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CITIC Futures Company Limited

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SC/Brent crude oil arbitrage

A review and case study

SC 和 Brent 原油期货套利交易介绍

Introduction → Analysis → Case study

概述

影响因素

案例分析

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概述

Introduction

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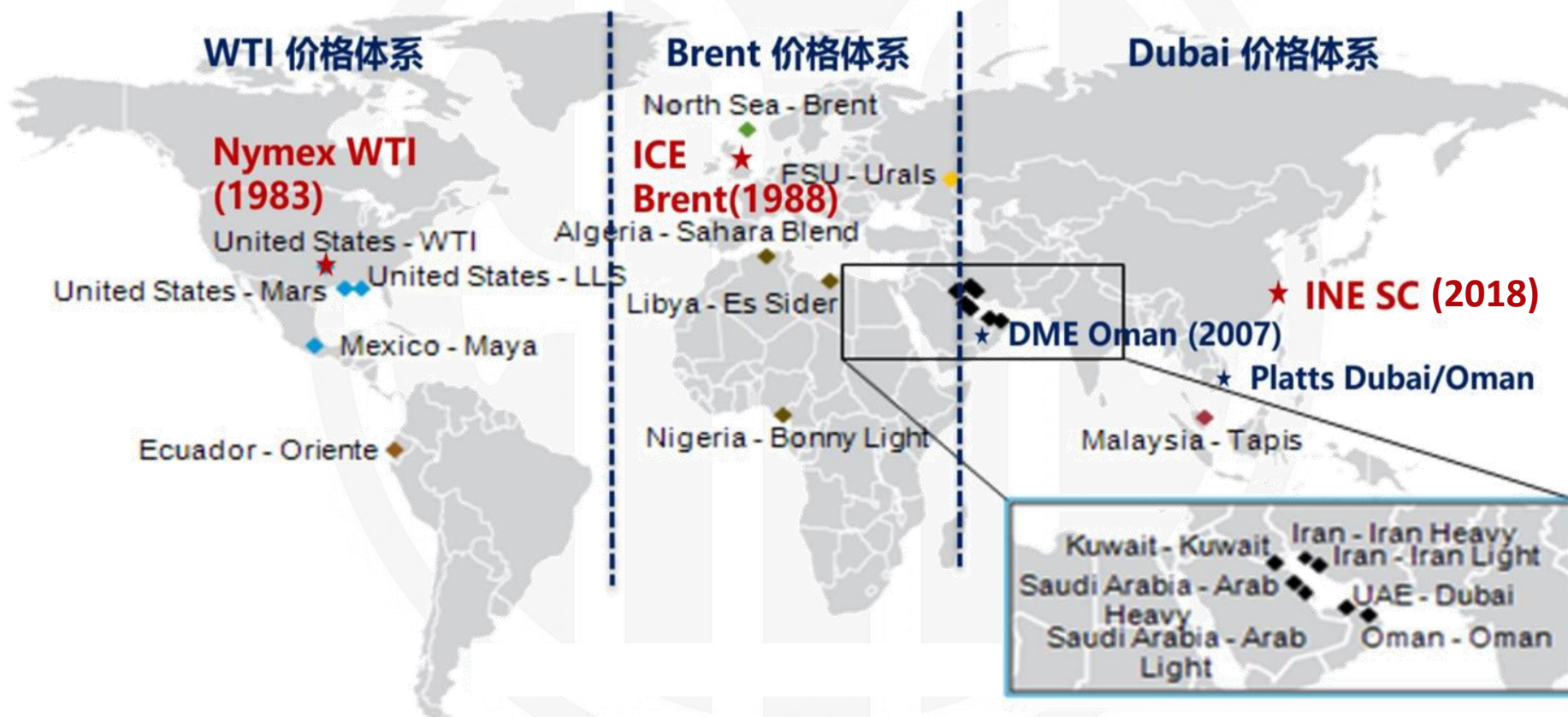
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Pricing mechanism of Crude oil 定价机制

Physical price = Benchmark price + discount/premium
现货价格 = 基准价格 + 升贴水

期货基准价格 Futures price benchmark: ICE Brent, Nymex WTI, INE SC, DME Oman, IFAD Murban...
现货基准价格 Physical price benchmark: Dated Brent, Argus ASCI, Platts Dubai/Oman...



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Price relationship 价格关系

- Crude oil futures price should include: production costs + production profits + trading expenses + expected profits from trading + circulation expenses, etc.
原油期货价格组成: 生产成本、生产利润、流通费用、交易费用、预期利润等



$$\text{INE SC} = (\text{Oman} + \text{Freight} + \text{other Fees}) * \text{Exchange rate}$$

$$\hookrightarrow = \text{ICE Brent} + \text{Dubai swap} / \text{Brent EFS} + \text{Oman/Dubai swap}$$

$$\hookrightarrow = \text{WTI Cushing} + (\text{WTI Houston} - \text{Cushing}) + (\text{Brent} - \text{WTI Houston})$$

Futures contract comparison 期货合约比较

	INE SC	ICE Brent	Nymex WTI
Underlying product quality 交易品种	Medium Sour Crude Oil	Light Sweet Crude Oil	Light Sweet Crude Oil
Contract Size 合约规模	1000 barrels/lot	1000 barrels/lot	1000 barrels/lot
Price Quotation 报价单位	(RMB) Yuan/barrel (no tax or duty included)	USD/barrel	USD/barrel
Minimum Price Fluctuation 最小变动价位	0.1 RMB/barrel	0.01 USD/barrel	0.01 USD/barrel
Listed Contracts 上市合约月份	12 consecutive months followed by 8 quarterly contracts.	Up to 9 years	96 consecutive months
Trading Hours 交易时间	Beijing Time 9:00-11:30, 13:30-15:00, 21:00-2:30 AM	New York Time 8 PM – 6 PM	New York Time 6 PM – 5 PM
Last Trading Day 最后交易日	The last trading day of the month prior to the delivery month	The last trading day of the second month prior to the delivery month	The third business day prior to the twenty-fifth calendar day of the month preceding the delivery month
Settlement Type 交割方式	Physical delivery at specified Warehouse	EFP or Cash delivery	Physical delivery at Cushing

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Physical delivery 可交割油种

Deliverable Crudes	Nation	API Gravity	Sulfur (%)	Price Differential (Yuan / Barrel)	Origins
Dubai	United Arab Emirates	≥30	≤2.8	0	Fateh Terminal
Upper Zakum	United Arab Emirates	≥33	≤2.0	0	Zirku Island
Murban	United Arab Emirates	≥35	≤1.5	5	Fujairah Terminal or Jebel Dhanna Terminal
Oman	Sultanate of Oman	≥30	≤1.6	0	Mina Al Fahal
Qatar Marine	State of Qatar	≥31	≤2.2	0	Halul Island
Basrah Light	Republic of Iraq	≥28	≤3.5	-5	Basrah Oil Terminal or SPM
Basrah Medium	Republic of Iraq	≥26	≤4.0	-10	Basrah Oil Terminal or SPM
Tupi	The Federative Republic of Brazil	≥28	≤0.8	10	Angra Dos Reis, Port Acu, STS Santos, STS Sao Paulo, Sao Sebastian, and FPSO of Brazil, La Paloma of Uruguay, and other loading ports recognized by INE
Shengli	People's Republic of China	≥24	≤1.0	-5	Dongming Oil Terminal of Sinopec Shengli Oilfield Company

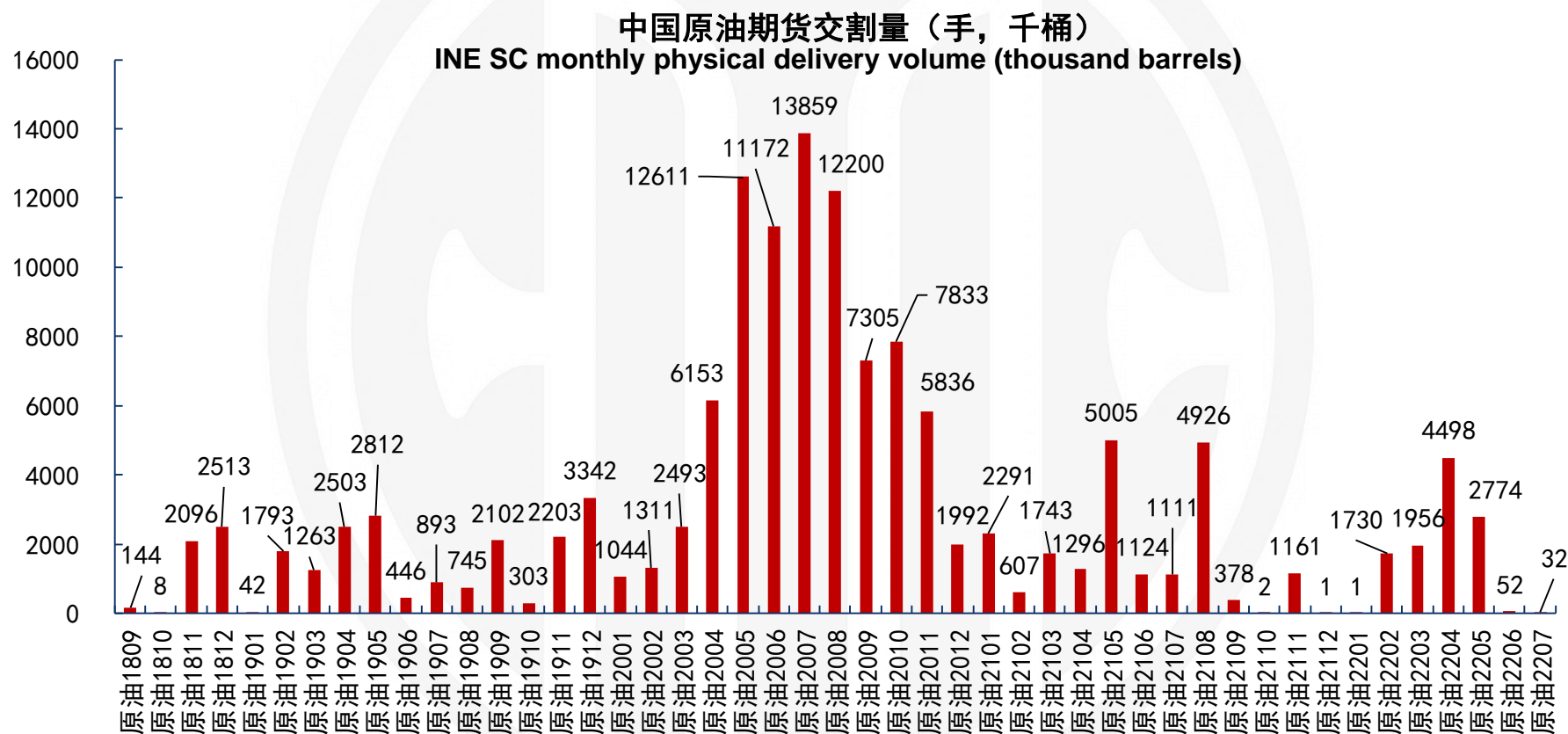
*The crude oil being loaded in shall be the crude oil that is shipped from the loading port in the country or region of origin, or after Physical Filing and stored in the bonded oil tanks in the Designated Delivery Storage Facilities, and shall not be mixed with other oil during the loading and storage.

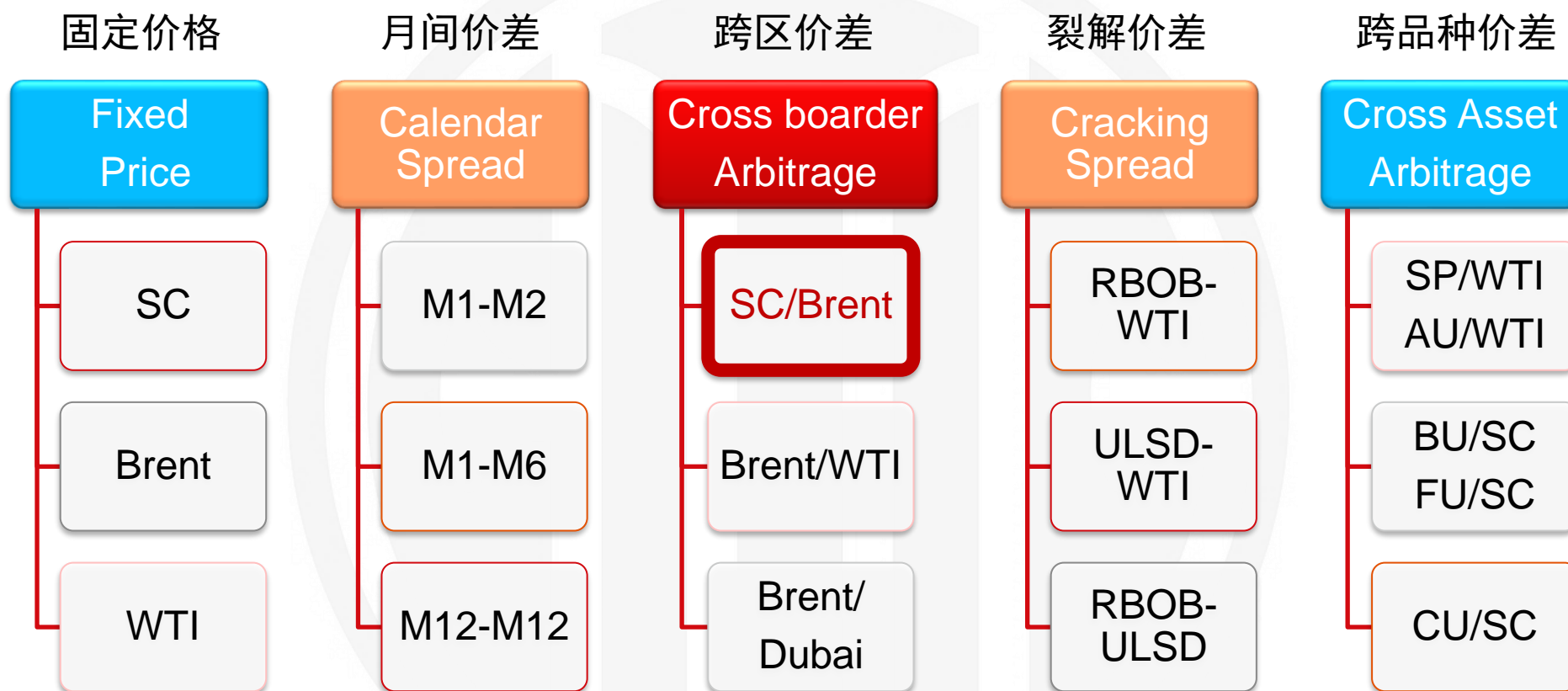
办理入库的原油应当是原油原产地装运港起运或者经现货备案已存放在指定交割仓库保税油罐内的原油，且在装运和储存期间不得与其他油品调和。指定交割仓库同一个保税油罐内不得混装不同交割油种的原油。

Physical delivery volume of SC 现货交割

- Since 26th March 2018, the accumulated physical delivery volume of 47 historical contracts is 138 million barrels.

2018年3月26日中国原油期货上市以来，47个历史合约累计交割量1.3亿桶。





影响因素

Analysis

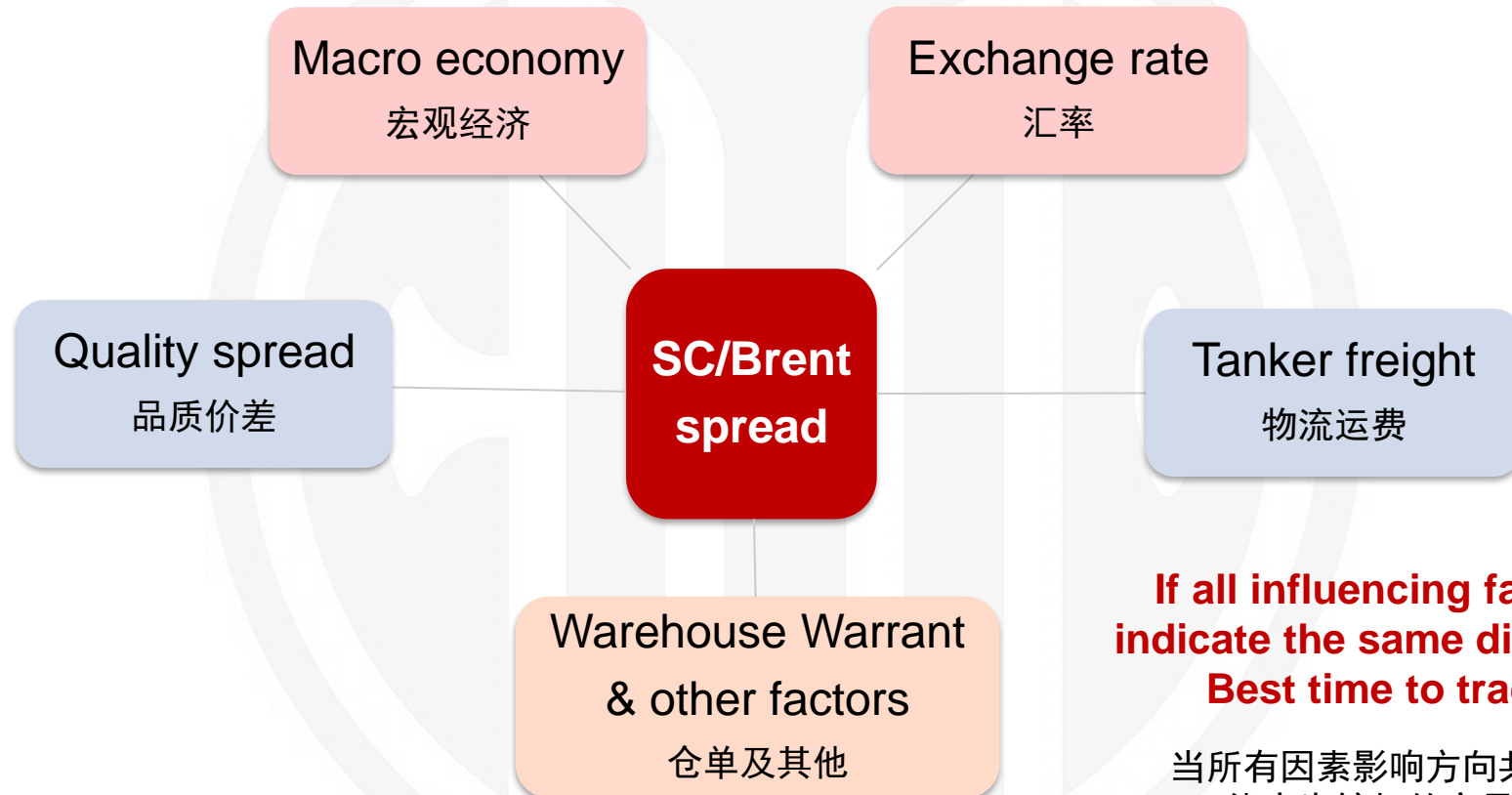
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What factors influence SC/Brent spread? 影响因素

$SC \rightarrow (Brent + Dubai\ swap / Brent\ EFS + Freight + other\ Fees) * Exchange\ rate$



If all influencing factors indicate the same direction, Best time to trade!

当所有因素影响方向共振时
可能产生较好的交易机会

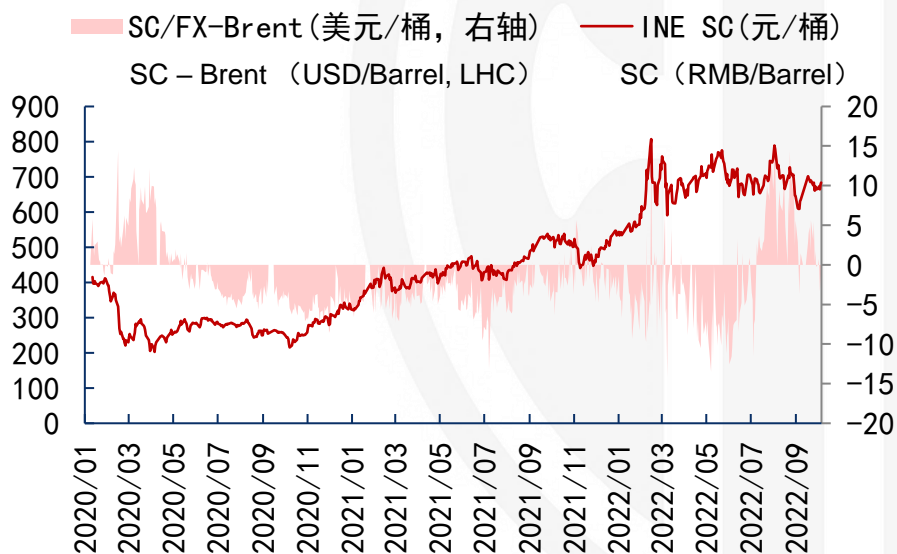
1. Macro economy 宏观经济

- Although global crude oil price are highly correlated, different crude oil futures reflect base country fundamental characteristics. Macro economy is the underlying driver for commodity demand, which influences the price difference. For example, SC/Brent futures spread show very similar pattern with China/US PMI difference.

虽然全球原油价格高度联动，局部供需进展会影响不同地区之间的价差。宏观经济是油品需求的根本驱动，从而影响价格差异。例如，SC和Brent原油期货价差与中美PMI差异体现出高度相关性。

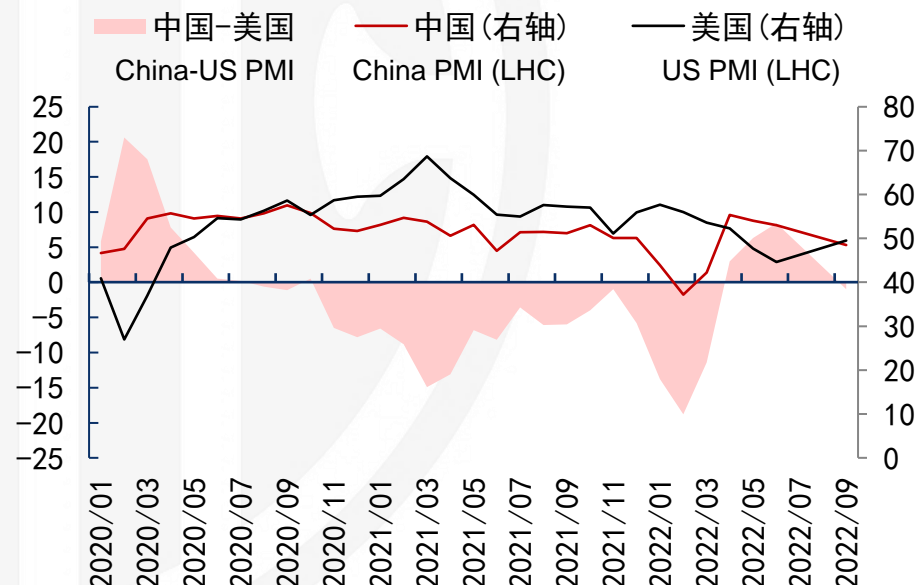
国内外原油期货价差（近月合约）

Crude oil futures spread



中美综合PMI比较

Composite PMI difference

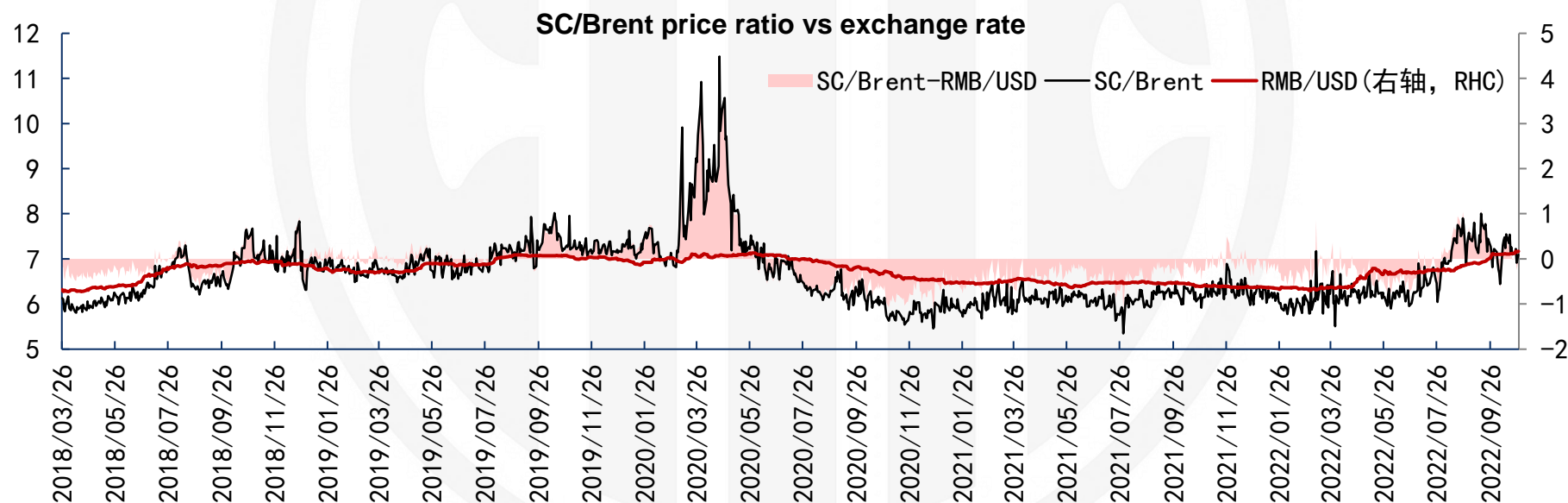


2. Exchange rate 汇率

- SC is quoted in RMB and Brent is quoted in USD, thus SC/Brent price ratio reflects the exchange rate change. One arbitrage strategy is the statistical regression between SC/Brent ratio and RMB/USD exchange rate, which works well in some periods such as 2018-2019. However, if some major fundamental shift occurs such as 2020 and 2022, other factors may dominate the spread change as well.

由于计价货币差异，SC/Brent 比价较大程度体现人民币兑美元汇率变化。长期来看内外比价围绕汇率波动，因此可以进行统计套利交易。但是当基本面发生重大变化时，如其他因素主导价差，可能导致策略短期失效。

国内外原油期货比价与汇率关系（近月合约）



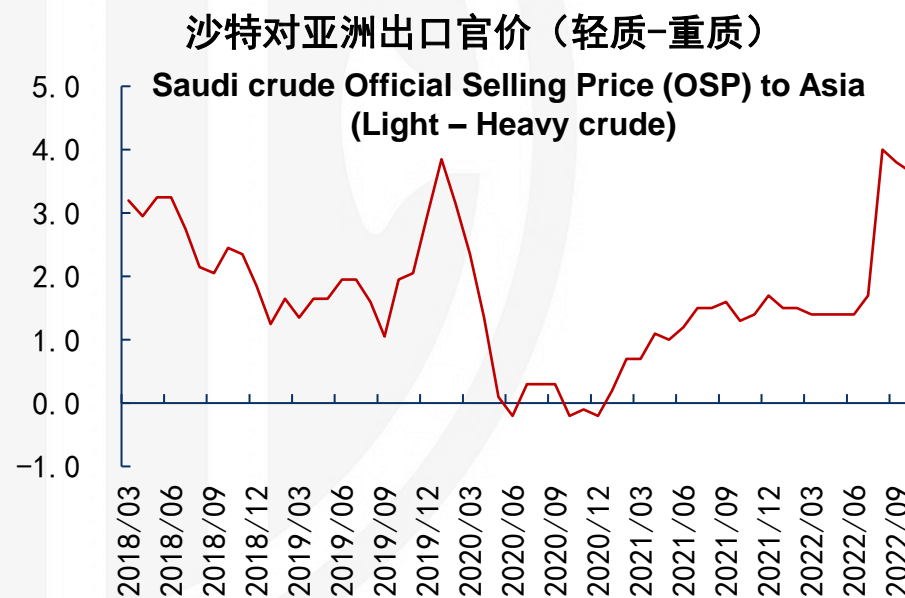
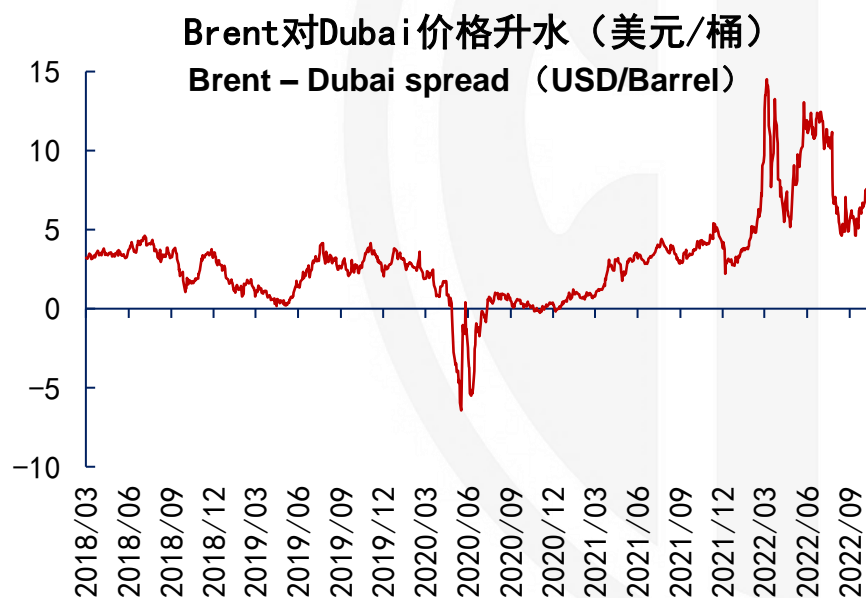
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3. Quality spread 品质价差

- Economy and forex influence SC/Brent spread from the financial aspects, while quality difference is the crude oil specific industry component. The underlying products of SC are medium sour crude oil, while Brent is light sweet crude oil, thus the spread should reflect the quality difference between light – heavy spread, which can be characterized by Brent-Dubai spread known as EFS (Exchange for swap).

由于SC是中质含硫原油，Brent是轻质低硫原油，因此品质价差会影响SC和Brent价格关系，可以通过Brent-Dubai价差进行表征。过去二十年间该价差通常在0-5美元/桶区间运行，但2020年疫情和2022年地缘冲突等特殊情形下，可能导致价差的大幅波动。



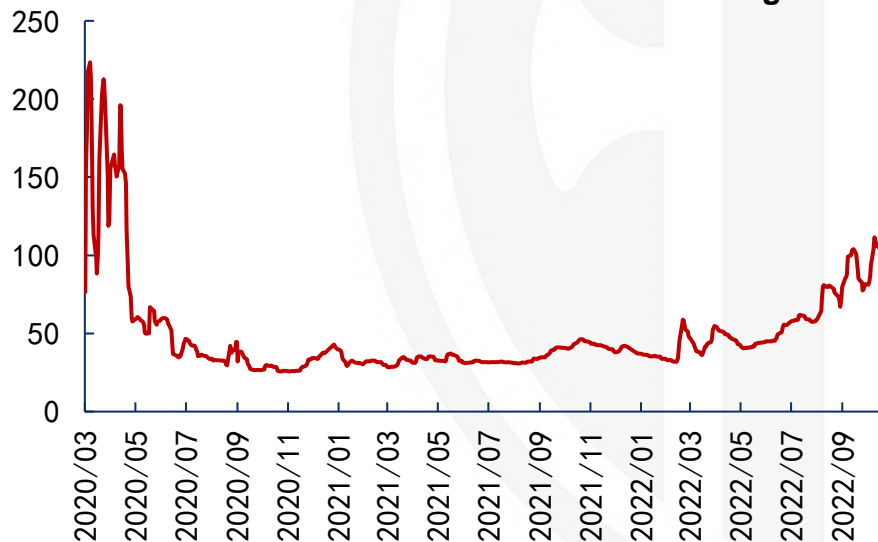
4. Tanker Freight 运费

- SC reflects the destination price of middle east crude oil, thus the price difference also needs to include the physical trading cost, such as freight. In most of time, crude tanker freight is relatively stable, however under special cases such as 2020, which may result in large fluctuation of the freight.

除了Brent和Dubai的品质价差外，由于SC反映的是中国到岸价格，因此从中东到中国的物流运费也会影响两地价差。原油海运费用通常较为稳定，特殊事件如2020年疫情期間可能造成运费大幅波动。

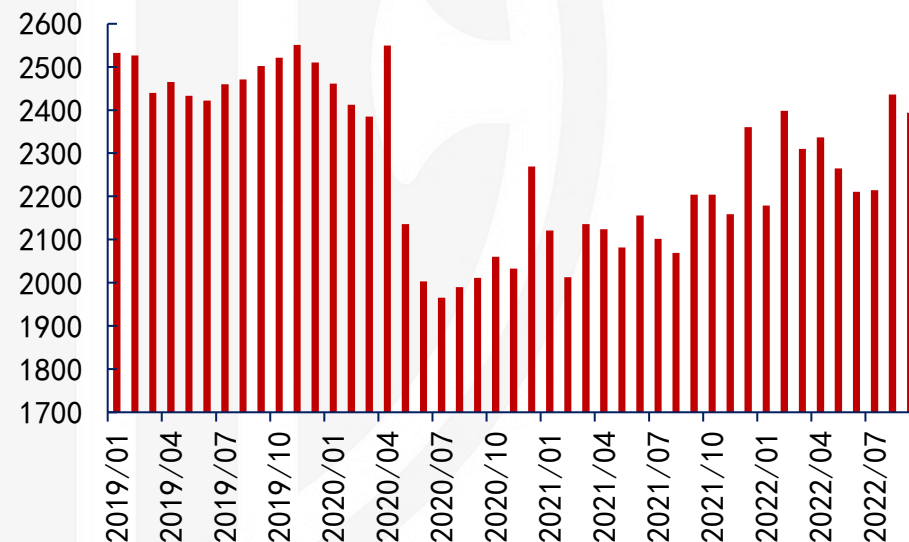
中东到中国原油海运费率 (WS)

Middle East to China TD3C route VLCC freight



欧佩克原油海运数量 (万桶/日)

OPEC Crude seaborn volume (10 thousand barrels/day)



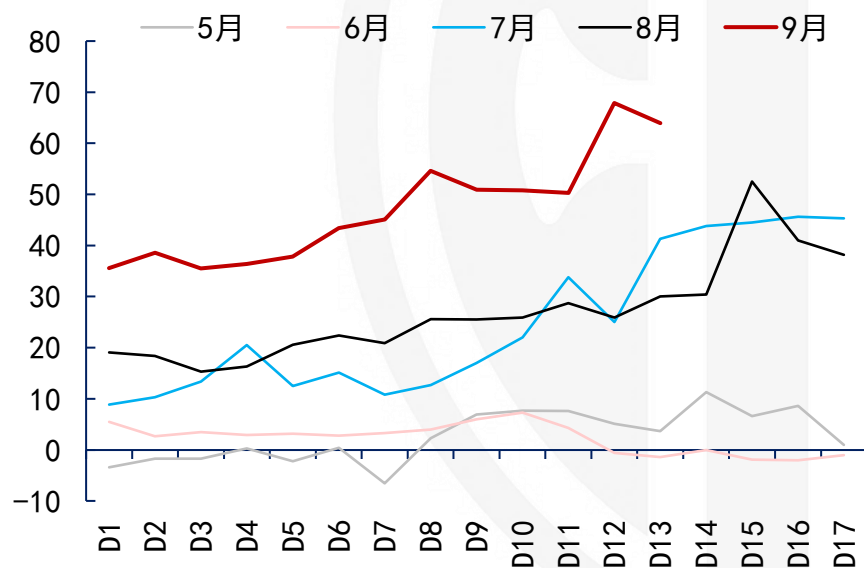
5. Warehouse Warrant 仓单

- Because SC is physical delivered, so the price in the last trading days also reflects the amount of deliverable inventory in the warehouse, which is reported as warehouse standard warrant. If the warehouse inventory is high, SC may be weaker than Brent; and vice versa.

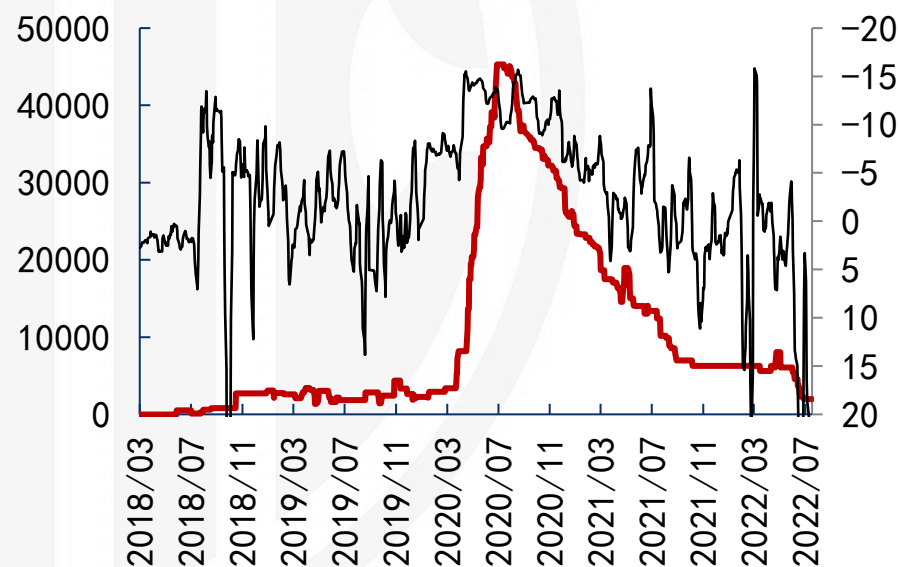
经济和汇率是宏观影响因素，品质价差和物流费用是行业影响因素，期货仓单影响则是来自SC合约特性。在临近交割窗口期，仓单库存数量可能影响到SC相对强度。仓单越少，对SC相对价格支撑越强；反之亦然。

INE SC 近次月差走势 (元/桶, 2022)

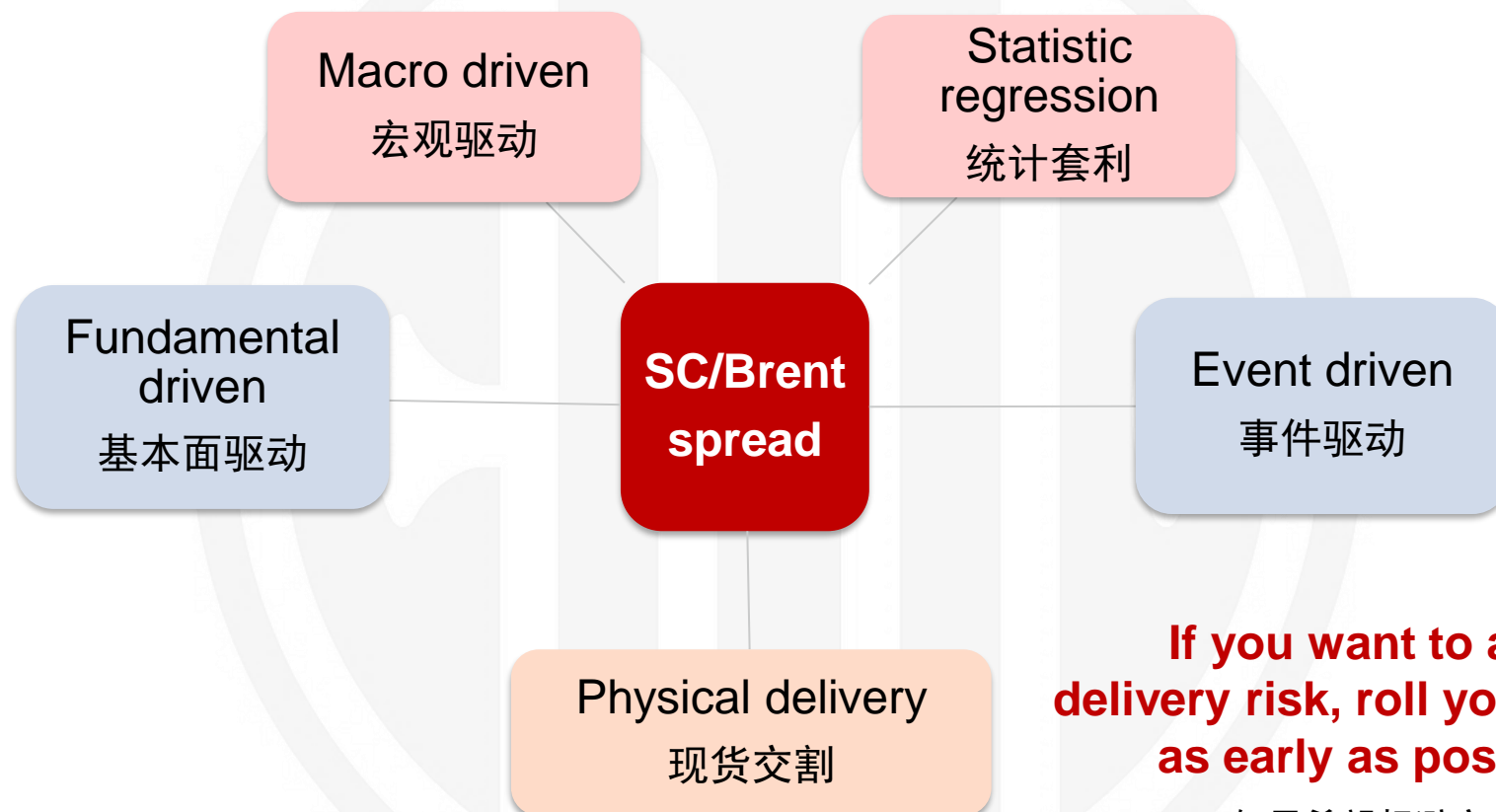
INE SC 1-2 month calendar spread



— SC仓单数量 (手) SC warehouse receipt (1000barrels)
— SC1-2月差 (七日均值, 右轴逆序) SC 1-2M spread (RHL)



$SC \rightarrow (Brent + Dubai\ swap / Brent\ EFS + Freight + other\ Fees) * Exchange\ rate$



If you want to avoid delivery risk, roll you position as early as possible!

如果希望规避交割风险
近月合约尽早展期远月

案例分析

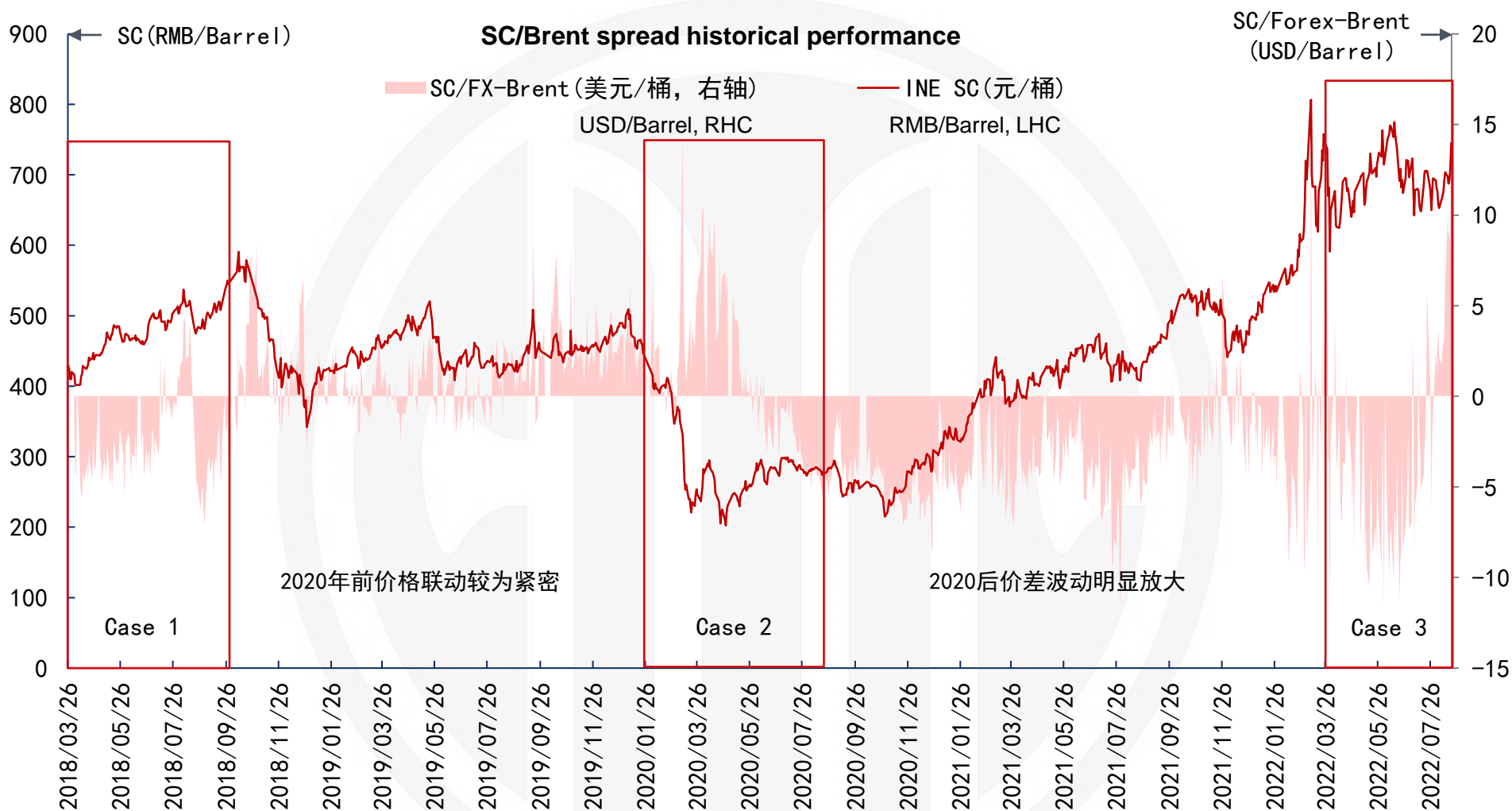
Case study

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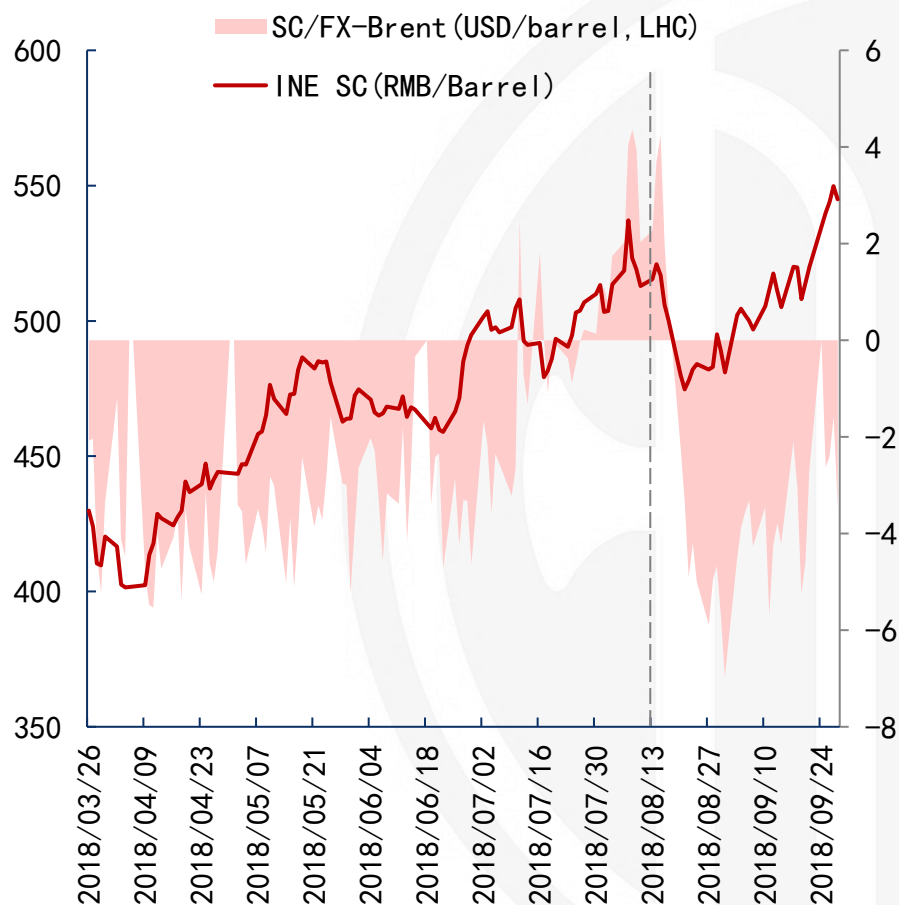
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Review of SC/Brent spread 价差回顾



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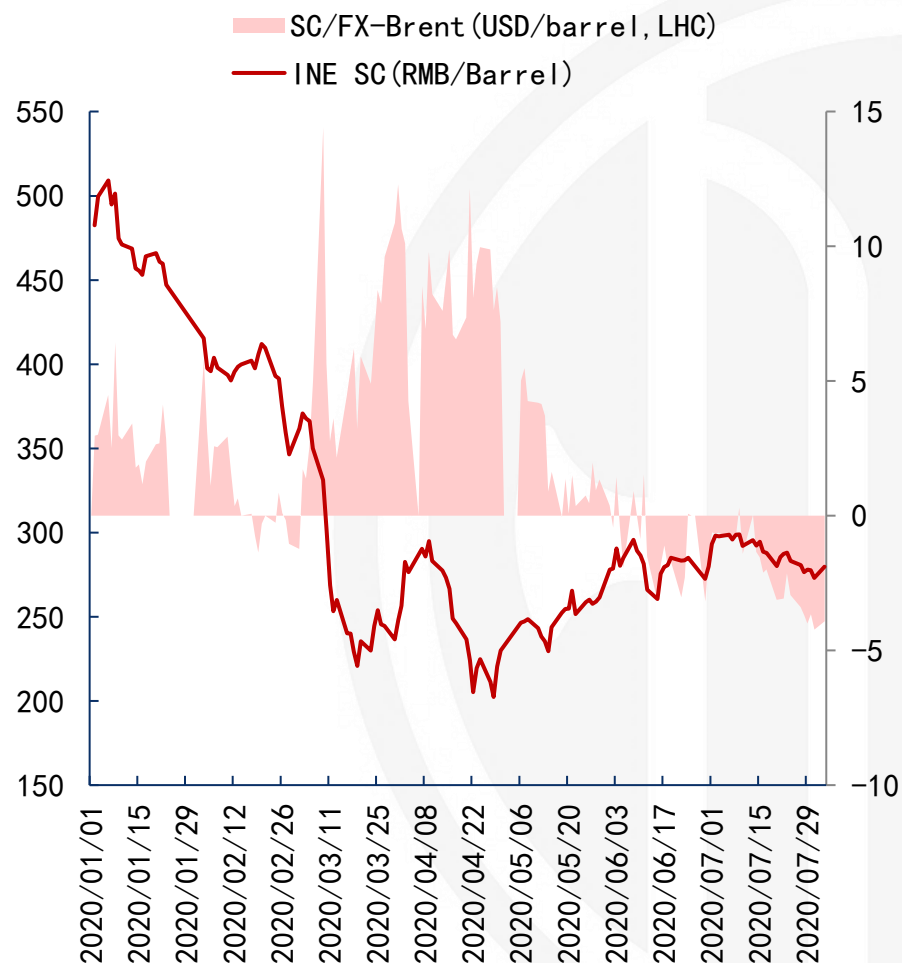


- Stage 1 (2018/3-2018/7)
- SC1809, 1st SC contract on list
- No warehouse receipt registered in the first few months.
- SC/Brent spread upward

SC是首个上市合约，初期注册仓单数量极低，推升价差上行

- Stage 2 (2018/8-2018/9)
- Warehouse receipt added, 144000 barrels delivered
- Financial participate do not participate in physical delivery
- SC/Brent spread drop

后期仓单逐渐增加，投机资金接货意愿有限，SC升水转贴水

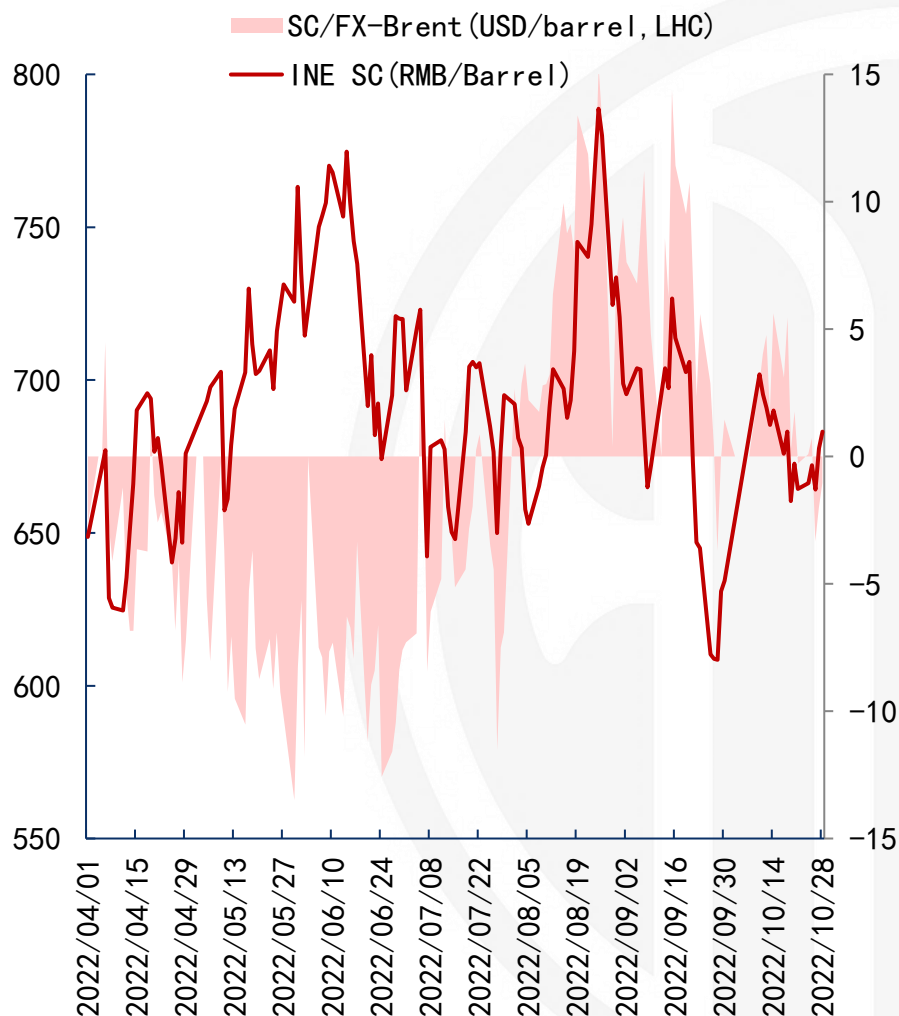


- Stage 1 (2020/2-2020/4)
- COVID-19 global outbreak
- Oversea demand largely dropped
- China demand recovering
- Warehouse space shortage
- SC/Brent spread upward

2020年二季度，国外疫情大爆发，油品需求和价格大幅回落。国内疫情逐渐好转，成品油地板价提振炼厂利润，中国经济和油品需求强于国外。叠加库容紧张担忧，SC升水大幅上行。

- Stage 2 (2020/5-2020/8)
- Warehouse space expanded by the INE Exchange
- Huge amount of warehouse receipt registered by crude physical traders
- SC/Brent spread drop

2020年下半年，美欧央行超常规刺激政策推升海外经济复苏，国内外需求差异修复。交割库容扩充，前期高升水吸引大量期现套利注册仓单生成。SC溢价回落，逐渐转为提水。



- Stage 1 (2022/4-2022/6)
- China COVID reduce oil demand
- European crude support by Russia Ukraine conflict
- SC/Brent discount deepens

二季度，俄罗斯军事冲突后对欧洲原油出口减少，大幅提振北海原油需求，推升Brent对Dubai溢价。同时国内疫情爆发，油品需求大幅回落。两端共同作用使SC对Brent深度贴水。

- Stage 2 (2022/7-2022/8)
- Oversea economy slow down
- SC warehouse receipt drop to critical low level
- SC/Brent premium expand

三季度，多重因素共振，推升SC溢价快速上行：1. 美欧经济增速显著放缓。2. 中国经济和需求自疫情逐渐回升。3. 北海油田结束检修，供应增加使Brent-Dubai溢价回落。4. 欧佩克原油出口增加推升中东海运运费。5. 期货注册仓单降至低位。SC由深度贴水转为高度升水。

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