

石油价格战——囚徒困境下的最优策略

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- 在当前沙特阿拉伯和俄罗斯之间的价格战中，美国页岩油行业将是最大的输家。
- 石油输出国组织（OPEC）提高石油产量是博弈论中“纳什均衡”概念下的最优策略。
- 在美国石油产量大幅下降之前，布伦特原油价格将维持在 30 美元以上的水平。

油价暴跌的赢家和输家。全球金融市场再一次遭遇另一个尾端风险事件，即 OPEC 延长减产协议失败，并导致了一场价格战。3 月 8 日，沙特阿拉伯宣布，计划从 4 月起将日产量从目前的 970 万桶提高至 1230 万桶，同时将售价从 6 美元/桶降至 8 美元/桶。超过 26% 销售量的增长应该完全抵消了超过 15% 平均售价的下降（基于 3 月 6 日迪拜原油的最后收盘价 \$45.7/桶）。众所周知，沙特是世界上成本最低的产油国之一，其平均成本约为 15 美元/桶（包括所有成本加上行政和运输成本）。因此，即使在降价之后沙特也能保证 20 美元/桶上下的边际收益。沙特阿拉伯的石油财政收入与价格战前相比将保持不变。

俄罗斯作为世界第三大石油生产国从 2018 年开始增加产量，这并没有严格遵守减产协议。截至 2020 年 1 月，其产量为每日 1130 万桶。俄罗斯还计划通过增加每日 50 万桶的潜在产量（比 1 月份的产量增加 4%）来打价格战。显然，油价下跌无法抵消俄罗斯的增产。然而，俄罗斯的平均生产成本大约为 20 美元/桶，对于目前油价水平该国依然有 15 美元/桶上下的缓冲。因此，俄罗斯将蒙受损失，但能够在价格战中支撑一段时间。

囚徒困境。我们通过经济学理论中的纳什均衡里囚徒困境这一经典案例进一步分析了沙特阿拉伯发动价格战的理由：

	OPEC 增产	OPEC 减产
俄罗斯增产	(R+, O+)	(R+, O-)
俄罗斯减产	(R-, O+)	(R-, O-)

首先，全球石油需求在过去 5 年以每年 1.5% 到 2% 的速度稳定增长。因此，石油供应在价格变动中起着举足轻重的作用。从 2014 年到 2016 年 10 月，当在“R+, O+”象限成功协调时，油价从 100 美元/桶下跌到 40 美元/桶（低位在 30 美元/桶下方）。2015 年 6 月，美国不顾油价低迷，将日产量从 800 万桶提高至的 950 万桶（第一个峰值）。但当油价被大幅拉低至低于美国平均产油成本时，美国的石油产量从峰值水平下降了每日 100 万桶（下降 11.6%）时，这种策略就发挥了作用。在此期间，OPEC+（OPEC 和俄罗斯）将产量增加了每日 500 万桶（上升了 12.5%）。因此，这两个集团容忍了超过 60% 的平均售价

的下降，以换取额外 5% 以上的市场份额，而美国的份额只下降了 1.5%。

从 2016 年 11 月到 2018 年 6 月，油价从 40 美元/桶恢复到 80 美元/桶，这是另一个协调（R-, O-）取得成功的例子。OPEC 减产每日 200 万桶（下降 4.4%），美国增产每日 220 万桶（上升 25%）。这一策略使得油价有几乎 100% 的复苏，但也导致了市场份额被美国夺走。

但戏剧性的一幕发生在最近一轮的减产中。自 2019 年 6 月以来，发生了协调失效（R+, O-）。截至 2020 年 1 月，俄罗斯的石油产量增加了 1.9% 至每日 1130 万桶，而 OPEC 的产量减少了 5%，至每日 2840 万桶。与此同时，美国在此期间的产量增长了 7.4%，达到创纪录的每日 1300 万桶。在这 7 个月里，石油价格下跌了 12.8%。OPEC 一直是遵守减产协议诚实的一方，从 2018 年 11 月到 2020 年 1 月，其产量下降了每日 480 万桶，而俄罗斯的产量仅从每日 1140 万桶下降到每日 1110 万桶，然后又恢复到每日 1130 万桶。另一方面，美国的产量又增加了每日 130 万桶（上升 12%）。因此美国成为最大的受益者。

回顾过去，事实上美国一直受益于 OPEC+ 最近几轮的减产。尽管美国页岩油公司的利润率很低，但市场份额的增加巩固了它们的市场地位，并对 OPEC 构成了威胁。综上所述，考虑到俄罗斯不同意延长产量削减，沙特阿拉伯有理由发动价格战，即从（R+, O-）移动到（R+, O+）是最佳选择。

然而，对于 OPEC+ 来说哪种成功协调的类型（R+, O+）或（R-, O-）是最佳选择呢？这是关于市场份额和价格之间的权衡。（R-, O-）已被证明是不可持续的，因为油价的支撑已使美国能够逐渐从 OPEC 手中夺取市场份额。与此同时，考虑到中国对俄罗斯石油的依赖日益增加（从 2014 年的 5% 增加到 2019 年的 15%），俄罗斯能保持其市场份额。（R+, O+）是石油供应链再平衡的最优策略。

冠状病毒疫情已于 3 月 12 日被宣布为全球流行病。各国采取的大量隔离措施和航班禁令将导致交通运输量大幅下降，这将导致今年的石油需求下降。石油需求的大幅下降和即将到来的供应激增肯定会扩大供需缺口。OPEC 目前的剩余产能估计为每日 300 万桶，这将在短期内得到充分利用。

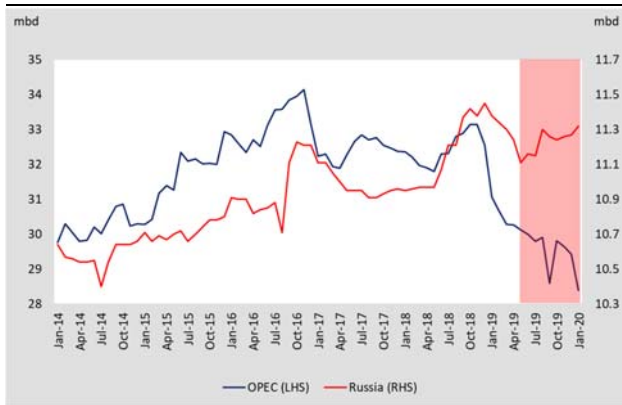
总体而言，我们预计价格战将导致数家美国页岩油公司倒闭。但在此之前，我们预计布伦特原油价格将在 30 美元/桶附近徘徊，直到美国石油产量下降约每日 300 万桶。只有到那时，我们才能指望油价回升。

图 1: 全球石油需求增长



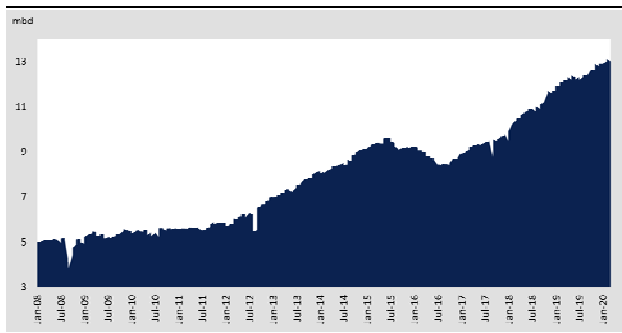
蓝柱 (左): 需求量 (百万桶/日); 红线 (右): 年增长率
来源: 彭博, 凯基研究

图 2: OPEC 和俄罗斯石油产量 (百万桶/日)



蓝线 (左): OPEC; 红线 (右): 俄罗斯
来源: 彭博, 凯基研究

图 3: 美国石油产量维持在历史高位 (百万桶/日)



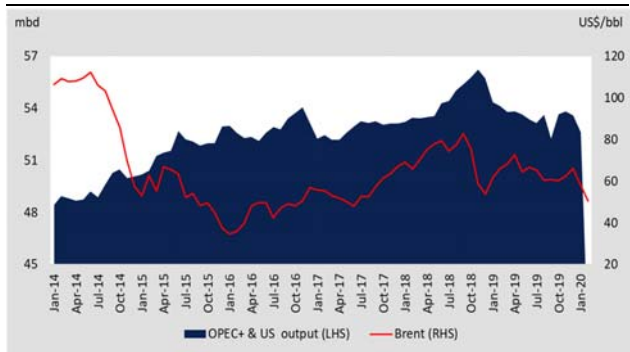
来源: 彭博, 凯基研究

图 4: OPEC+ 产量 (百万桶/日)



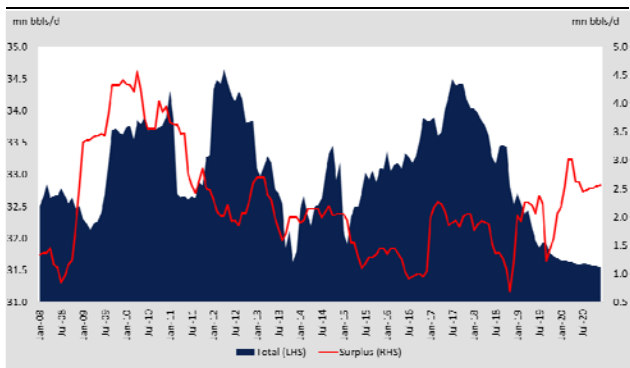
蓝区 (左): OPEC+ 产量; 红线 (右): 布伦特原油价格
来源: 彭博, 凯基研究

图 5: OPEC+ 及美国总产量



蓝区 (左): 总产量 (百万桶/日); 红线 (右): 布伦特原油价格 (美元/桶)
来源: 彭博, 凯基研究

图 6: OPEC 产能



蓝区 (左): 总产能 (百万桶/日); 红线 (右): 剩余产能 (百万桶/日)
来源: 彭博, 凯基研究

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