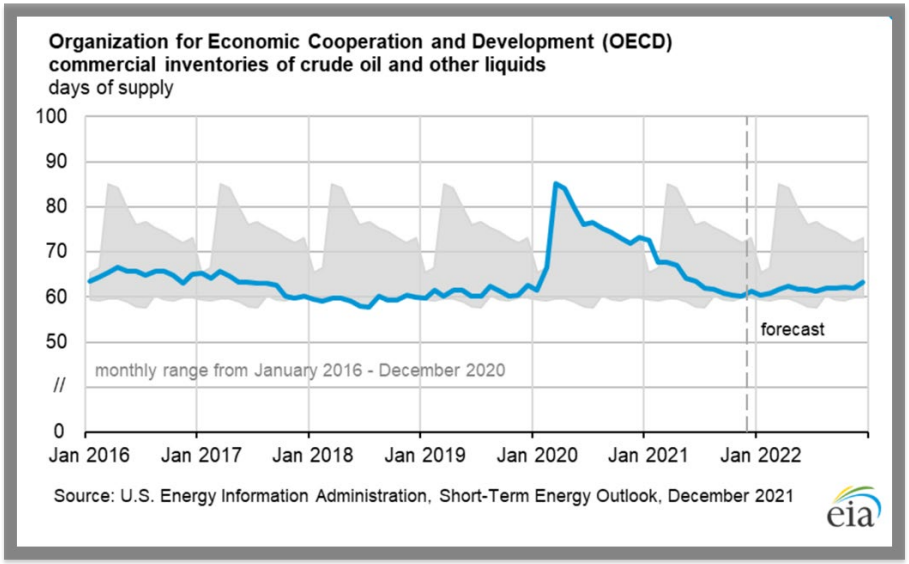
Source of Chart: J.P. Morgan Global Research (2021)

III. Can a Spare Capacity Cushion be Retained?

C. No Indication of an Extraordinary Inventory Accumulation to Offset a Possible Declining Spare Capacity Cushion

Sieminski (2018): "Spare capacity is only one piece of a much larger picture in terms of neutralizing the negative impact of oil shocks.

By maintaining costly inventories, individual consumers, producers, government agencies, and multilateral organizations [can] also shoulder part of the burden of dealing with oil price shocks."



A problem right now, according to Sen in Bordoff (2021), is that both "crude [and] product stocks are … very low … everywhere."

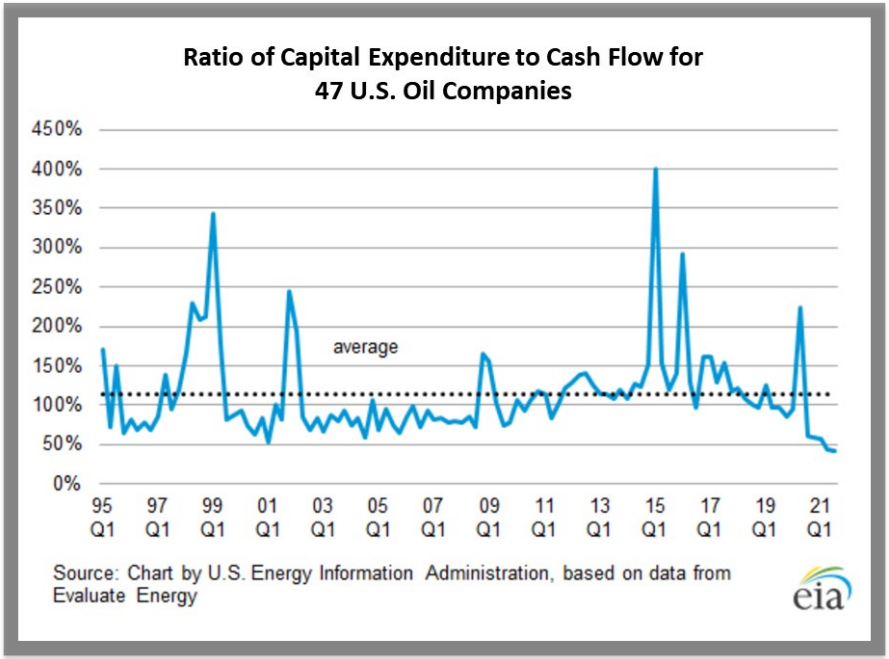
Source of Graph: EIA (2021a)

IV. The Markets Need U.S. Shale to Preserve Spare Capacity Cushion*

Assuming the Continuation of the Global Economic Recovery

A. Oil as the New Tobacco: The Pressure Not to Invest

Toplensky (2020): "Like cigarette makers before them, oil producers face a state-sponsored drive to drastically cut demand for their products …"



Source of Graph: EIA (2021b)

** That is, the OPEC(+) Spare Capacity Cushion*

IV. The Markets Need U.S. Shale to Preserve Spare Capacity Cushion

A. Oil as the New Tobacco: The Pressure Not to Invest [Continued]

Jesse (2020): "Western European banks are mostly looking to discontinue financing new oil projects over the longer term."

Murti in Bordoff (2021): Traditional investors, governments, and ESG investors are all encouraging oil companies not to invest.

Sen in Bordoff (2021): "Last year 88 banks and financial institutions that used to … fund or finance fossil fuels stopped doing so."

Therefore, we are back to asking the same question as in 2007:

"[W]here does the onus of maintaining sufficient spare capacity lie?", citing OPEC (2007).

IV. The Markets Need U.S. Shale to Preserve Spare Capacity Cushion

B. Capital Discipline Now Essential

1. The Resources Exist

Jesse (2020): The "new oil & gas revolution led by U.S. E&P companies … unlocked 100+ billion barrels of U.S. shale oil resources."

Murti in Bordoff (2021): "There is still quite a bit of non-OPEC supply that could come on in coming years, but [we are] … in a world where Western oil companies (the U.S. shale producers, the majors) are coming off a decade of really poor profitability …

There is still an abundant shale resource to be developed, especially in the Permian Basin. … This is not about [the world] running out of oil … [given the] short-cycle resources, … medium-cycle projects … [and] long-cycle projects [that are all possible with investment.]"

IV. The Markets Need U.S. Shale to Preserve Spare Capacity Cushion

B. Capital Discipline Now Essential

2. Past Cycle

a. Customizable Financing Solutions Became Available

Till (2016): With horizontal drilling and hydraulic fracturing, one could estimate the quantity of oil or gas that is potentially recoverable from a reserve or well, along with its initial production rate.

As long as one had a set of credible oil price forecasts across time, one then valued a shale company's oil reserves along with the size and timing of cash flows from production. This means that very customizable financing solutions became available in the development of shale oil projects.

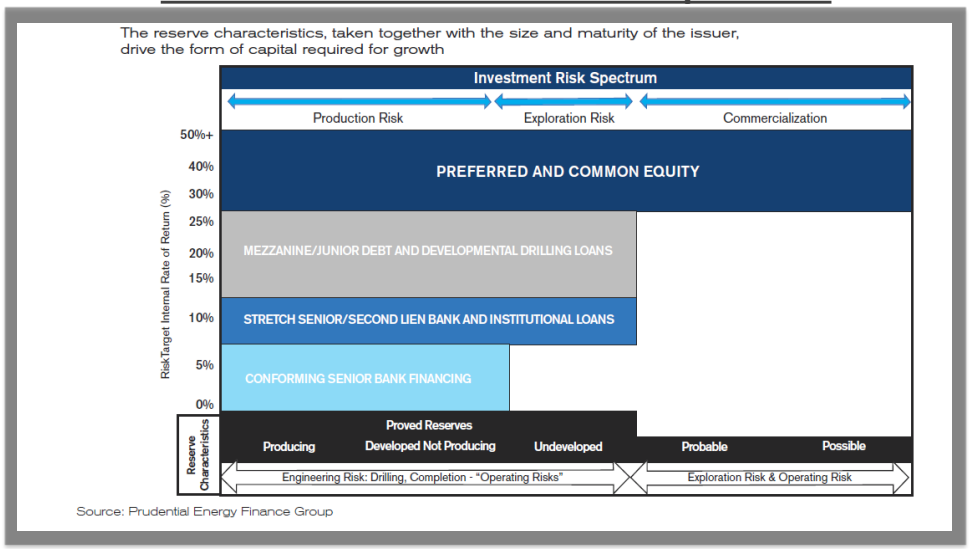
IV. The Markets Need U.S. Shale to Preserve Spare Capacity Cushion

B. Capital Discipline Now Essential

2. Past Cycle

a. Customizable Financing Solutions Became Available [Continued]

Oil and Gas Investment Risk Spectrum



Source of Chart: Clouser (2014)

Murti (2021b): "There have been few strategies more damaging to the E&P sector than the 'well IRR' model that characterized Shale 1.0."

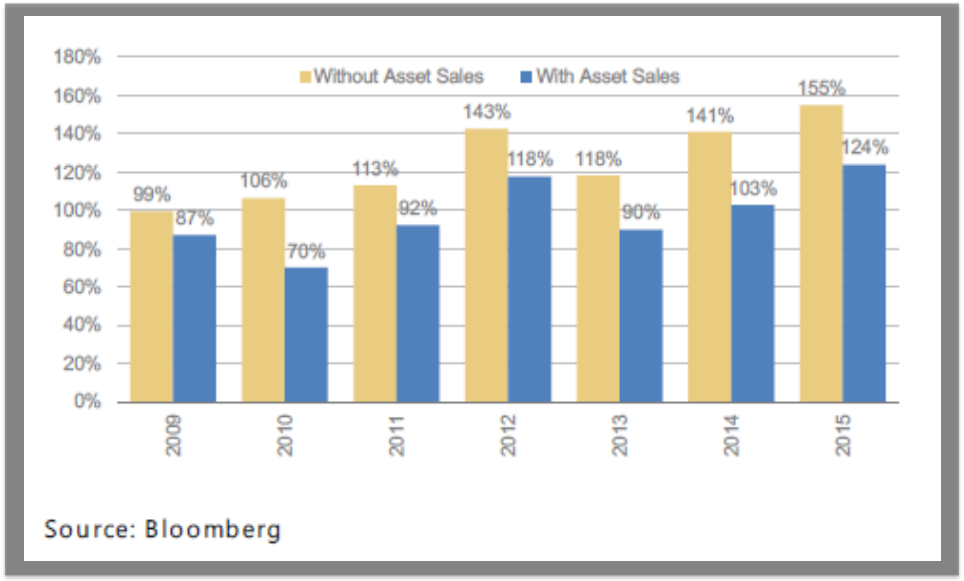
IV. The Markets Need U.S. Shale to Preserve Spare Capacity Cushion

B. Capital Discipline Now Essential

2. Past Cycle

b. E&P's Significantly Overspent Cash Flow

Historical E&P Outspend (Capex as % of CF)



Source of Chart: Morgan Stanley Research (2016)

IV. The Markets Need U.S. Shale to Preserve Spare Capacity Cushion

B. Capital Discipline Now Essential

3. Current Cycle



McCormick (2021): "After years of burning through investor cash in pursuit of ever-greater growth, America's shale patch is suddenly making money.

"[F]ree cash flow, a key shale investor metric determined by the difference between cash from operations and capex, is coursing through a sector that once exemplified value-destruction …

[The] new [business] model involves not injecting cash back into drilling new wells but rather funneling cash back to investors in the form of healthy dividends."

IV. The Markets Need U.S. Shale to Preserve Spare Capacity Cushion

C. Clarification: Shale Cannot Be a "Swing Producer"

McNally (2020): "In theory, shale's shorter production cycle - quarters as opposed to the years required for conventional production - lowers supply inelasticity and makes it more responsive to prices.

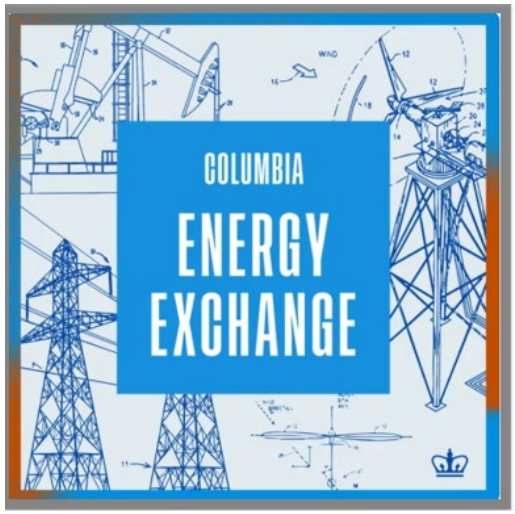
But shale oil has proven ill-suited to the swing production role.

While it has shorter cycles than conventional oil production, shale output still does not adjust fast enough to prevent large imbalances.

Even if shale companies were able to adjust swiftly enough, U.S. antitrust laws prohibit them from collaborating to do so."

IV. The Markets Need U.S. Shale to Preserve Spare Capacity Cushion

D. Twin Goals: A "Non-Messy Energy Transition" & Avoidance of Energy Poverty



… As discussed by Arjun Murti, Senior Advisor, Warburg Pinkus, and Amrita Sen, Chief Oil Analyst, Energy Aspects, in Bordoff (2021).

Sen in Bordoff (2021): "Structurally, [there is a] … real investment hole that is already present, [which] … will only get worse over the coming years.

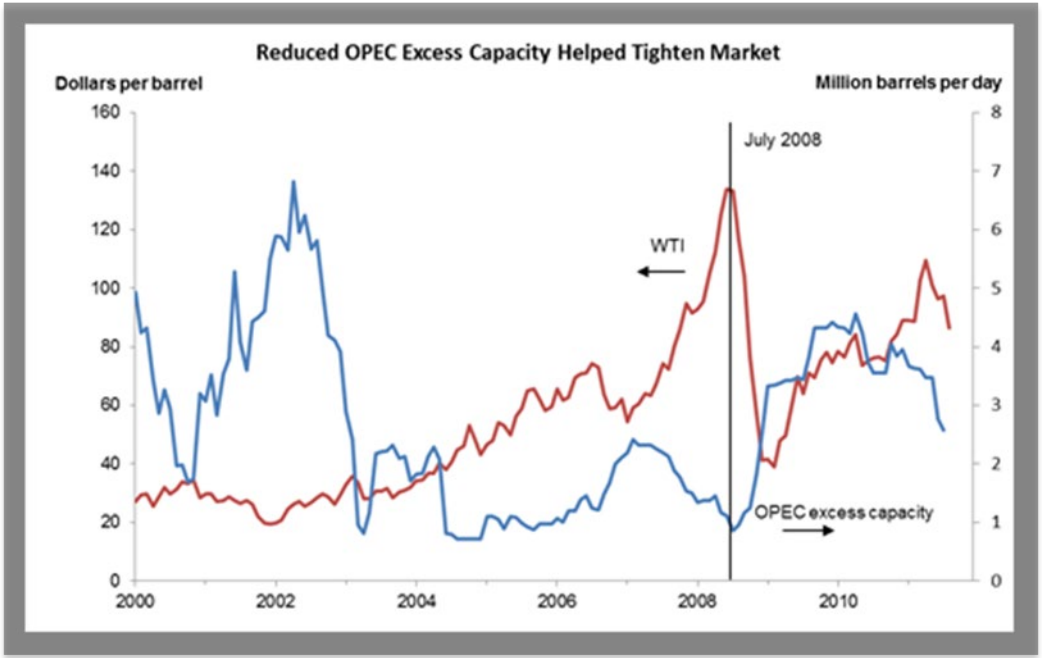
… If there isn't enough energy, you are talking about energy poverty that is going to massively inhibit economic growth."

Murti in Bordoff (2021): "What motivates investors to come back?"

IV. The Markets Need U.S. Shale to Preserve Spare Capacity Cushion

D. Twin Goals: A "Non-Messy Energy Transition" & Avoidance of Energy Poverty

1. Understand the Dynamics of What Causes Oil Price Spikes



Notes: Oil prices are monthly average. The red line is WTI prices while the blue line is OPEC excess capacity.

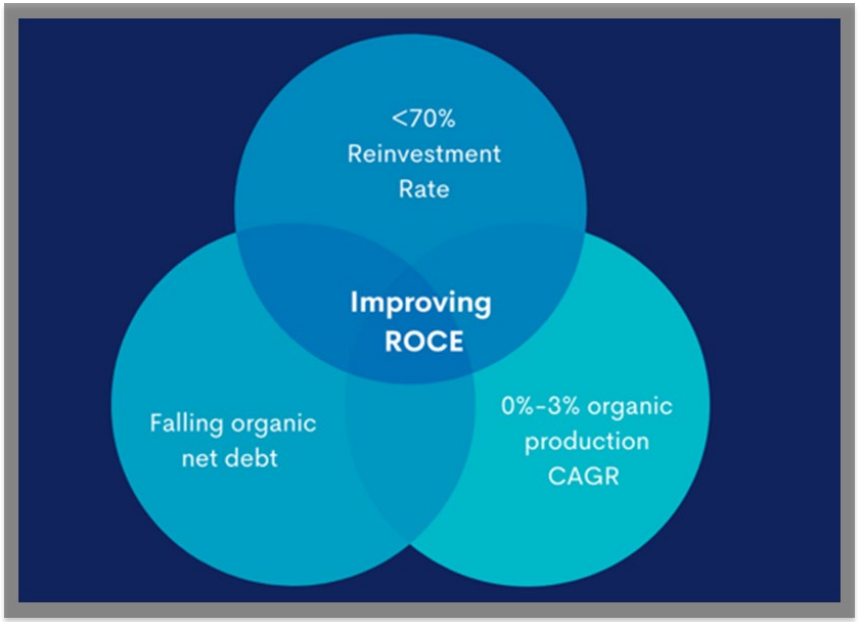
Source of Graph: Plante and Yücel (2011)

IV. The Markets Need U.S. Shale to Preserve Spare Capacity Cushion

D. Twin Goals: A "Non-Messy Energy Transition" & Avoidance of Energy Poverty

2. Solve for Cost-of-Capital Return

a. "Coincident E&P ROCE Success Indicators" in Shale 2.0



Murti (2021a): "[It] is critical that" capex increases "in the coming year" in order to avoid "an oil price super cycle due to insufficient non-OPEC supply growth."

Note: ROCE stands for Return on Capital Employed.

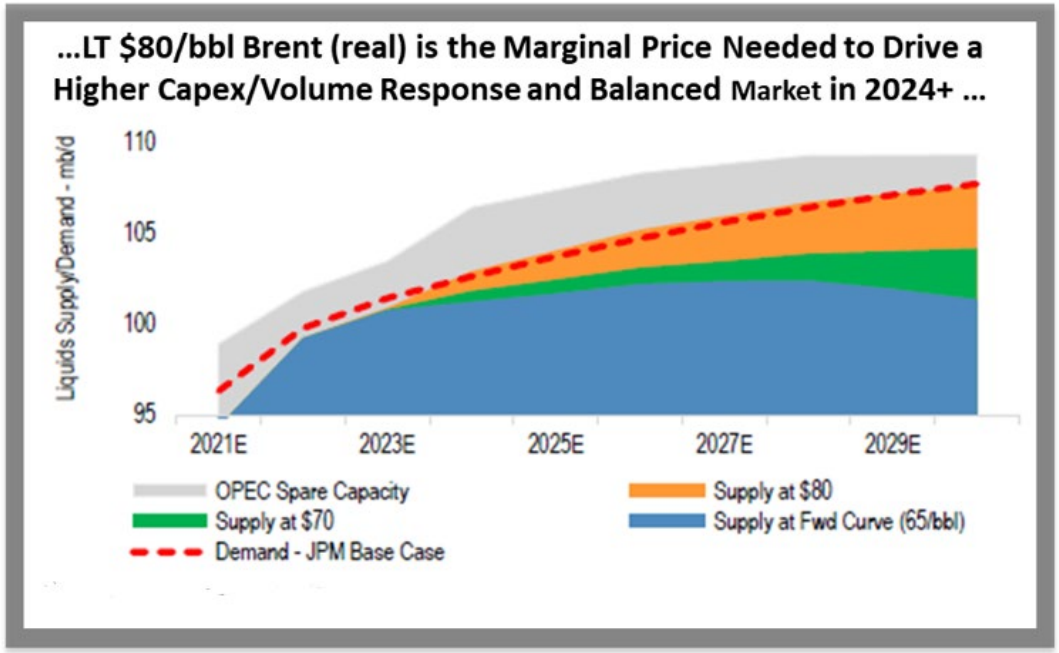
Source of Diagram: Murti (2021b)

IV. The Markets Need U.S. Shale to Preserve Spare Capacity Cushion

D. Twin Goals: A "Non-Messy Energy Transition" & Avoidance of Energy Poverty

2. Solve for Cost-of-Capital Return

b. "Marginal Price … to Drive a Higher Capex/Volume Response and Balanced Market in 2024+"



Murti in Bordoff (2021): "It is going to take a period of above normal returns to get … [the] shale engine going again."

Source of Graph: J.P. Morgan Global Research (2021)

V. Conclusion

What is the Future Role of OPEC(+) for Risk Mitigation via the Use of Spare Capacity to Balance World Oil Markets?

This is so crucial that one must also think about how such a spare capacity cushion can be retained with the sector so disfavored by large swathes of stakeholders.



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