中信期货有限公司
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中国原油期货
China Crude Oil Futures

基础介绍 Introduction

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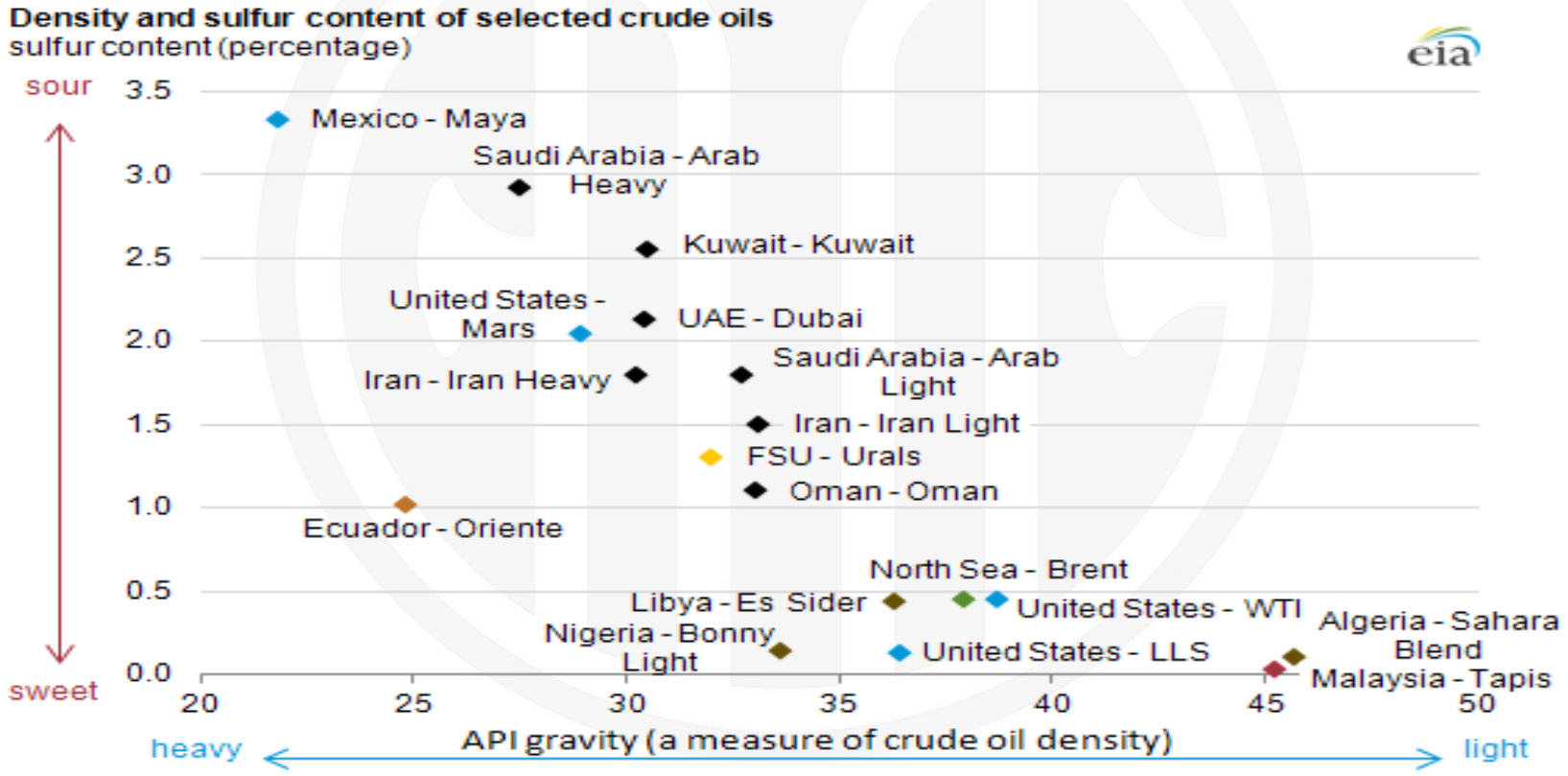
原油是全球贸易额最高的大宗商品

Crude oil is one of the most important commodity in the world

- Global crude oil production is around 100 million barrels/day, with total value of 3.65 trillion USD at 100 dollar/barrel. (1/8 of US GDP, 1/6 of China GDP)
- 全球原油总产量约1亿桶/日，按Brent100美元/桶计算，年产值3.6万亿美元。



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Source: EIA CITIC Futures

原油贸易定价公式和三大基准价格体系

Crude oil pricing formula and major benchmark systems

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Source: EIA CITIC Futures

WTI 价格体系

WTI price system

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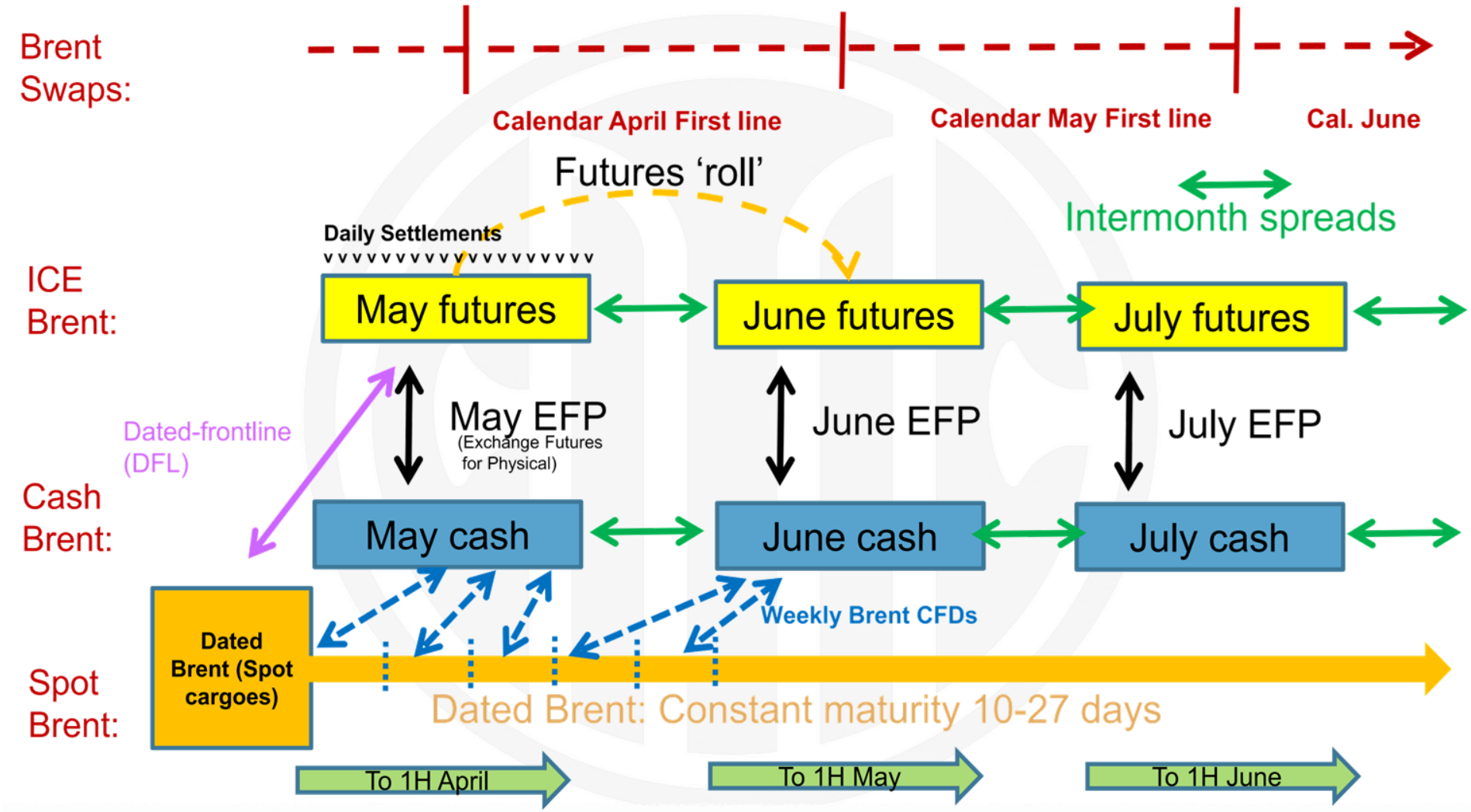
Source: CITIC Futures

Brent 价格体系

Brent price system



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Source: Platts CITIC Futures

Dubai 价格体系

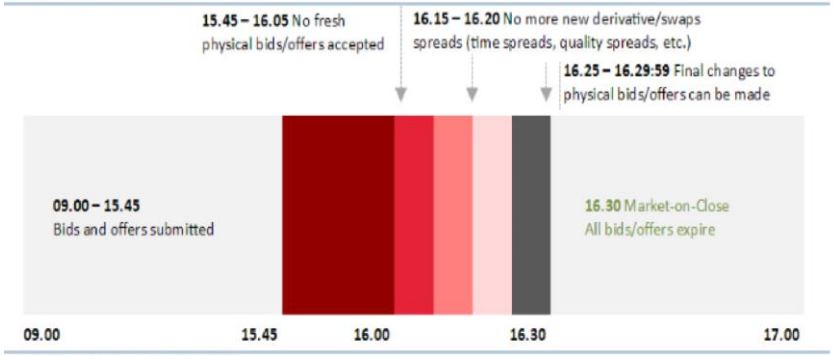
Dubai price system

表 1：公式定价主要基准价格

	亚洲	欧洲	美国
沙特	Dubai/Oman	Bwave(00 年 6 月后)，之前为 Dated Brent	ASCI（10 年 1 月后），之前为 WTI
伊朗	Dubai/Oman	Bwave(01 年 1 月后)，之前为 Dated Brent	无出口
伊拉克	Dubai/Oman	Bwave(00 年 6 月后)，之前为 Dated Brent	ASCI（10 年 4 月后），之前为 WTI
科威特	Dubai/Oman	Dated Brent	ASCI（09 年 12 月后），之前为 WTI
俄罗斯	ESPO（Dubai）	Urals（Dated Brent）	

资料来源：The Oxford institute for energy studies 中信期货研究部

图 9：普氏窗口报价时间轴



资料来源：Platts 中信期货研究部

KEY BENCHMARKS ($/barrel)

			Mid	Change
(PGA page 2210)				
Dubai (May)	PCAAT00	66.78–66.80	66.790	+1.040
Dubai (Jun)	PCAAU00	66.50–66.52	66.510	+1.010
Dubai (Jul)	PCAAV00	66.21–66.23	66.220	+0.970
MEC (May)	AAWSA00	66.78–66.80	66.790	+1.040
MEC (Jun)	AAWSB00	66.50–66.52	66.510	+1.010
MEC (Jul)	AAWSC00	66.21–66.23	66.220	+0.970
Brent/Dubai (May)	AAJMS00	-0.21/-0.19	-0.200	-0.040
(PGA page 1212)				
Brent (Dated)	PCAAS00	65.21–65.22	65.215	+1.705
Dated North Sea Light	AAOFD00	65.21–65.22	65.215	+1.705
Dated Brent (CIF)	PCAKM00		66.220	+1.710
Brent (May)	PCAAQ00	66.31–66.32	66.315	+1.505
Brent (Jun)	PCAAR00	66.30–66.32	66.310	+1.595
Brent (Jul)	PCARR00		66.110	+1.495
Sulfur de-escalator	AAUXL00		0.15	
Oseberg QP (Mar)	AAXDW00		0.6176	
Oseberg QP (Apr)	AAXDX00		0.5415	
Ekofisk QP (Mar)	AAXDY00		0.5213	
Ekofisk QP (Apr)	AAXDZ00		0.4569	
Troll QP (Mar)	ATFNB00		0.0000	
Troll QP (Apr)	ATFNA00		1.0524	
(PGA page 210)				
WTI (Apr)	PCACG00	56.78–56.80	56.790	+0.720
WTI (May)	PCACH00	57.11–57.13	57.120	+0.690
WTI (Jun)	AAGIT00	57.53–57.55	57.540	+0.670
Light Houston Sweet	AAXEW00		63.990	+0.820
Light Houston Sweet M2	AAYRY00		63.770	+0.940
LOOP Sour (Apr)	AALSM01		63.940	+0.870
LOOP Sour (May)	AALSM02		63.670	+0.840
LOOP Sour (Jun)	AALSM03		63.390	+0.720
Bakken	AAXPP00		56.340	+0.780
Eagle Ford Marker	AAYAJ00		63.900	+0.830
ACM* (Apr)	AAQHN00	63.48–63.50	63.490	+0.870
ACM* (May)	AAQHO00	63.21–63.23	63.220	+0.840
ACM* (Jun)	AAQHP00	62.93–62.95	62.940	+0.720

*Americas Crude Marker.

FORWARD DATED BRENT ($/barrel) (PGA page 1250)

			Mid	Change
North Sea Dated strip	AAKWH00	65.64–65.66	65.650	+1.645
Mediterranean Dated strip	AALDF00	65.64–65.66	65.650	+1.640
33-63 Day Dated strip	AALEJ00	65.65–65.67	65.660	+1.515
BTC Dated strip	AAUFI00	65.66–65.67	65.665	+1.660
15-45 Day Dated strip	AALGM00	65.68–65.69	65.685	+1.695
30-60 Day Dated strip	AAXRK00	65.65–65.67	65.660	+1.515
North Sea CIF Dtd strip	AAHXE00		65.655	+1.650
20-60 Day Dated Strip	ADBRA00		65.650	+1.525

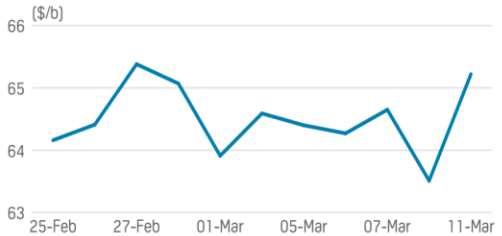
BRENT/WTI SPREADS AND EFPS (PGA page 218)

			Mid	Change
Brent/WTI 1st	AALAU00	9.42/9.43	9.425	+0.195
Brent/WTI 2nd	AALAV00	8.99/9.01	9.000	+0.305
Brent/WTI 3rd	AALAY00		8.390	+0.245
Brent EFP (May)	AAGVX00	0.06/0.07	0.065	-0.005
Brent EFP (Jun)	AAGVY00	0.13/0.15	0.140	+0.125
Brent EFP (Jul)	AAMVY00		0.080	+0.065
WTI EFP (Apr)	AAGVT00	-0.01/0.01	0.000	0.000
WTI EFP (May)	AAGVU00	-0.01/0.01	0.000	0.000
WTI EFP (Jun)	AAGVV00	-0.01/0.01	0.000	0.000

MIDDLE EAST ($/barrel)

			Mid	Change
(PGA page 2210)				
Oman (May)	PCABS00	66.81–66.83	66.820	+1.070
Oman (Jun)	AAHZF00	66.52–66.54	66.530	+1.030
Oman (Jul)	AAHZH00	66.22–66.24	66.230	+0.980
Upper Zakum (May)	AAOUQ00	66.80–66.84	66.820	+1.070
Murban (May)	AAKNL00	67.93–67.97	67.950	+1.000
Murban (Jun)	MBNSA00		67.650	+0.970
Murban (Jul)	MBNSB00		67.350	+0.930
Al Shaheen	AAPEV00	66.77–66.81	66.790	+1.040
		Spread vs OSP		
Murban	AAKUB00	-0.15–-0.05	-0.100	0.000
		Spread vs Dubai		
Murban	AARBZ00		1.730	+0.030
Al Shaheen	AAPEW00	0.52–0.62	0.570	+0.070
		Quality Premiums		
Murban QP (May)	AAISV00		0.5893	
(PGA page 2658)				
Dubai Swap (Apr)	AAHBM00	66.49–66.53	66.510	+1.010
Dubai Swap (May)	AAHBN00	66.20–66.24	66.220	+0.970
Dubai Swap (Jun)	AAHBO00	65.89–65.93	65.910	+0.940

DATED BRENT



Source: S&P Global Platts

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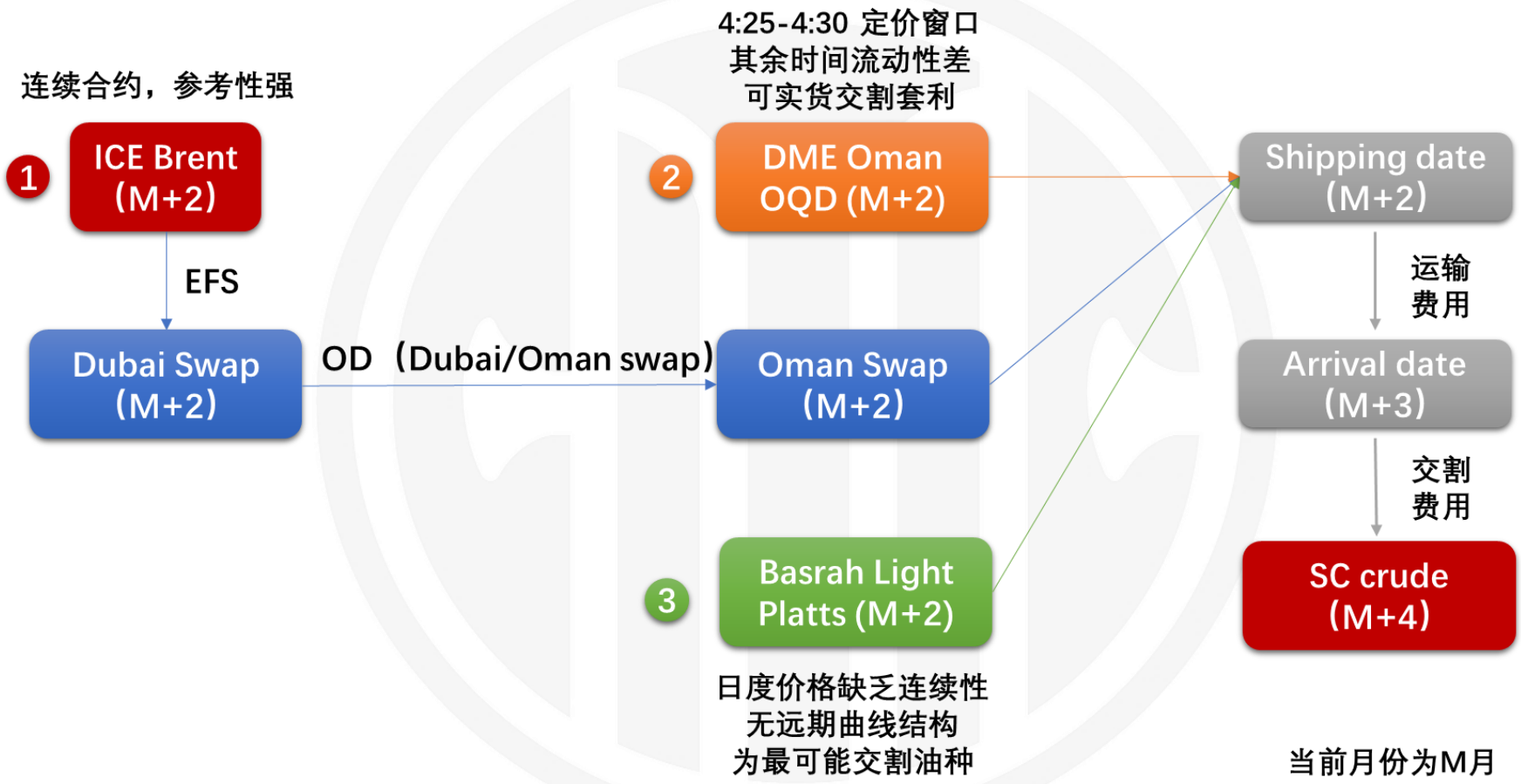
Source: Platts CITIC Futures

WTI 价格体系

INE price system



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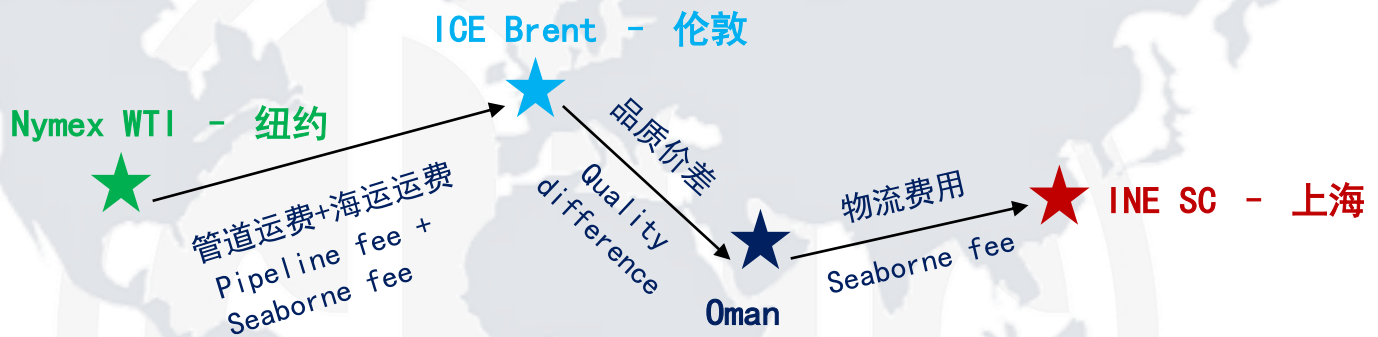
Source: CITIC Futures

全球原油基准价格相互联动

Global crude oil prices are highly correlated



INE SC = (Oman + transportation fee + delivery and other fees) * RMB/USD exchange rate

= ICE Brent + Dubai swap / Brent EFS + Oman/Dubai swap

= WTI Cushing + (WTI Houston - Cushing) + (Brent - WTI Houston)

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Source: CITIC Futures

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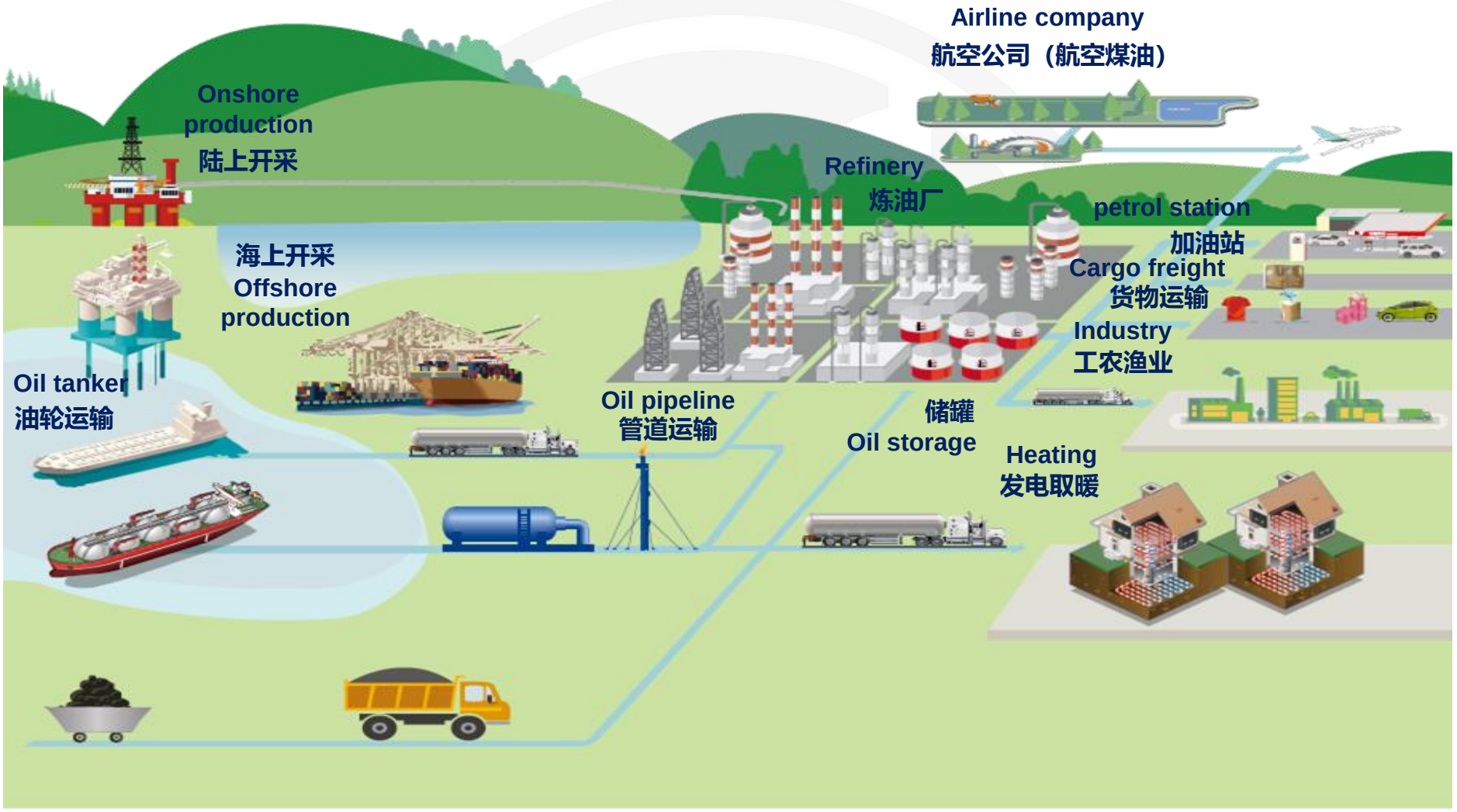
原油具有庞大的产业链体系

Crude oil has huge global industry network



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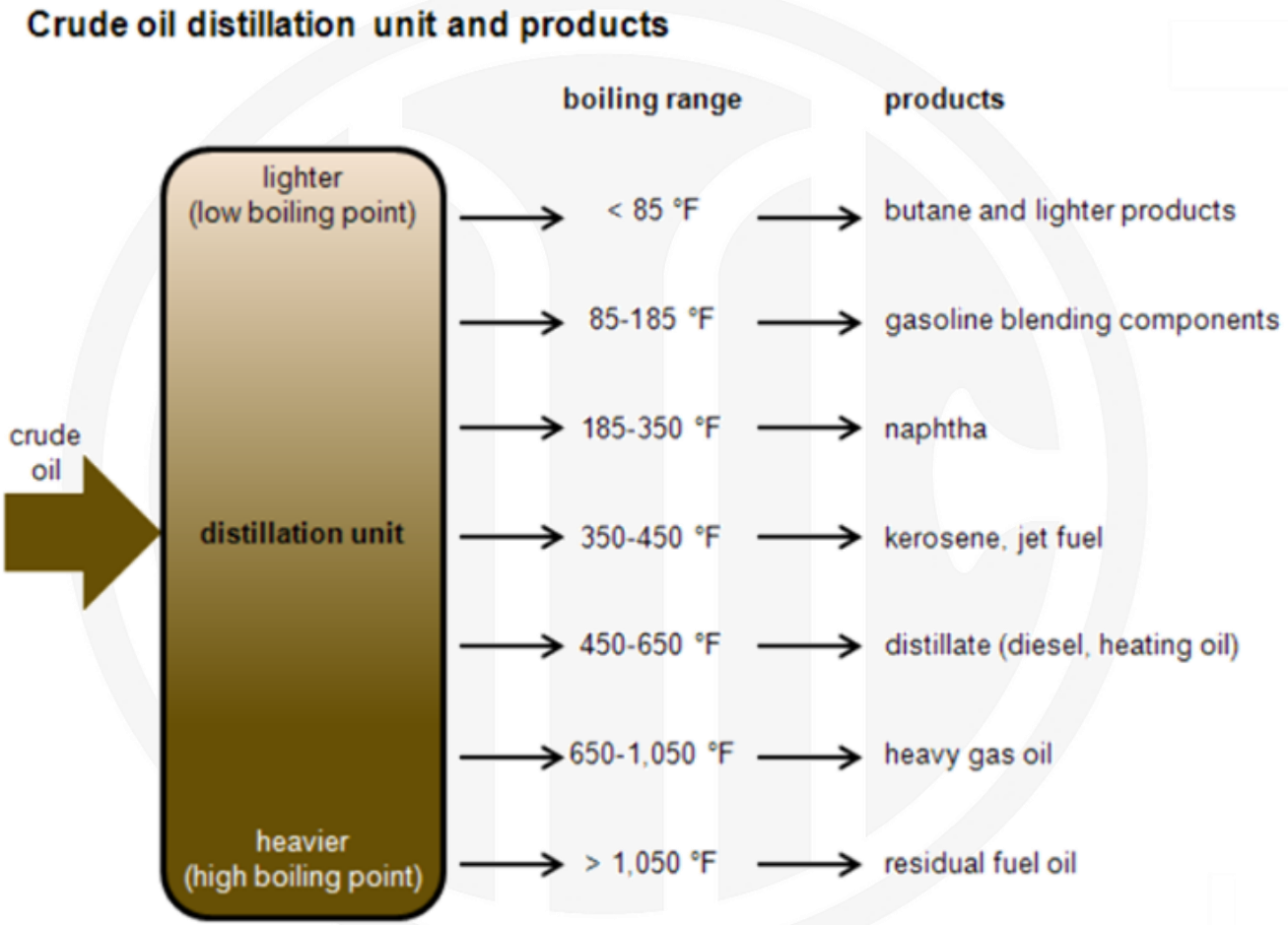
Source: CITIC Futures

炼厂环节将原油转变成为成品油

Refinery processes crude oil into oil products



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Source: EIA CITIC Futures

原油供应来自地理条件，油品需求取决于经济状况

Global crude oil production and consumption distribution

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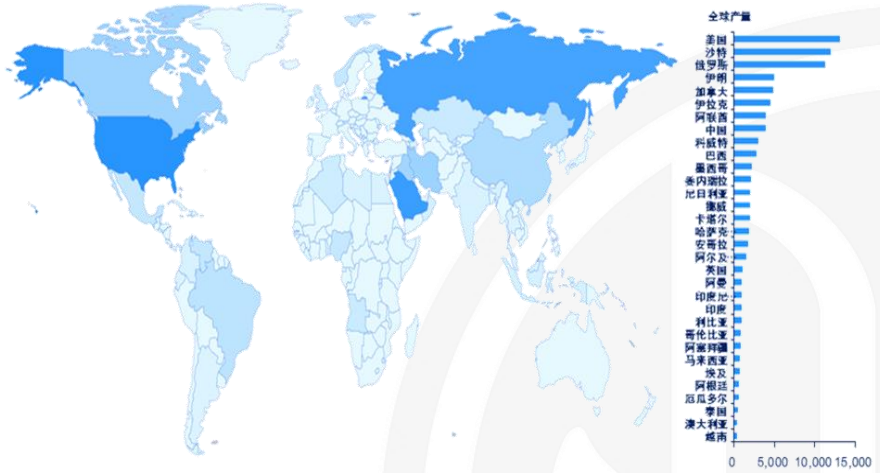
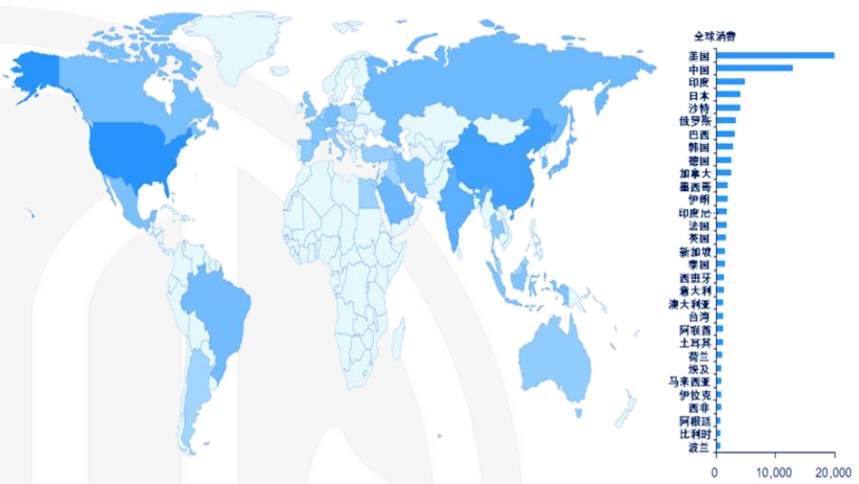
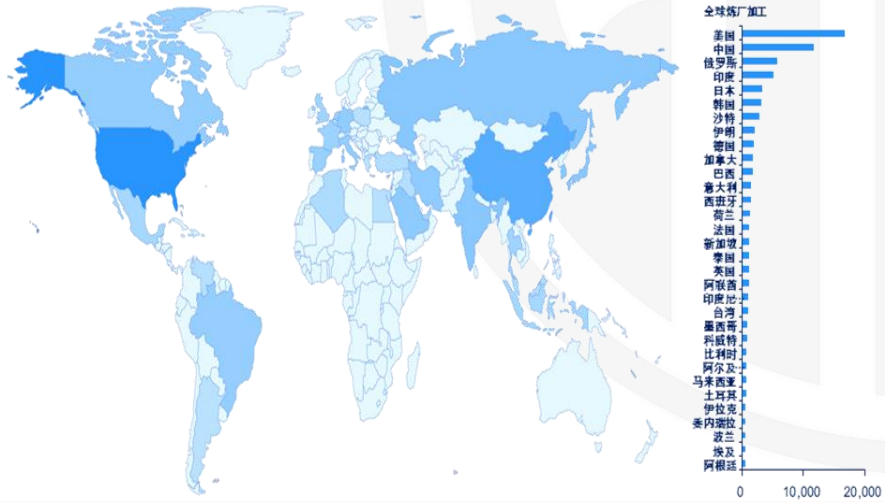
全球产量分布 Global crude oil production



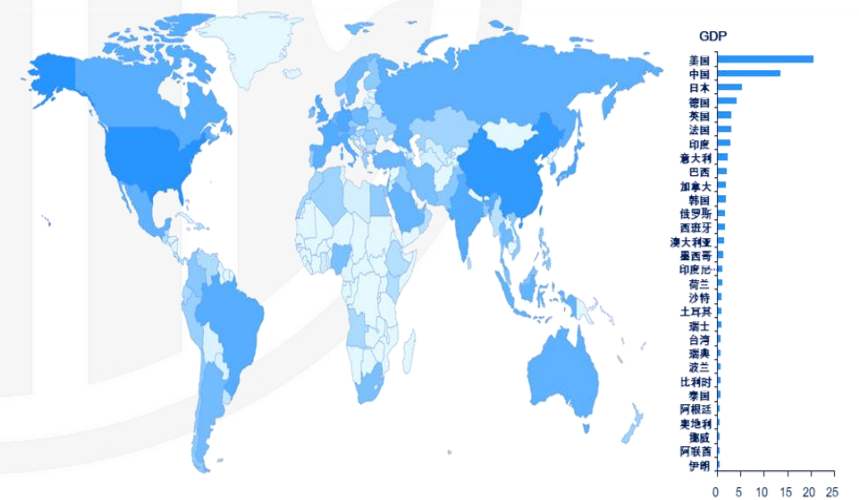
全球需求分布 Global oil consumption



全球炼厂加工量 Global refinery throughput



全球GDP总量 Global GDP



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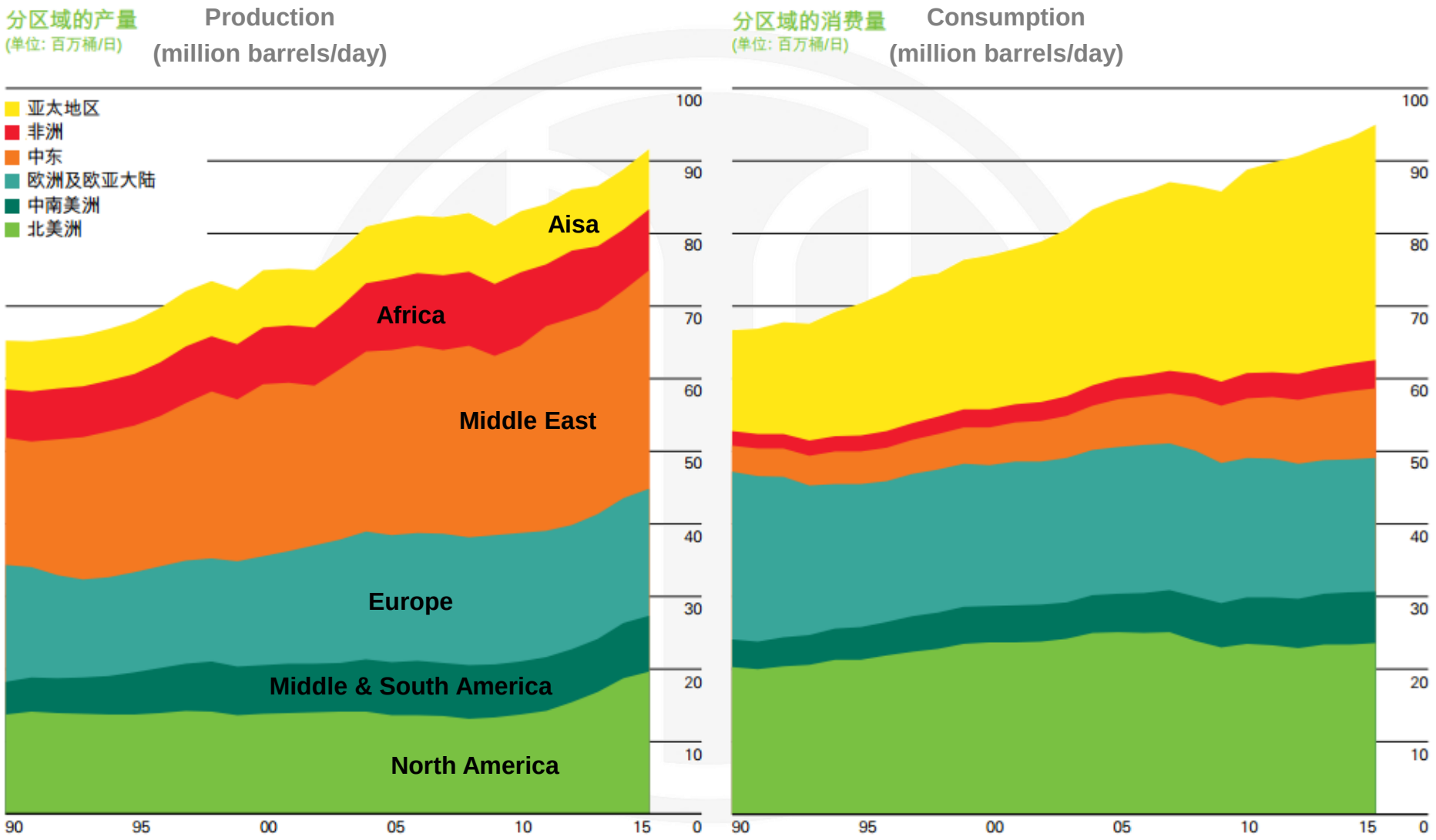
Source: EIA CITIC Futures

全球供需形成三大均衡体系

Global supply and demand balance



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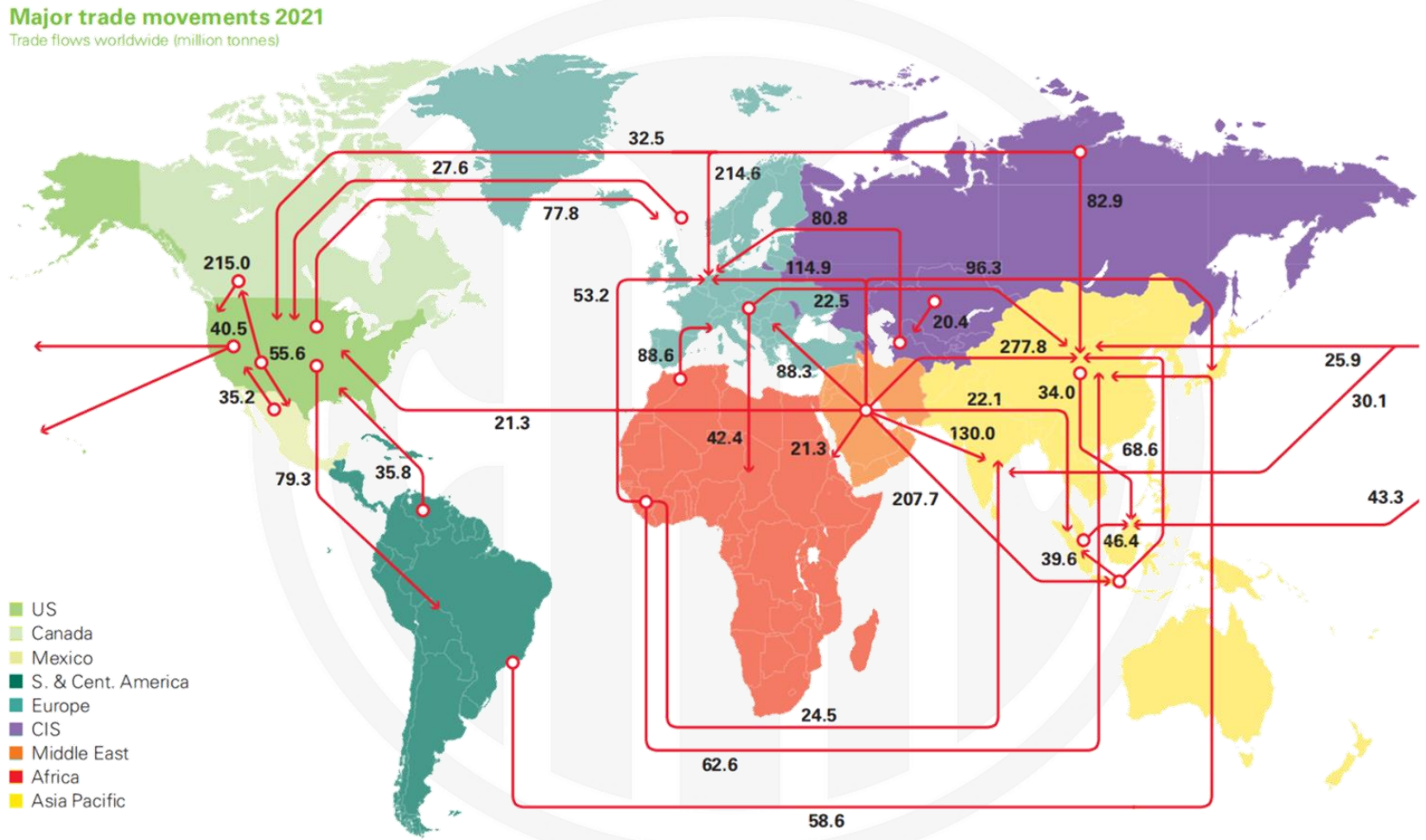
Source: BP CITIC Futures

供需格局改变影响国际贸易流向

Global oil trade flow



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Source: BP CITIC Futures

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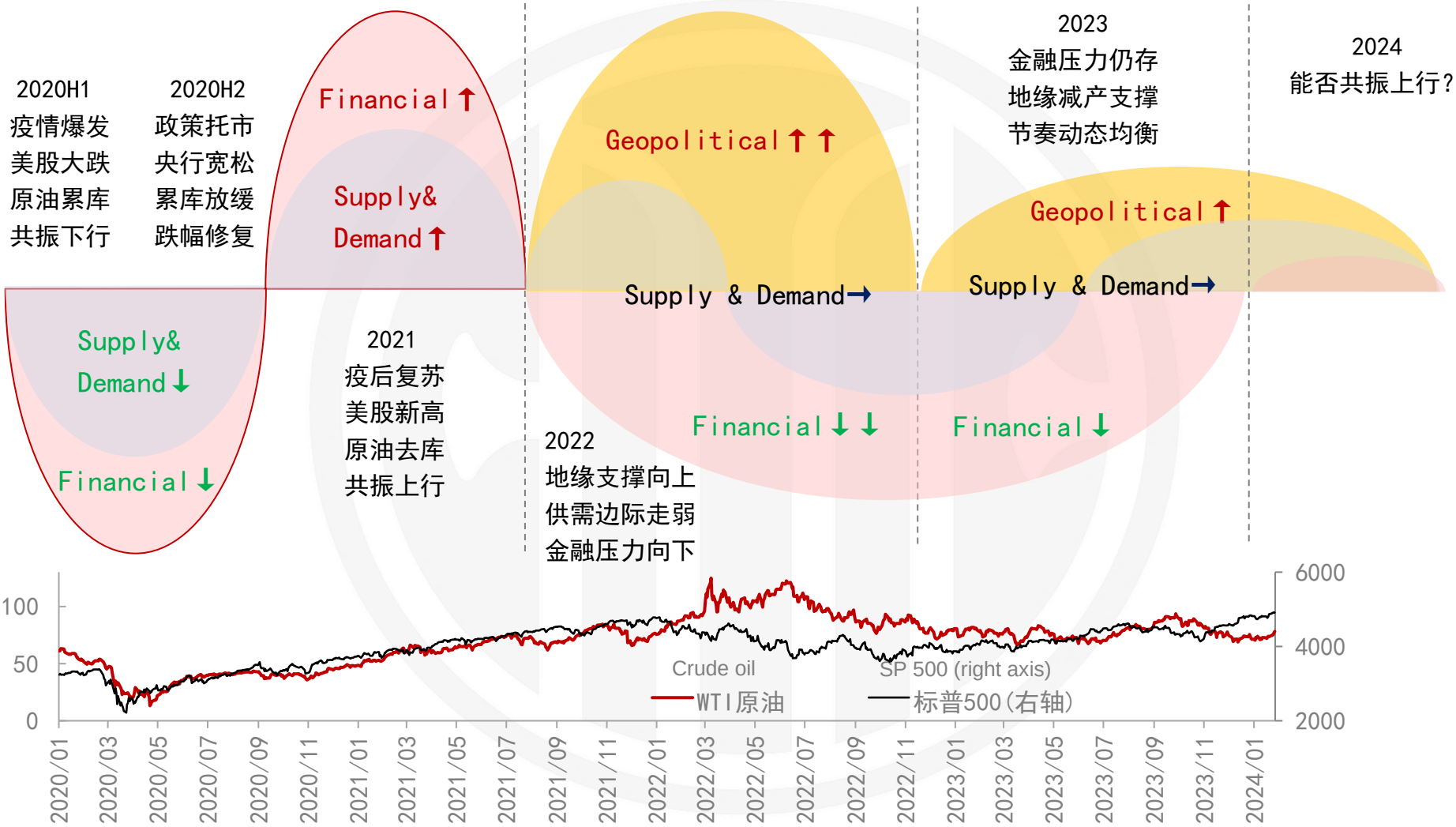
原油价格的三重属性分析框架

Crude oil price three layered influencing factors



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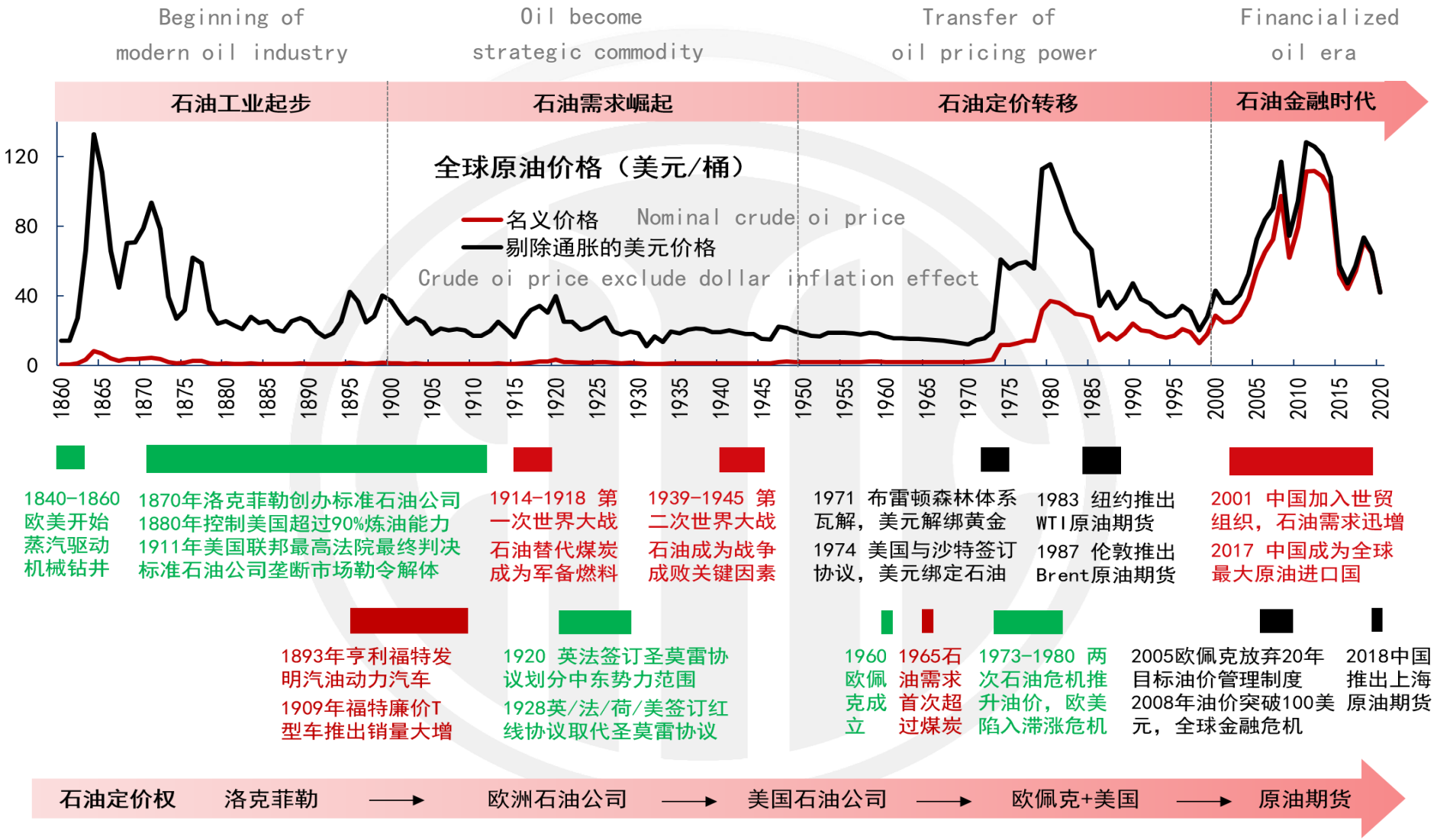
Source: Wind CITIC Futures

地缘属性：原油价格最顶层影响因素

Geopolitical: the top level influencing factor



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Source: BP CITIC Futures

金融属性：原油价格与经济周期紧密相关

Financial: crude oil price is closely related to economic cycle

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经济扩张周期 Economy expanding cycle

周期范围 Time period			原油价格收益率 Crude oil price yield		触底时间 Peak time		
开始 Start	结束 End	持续月份 Lasting months	累计 Accumulated	年化 Annualized	PMI PMI	油价 Crude oil price	滞后月份 Delayed months
1975-03	1980-01	59	132%	44%	1975-01	1974-10	-3
1980-07	1981-07	12	4%	1%	1980-05	1980-05	0
1982-11	1990-07	93	-18%	-18%	1982-05	1983-04	11
1991-03	2001-03	122	28%	4%	1991-01	1991-03	2
2001-11	2007-12	74	365%	36%	2001-10	2001-12	2
2009-06	2020-02	130	-56%	-9%	2008-12	2009-02	2
平均值 Average		82	76%	10%			2

经济衰退周期 Economy recession cycle

周期范围 Time period			原油价格收益率 Crude oil price yield		触底时间 Trough time		
开始 Start	结束 End	持续月份 Lasting months	累计 Accumulated	年化 Annualized	PMI PMI	油价 Crude oil price	滞后月份 Delayed months
1974-01	1975-03	13	38%	29%	1974-01	1974-06	4
1980-01	1980-07	6	12%	24%	1980-02	1981-02	12
1981-07	1982-11	16	-8%	-6%	1981-05	1981-05	0
1990-07	1991-03	8	-27%	-41%	1990-04	1990-10	6
2001-03	2001-11	8	-21%	-32%	1999-11	2000-09	10
2007-12	2009-06	18	-25%	-17%	2006-02	2008-07	29
2020-02	2020-04	2	-30%	-178%	2018-08	2018-10	2
平均值 Average		10	-9%	-31%			9

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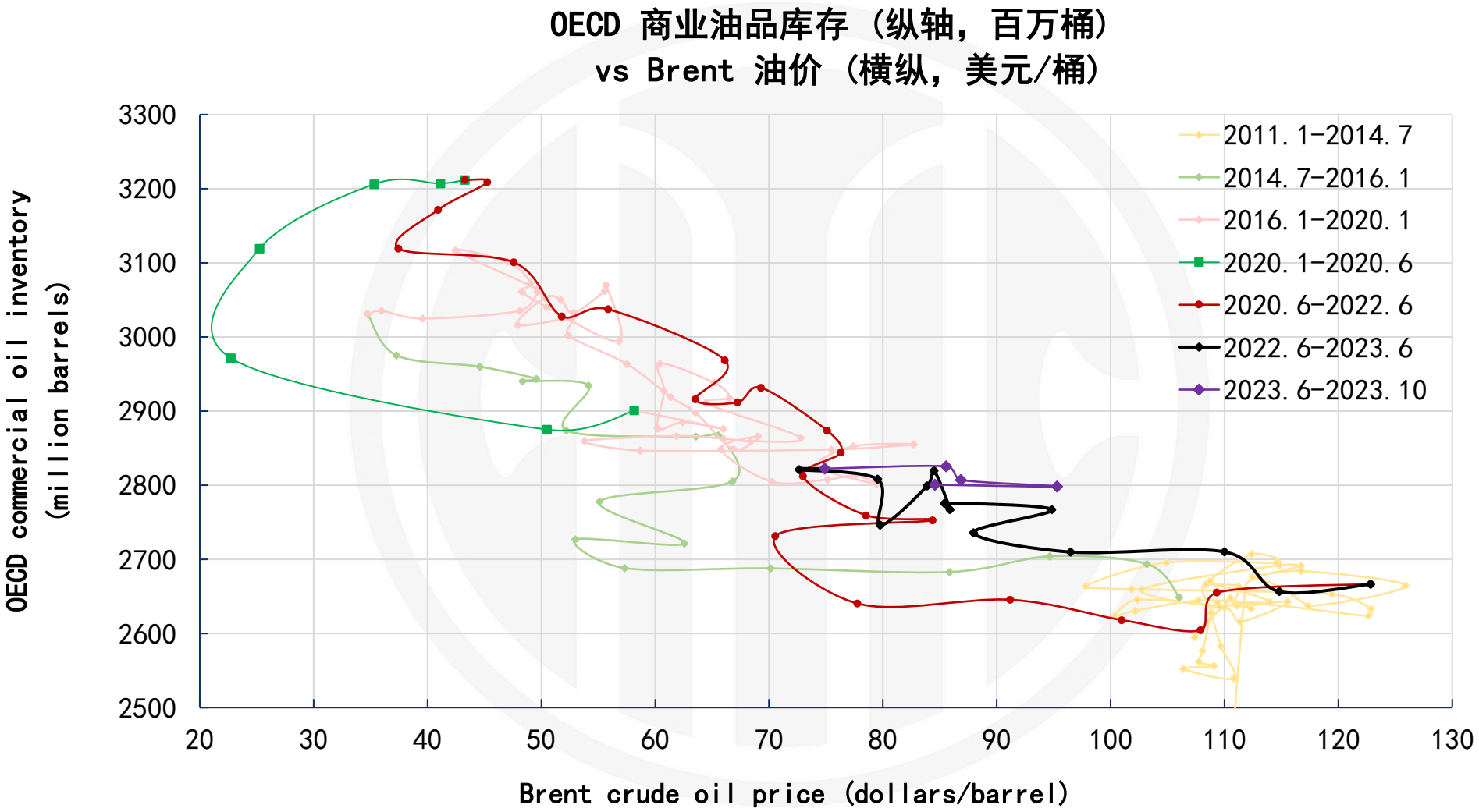
Source: NBER CITIC Futures

供需属性:可以作为原油估值参考

Supply & Demand: inventory is an effective reference for oil price



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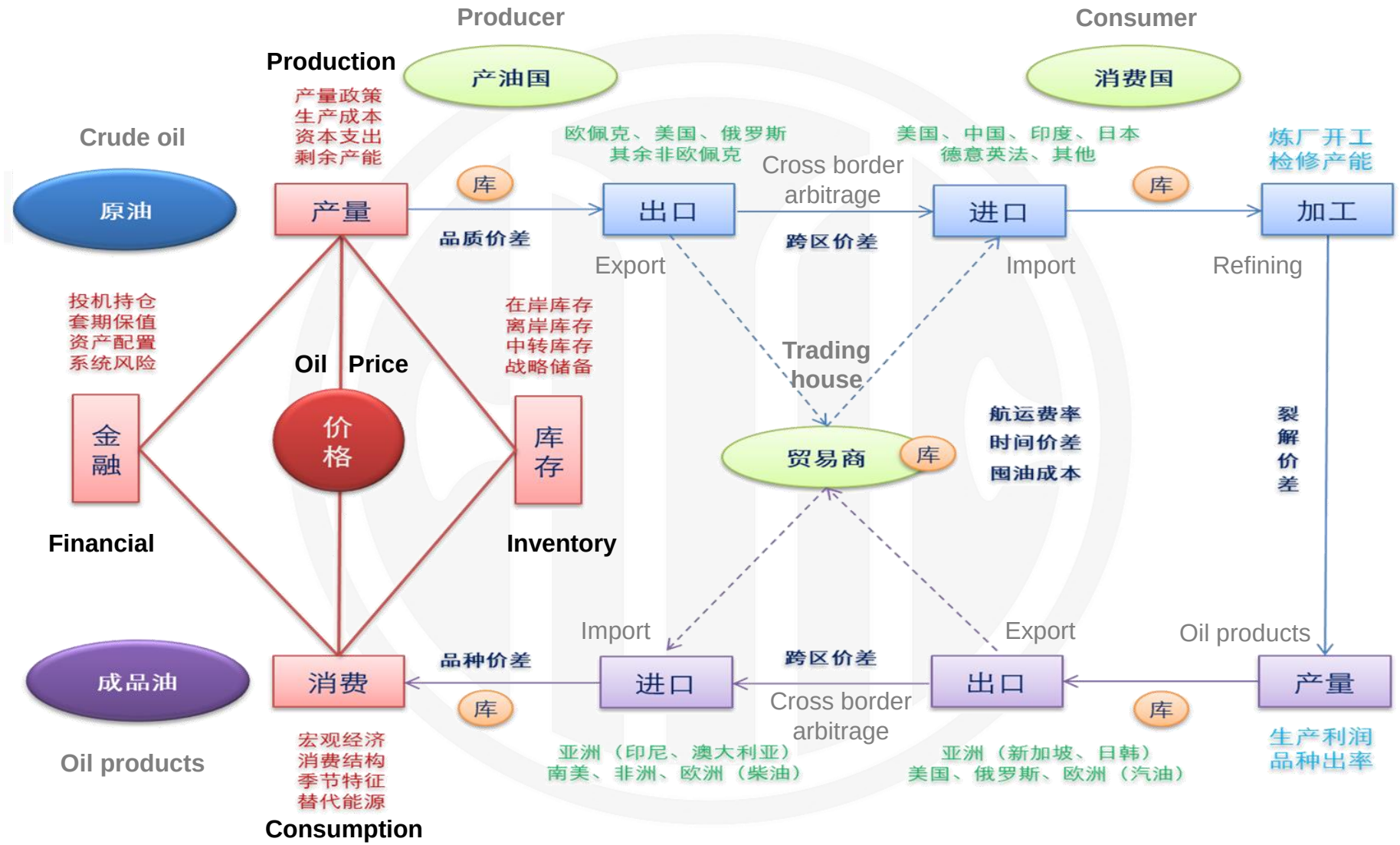
Source: IEA EIA CITIC Futures

原油供需分析框架

Crude oil supply and demand framework



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Source: CITIC Futures

原油供需平衡表

Crude oil supply and demand balance

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单位 Unit 万桶/日	年度均值					同比变化				同比增幅			
	2019	2020	2021	2022	2023	2020	2021	2022	2023	2020	2021	2022	2023
供应 Supply	Annual average(million barrels/day)					YOY (million barrels/day)				YOY(%)			
OECD	3152	3061	3112	3234	3405	-92	51	123	171	-2.9%	1.7%	3.9%	5.3%
美国	1953	1863	1897	2029	2163	-90	35	132	133	-4.6%	1.9%	7.0%	6.6%
加拿大	548	524	554	570	578	-24	30	16	8	-4.4%	5.7%	3.0%	1.4%
墨西哥	192	193	192	190	211	2	-1	-2	21	0.9%	-0.5%	-1.1%	11.0%
其他OECD	460	481	468	444	454	21	-13	-24	9	4.6%	-2.7%	-5.1%	2.1%
非OECD	6877	6330	6456	6760	6712	-548	126	304	-47	-8.0%	2.0%	4.7%	-0.7%
OPEC	3461	3070	3165	3417	3333	-391	95	252	-83	-11.3%	3.1%	8.0%	-2.4%
其中：原油	**2927**	**2560**	**2627**	**2867**	**2792**	**-367**	**67**	**240**	**-75**	**-12.5%**	**2.6%**	**9.2%**	**-2.6%**
其中：其他液体	534	510	538	550	542	-24	29	11	-8	-4.5%	5.6%	2.1%	-1.5%
前苏联	1460	1344	1374	1381	1364	-117	31	7	-17	-8.0%	2.3%	0.5%	-1.3%
中国	486	486	499	512	530	0	13	13	18	0.0%	2.7%	2.6%	3.5%
其他非OECD	1470	1430	1417	1450	1485	-40	-13	33	35	-2.7%	-0.9%	2.3%	2.4%
全球总供应 World	**10029**	**9390**	**9567**	**9994**	**10118**	**-639**	**177**	**427**	**124**	**-6.4%**	**1.9%**	**4.5%**	**1.2%**
需求Demand													
OECD	4775	4201	4479	4566	4580	-573	278	87	14	-12.0%	6.6%	1.9%	0.3%
美国	2054	1819	1988	2001	2014	-235	169	14	13	-11.5%	9.3%	0.7%	0.6%
其他	12	12	12	12	12	0	0	0	-1	-2.0%	1.8%	0.0%	-4.2%
加拿大	249	219	228	228	229	-30	8	1	1	-12.0%	3.8%	0.3%	0.4%
欧洲	1430	1242	1311	1351	1354	-188	70	40	3	-13.2%	5.6%	3.0%	0.2%
日本	377	336	342	337	333	-40	5	-5	-4	-10.7%	1.6%	-1.4%	-1.3%
其他OECD	653	574	599	636	639	-79	25	37	3	-12.1%	4.4%	6.2%	0.4%
非OECD	5315	4957	5234	5352	5518	-358	277	118	166	-6.7%	5.6%	2.3%	3.1%
欧亚大陆	488	453	467	452	459	-36	15	-15	6	-7.3%	3.2%	-3.2%	1.4%
欧洲	77	71	75	76	76	-7	4	1	0	-8.6%	5.6%	1.8%	0.3%
中国	1401	1443	1527	1515	1593	42	84	-12	78	3.0%	5.8%	-0.8%	5.1%
其他亚洲	1369	1234	1315	1369	1413	-135	81	54	44	-9.9%	6.5%	4.1%	3.2%
其他非OECD	1979	1756	1850	1939	1977	-223	94	90	38	-11.3%	5.3%	4.8%	1.9%
全球总需求 World	**10089**	**9158**	**9712**	**9917**	**10098**	**-931**	**554**	**205**	**181**	**-9.2%**	**6.1%**	**2.1%**	**1.8%**
库存净变化 Δ Inventory	**-60**	**232**	**-145**	**77**	**20**								

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Source: CITIC Futures

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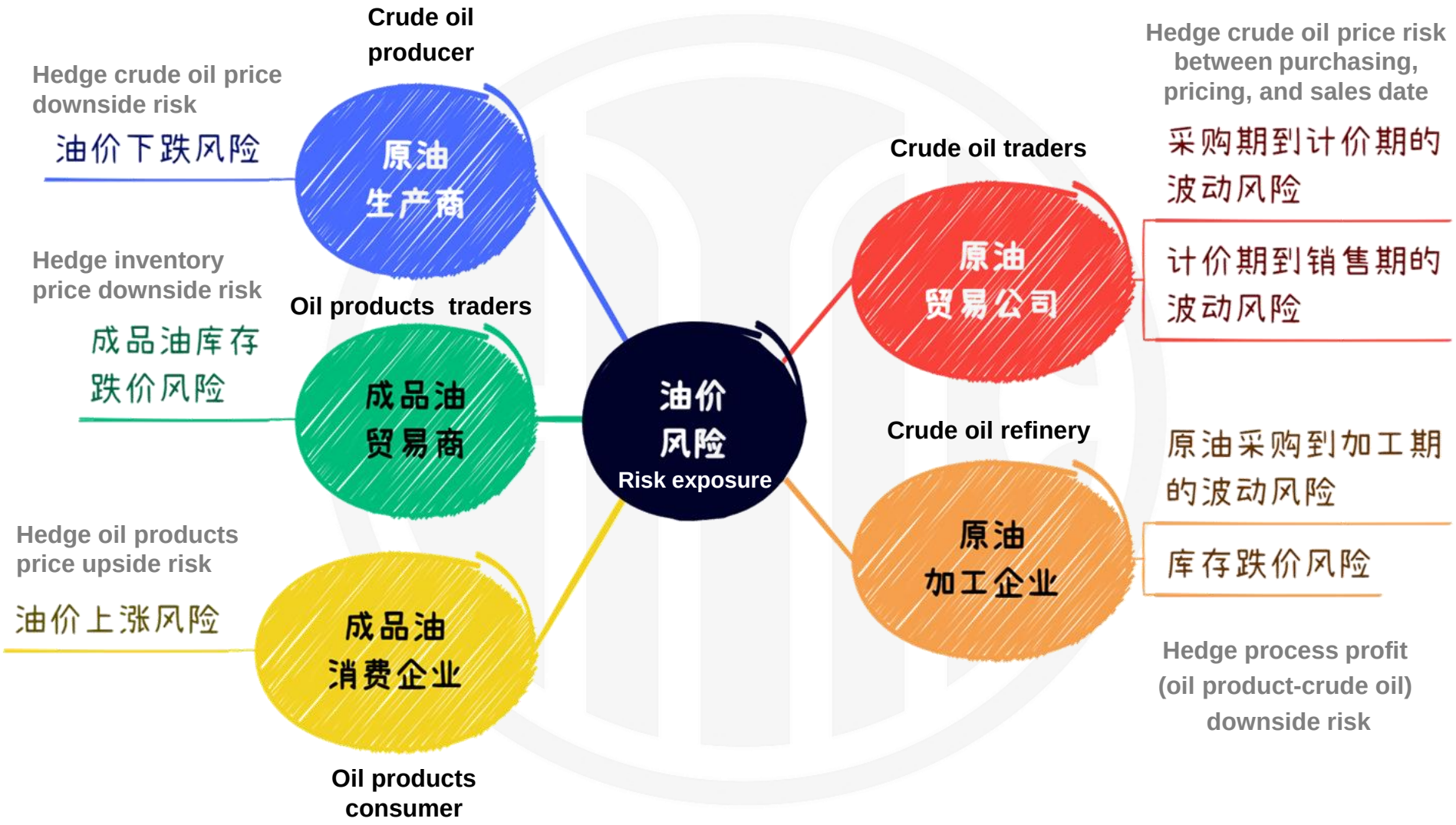
石油公司的油价风险敞口

Oil price risk exposure of oil companies



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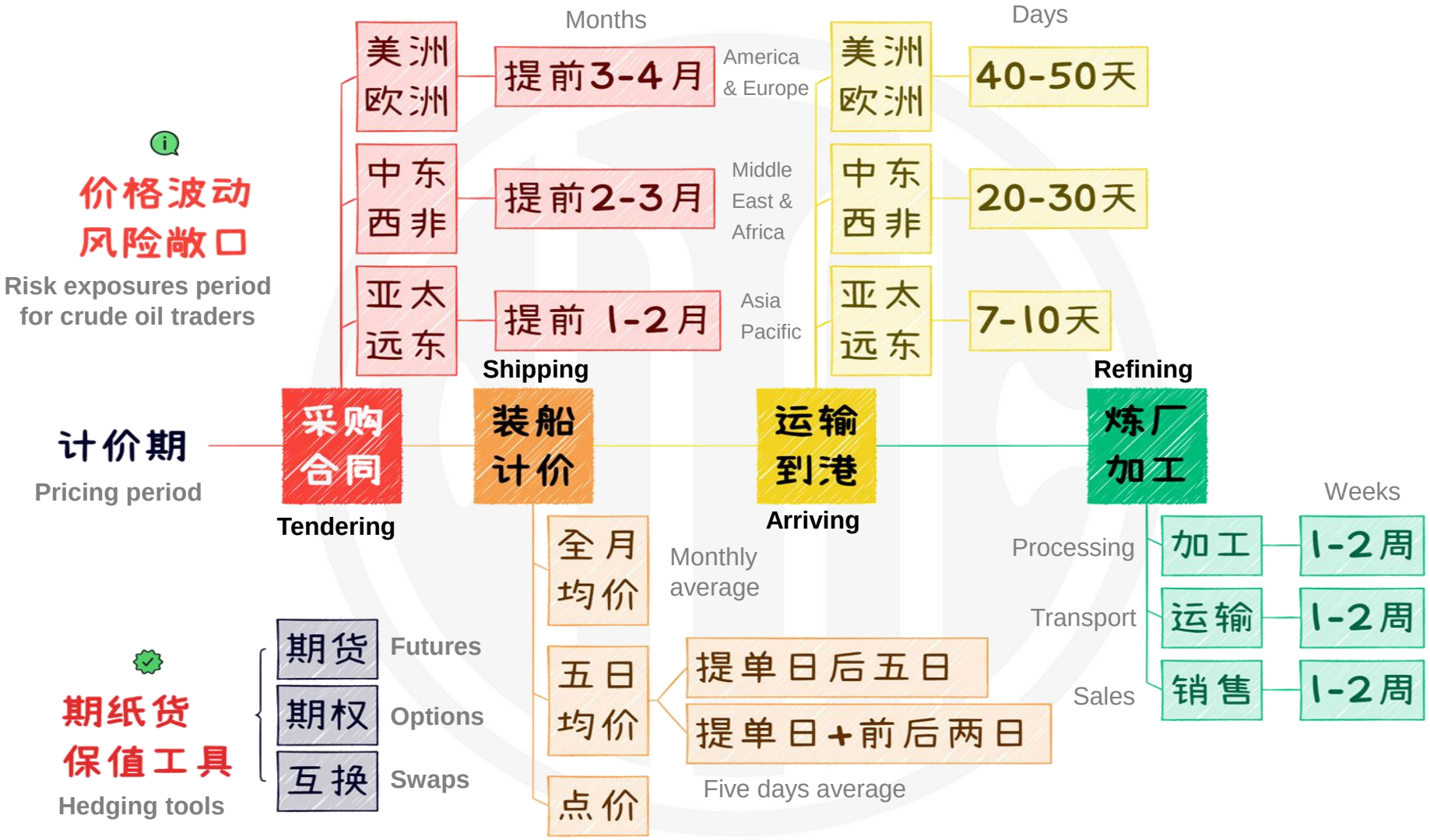
Source: CITIC Futures

原油贸易价值链周期

Crude oil trading price exposure period



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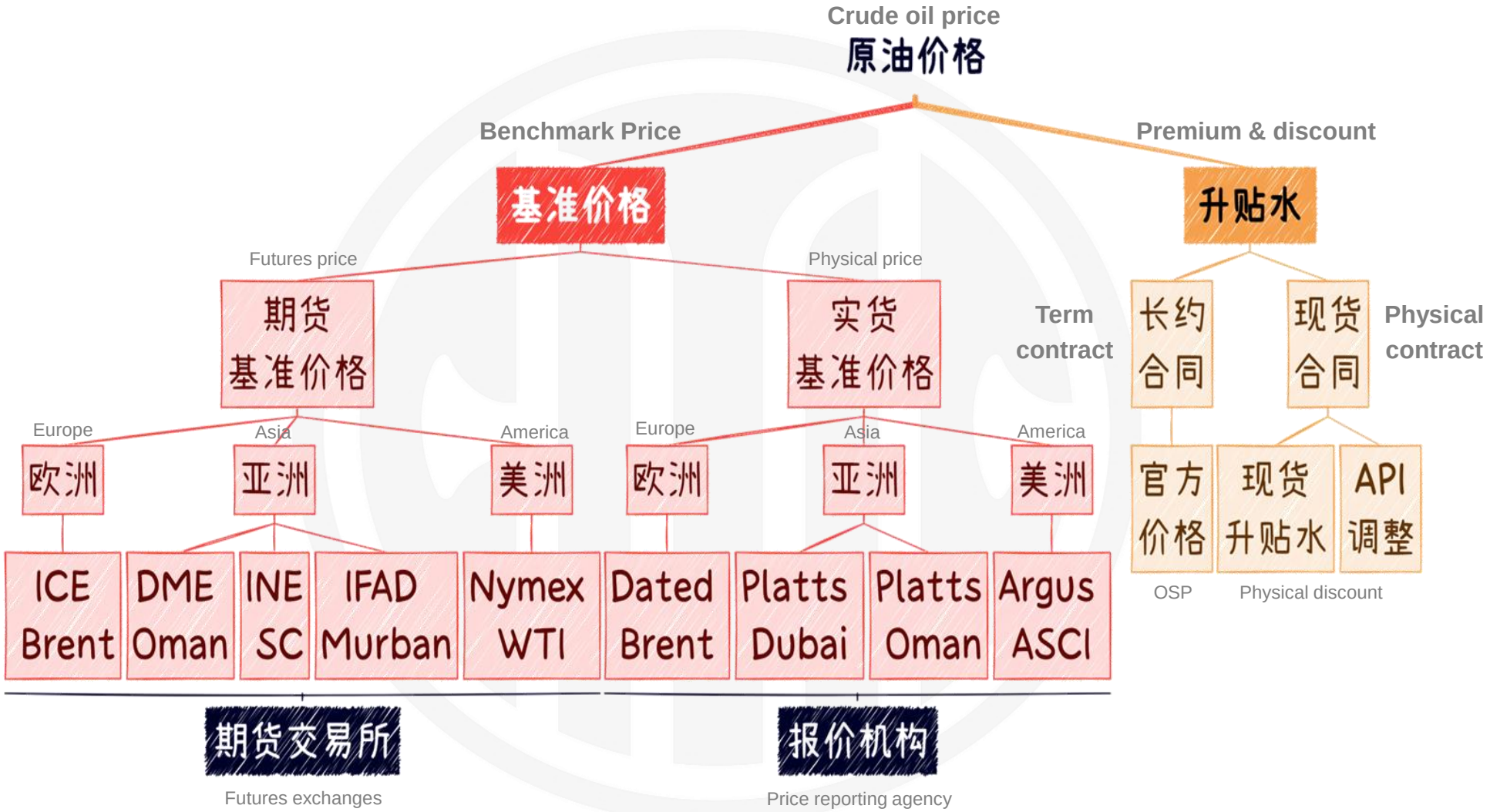
Source: CITIC Futures

根据基准价格选择合适的保值工具

Choosing hedging tools based on benchmark system



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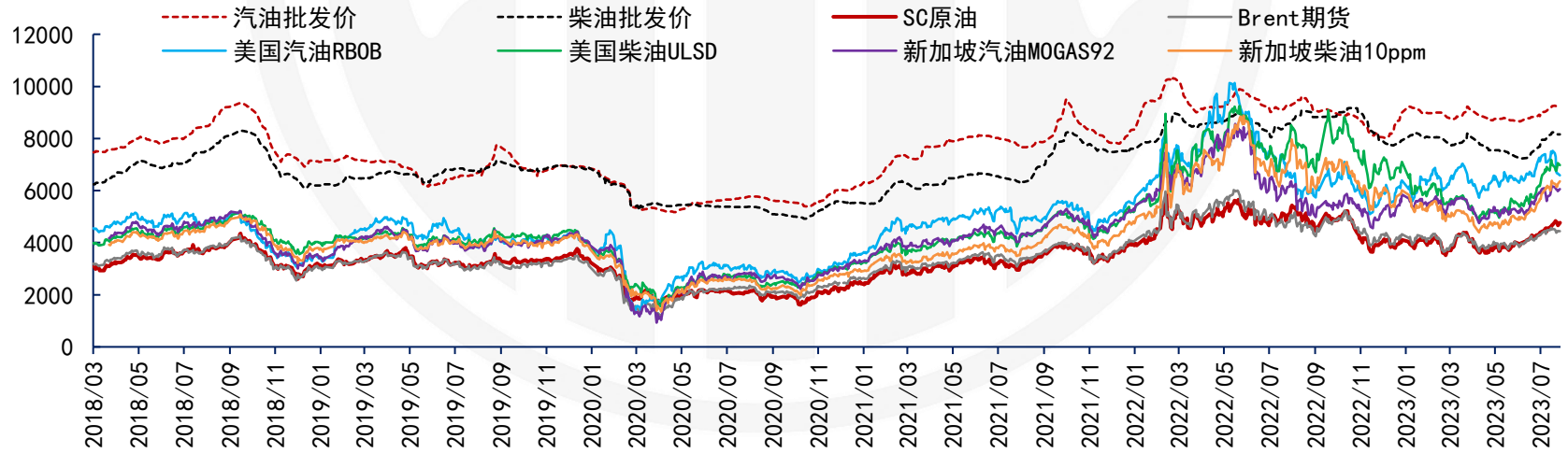
Source: CITIC Futures

中国汽柴油批发价与中国原油期货相关性最高

China gasoline and gasoil price has the highest correlation with SC

2018/3-2023/7	Crude oil futures 全球原油期货			Global oil products derivatives 海外成品油期纸货					China oil products futures 中国油品期货			
价格相关性 Price correlation	原油 SC China	原油 Brent UK	原油 WTI US	汽油 新加坡 MOGAS Singapore gasoline	汽油 Nymex RBOB US gasoline	柴油 新加坡 10ppm Singapore gasoil	柴油 Nymex ULSD US gasoil	柴油 ICE Gasoil UK gasoil	低硫燃料油 LU Low sulfur fuel oil	沥青 BU Bitumen	高硫燃料油 FU High sulfur fuel oil	液化石油气 LPG Liquid petroleum gas
中国汽油 China gasoline	0.915	0.923	0.907	0.903	0.878	0.886	0.872	0.877	0.883	0.856	0.863	0.796
山东汽油 Shandong gasoline	0.909	0.920	0.909	0.905	0.884	0.875	0.863	0.865	0.860	0.860	0.856	0.768
中国柴油 China gasoil	0.941	0.888	0.871	0.851	0.825	0.912	0.910	0.910	0.892	0.851	0.786	0.776
山东柴油 Shandong gasoil	0.941	0.884	0.859	0.906	0.816	0.906	0.897	0.906	0.892	0.843	0.787	0.795

中国汽柴油批发价与原油和海外汽柴油期纸货价格走势（元/吨）



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Source: CITIC Futures

原油期货合约比较

Crude oil futures comparison

	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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Source: INE ICE Nymex CITIC Futures

中国原油期货可交割油种

Deliverable grades of SC crude oil futures

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 Paolo, 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。

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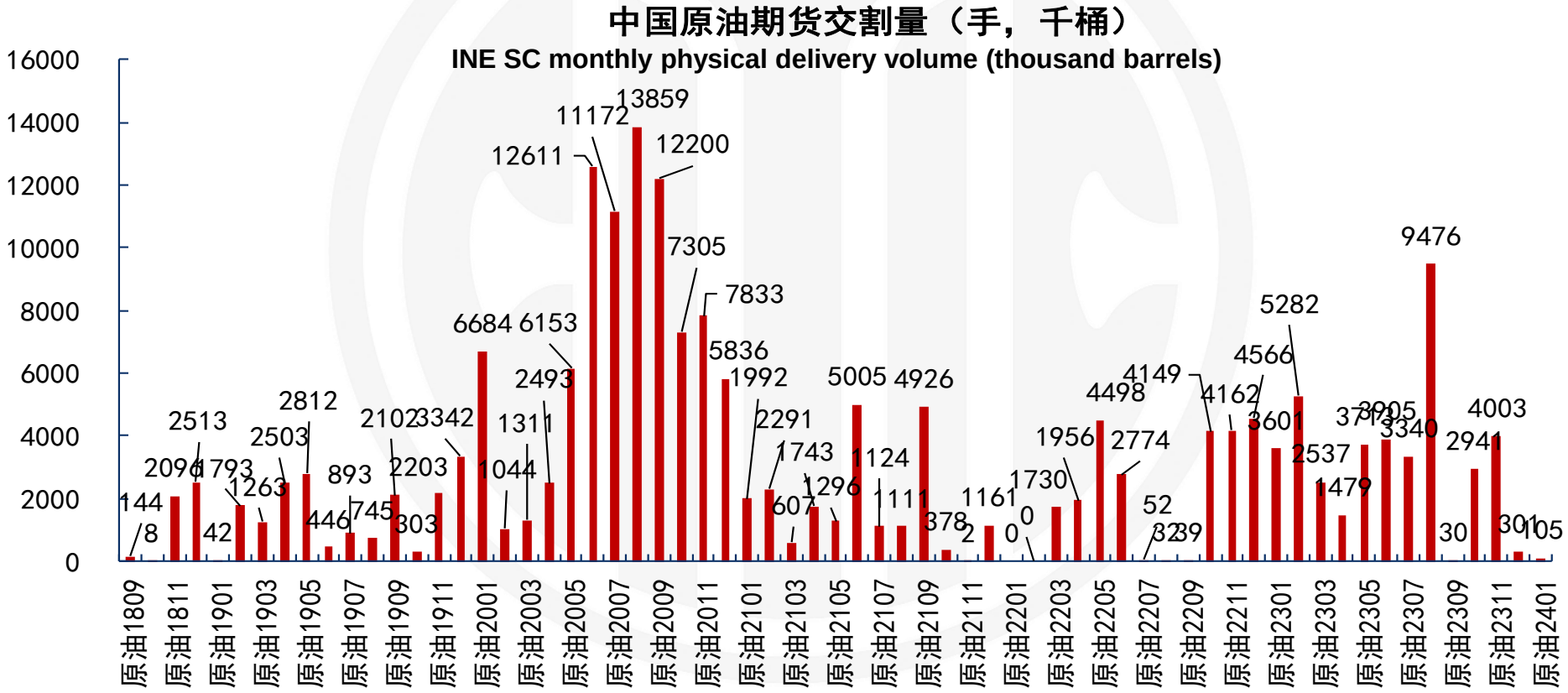
Source: INE CITIC Futures

中国原油期货实物交割量
Physical delivery volume of SC crude oil futures

- Since 26th March 2018, the accumulated physical delivery volume of 65 historical contracts is 200 million barrels.

2018年3月26日中国原油期货上市以来，65个历史合约累计交割量2亿桶。



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Source: INE CITIC Futures

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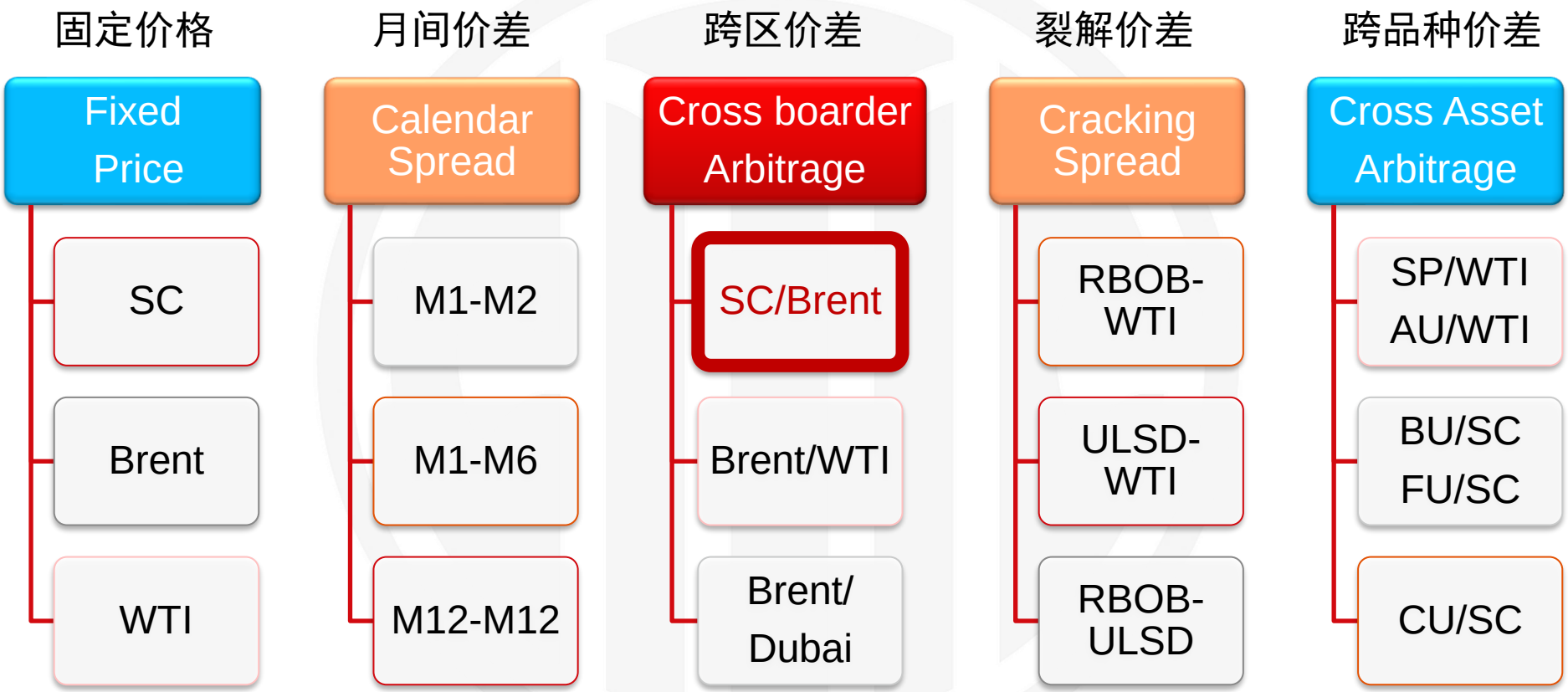
Trading opportunity 交易机会



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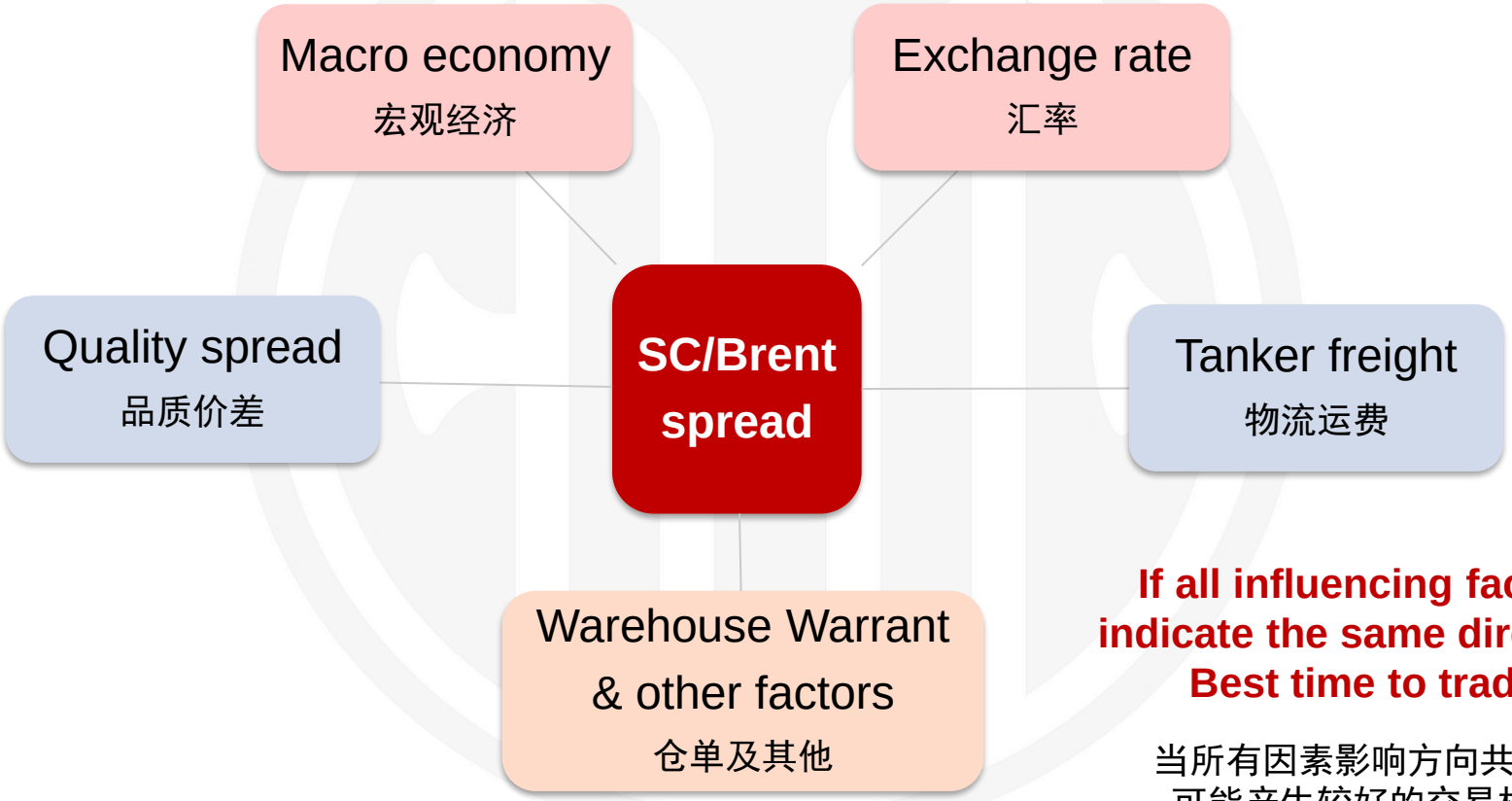
What factors influence SC/Brent spread? 影响因素

SC → （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

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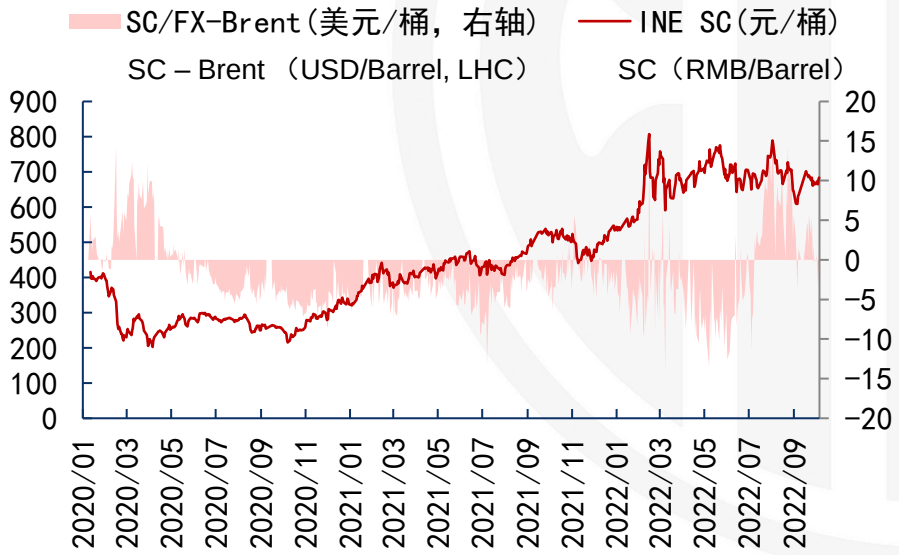
1. Macro economy 宏观经济

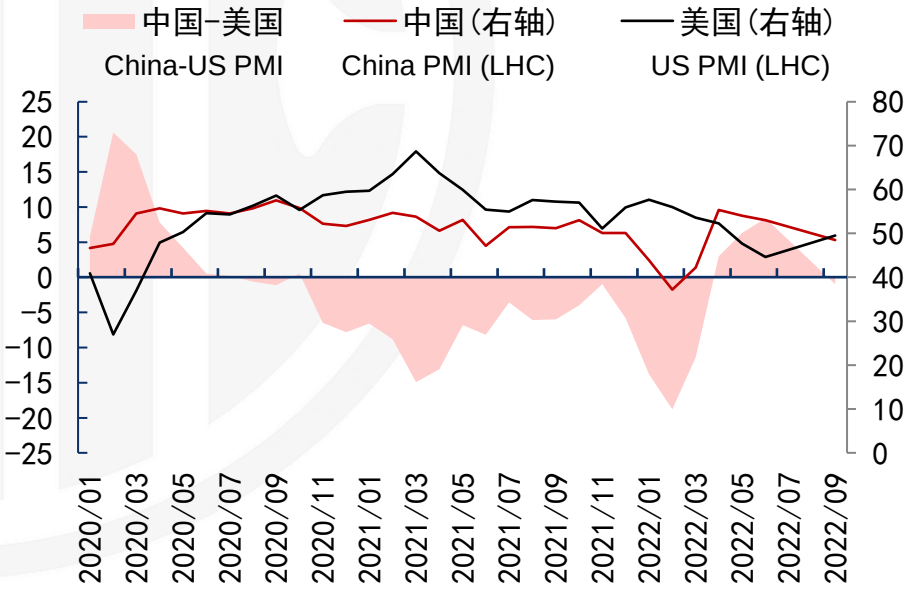
- Although global crude oil price are highly correlated, different crude oil futures reflect base country fundamental characteristics. Macro economy is the underlying driver for commodity demand, which influences the price difference. For example, SC/Brent futures spread show very similar pattern with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



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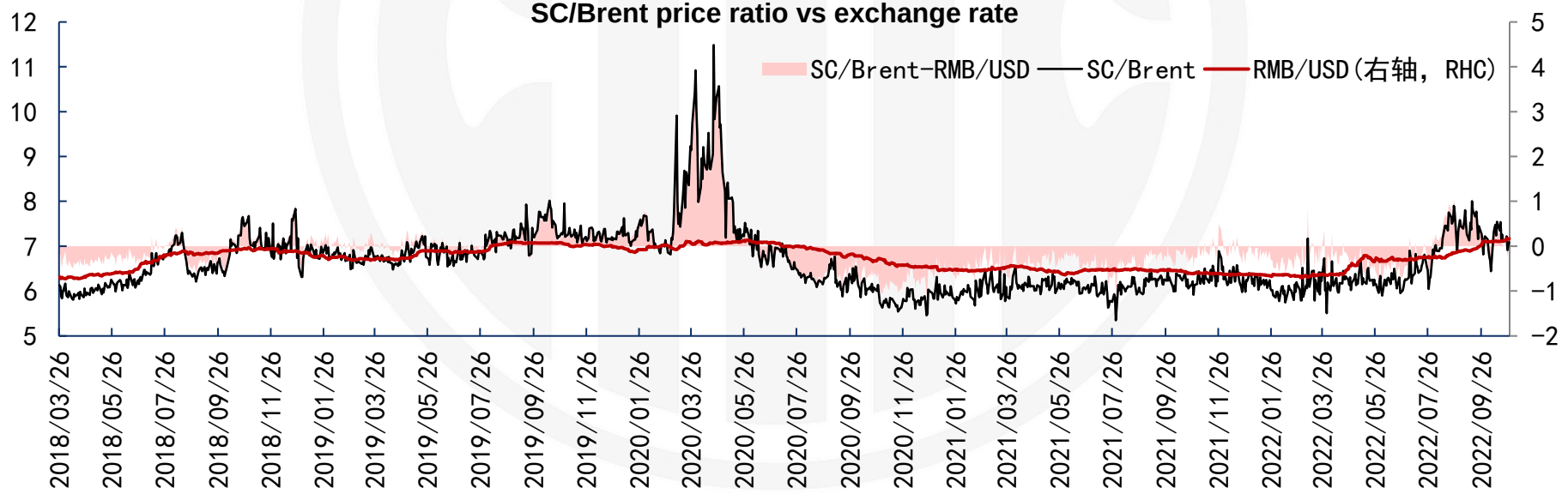
2. Exchange rate 汇率

- 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）

SC/Brent price ratio vs exchange rate



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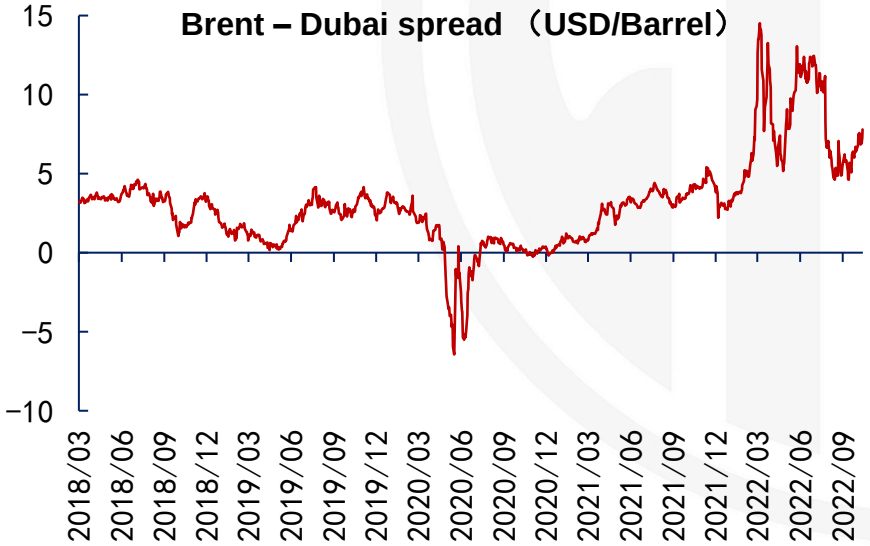
3. Quality spread 品质价差

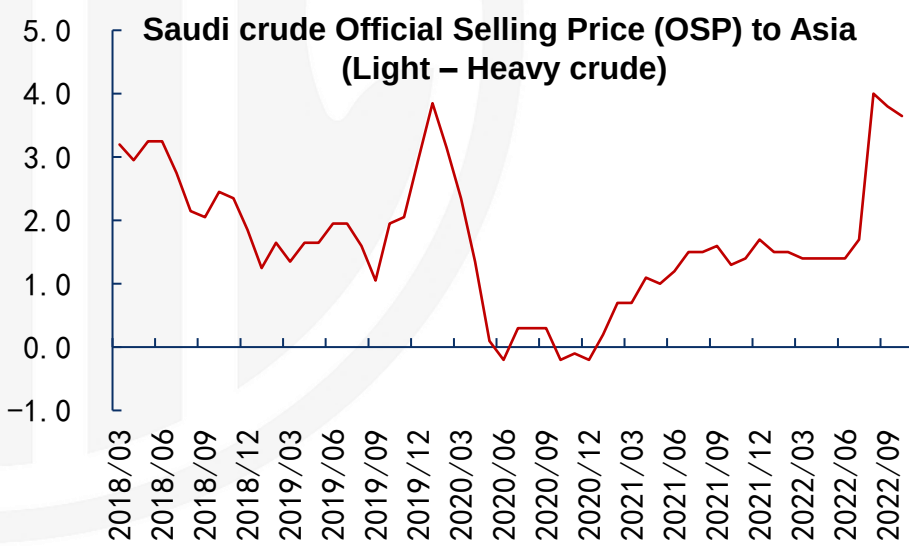
- Economy and forex influence SC/Brent spread from the financial aspects, while quality difference is the crude oil specific industry component. The underlying products of SC are medium sour crude oil, while Brent is light sweet crude oil, thus the spread should reflect the quality difference between 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。

Brent对Dubai价格升水（美元/桶）



沙特对亚洲出口官价（轻质-重质）



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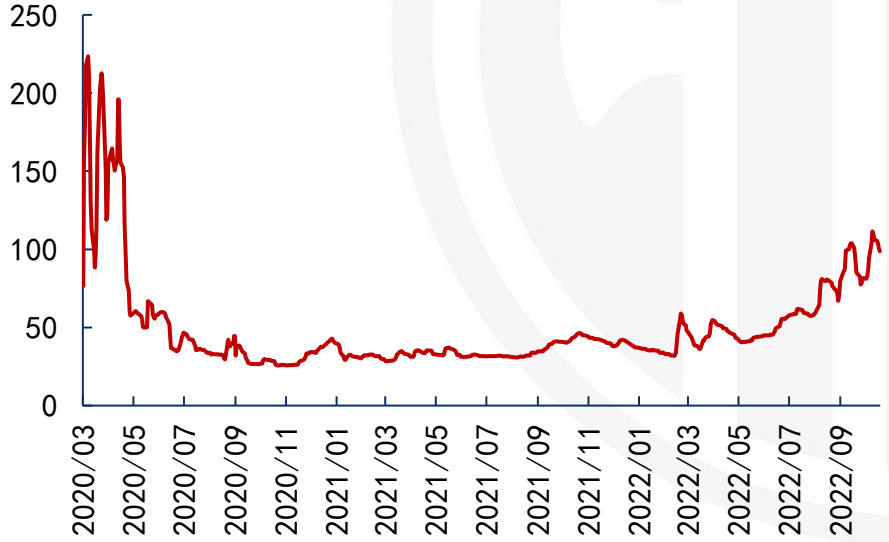
4. Tanker Freight 运费

- 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年疫情期间可能造成运费大幅波动。

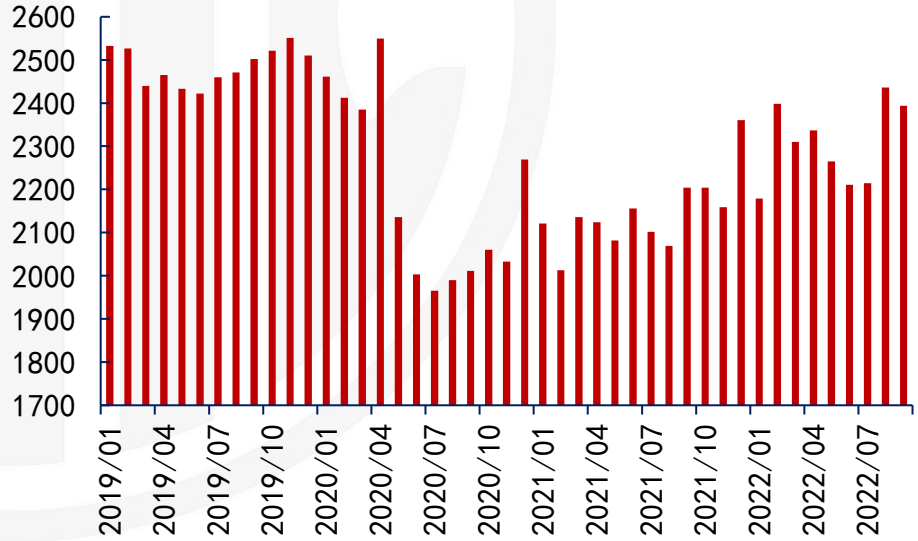
中东到中国原油海运费率（WS）

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)



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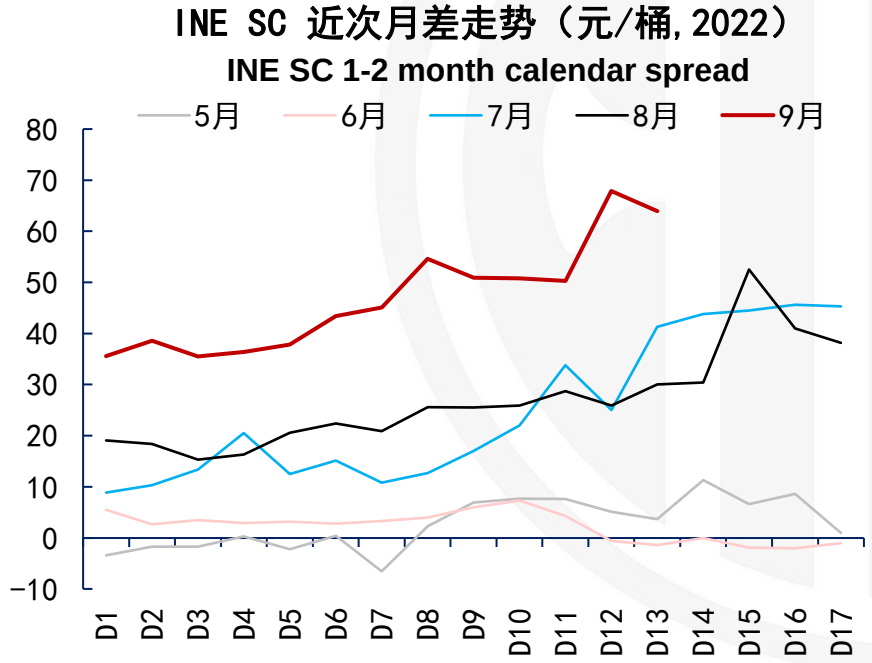
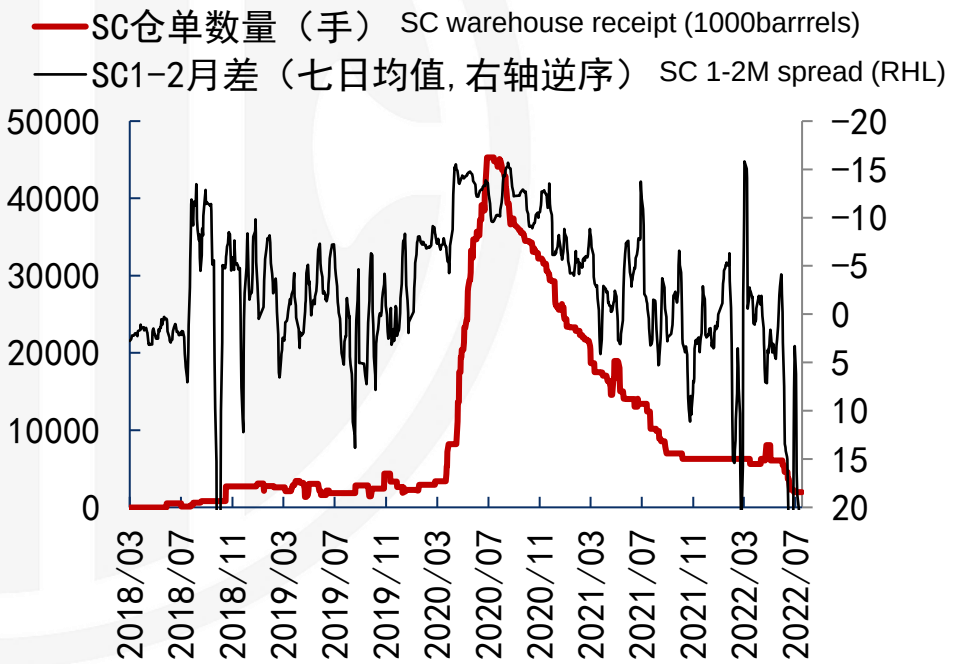
5. Warehouse Warrant 仓单

- 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 maybe 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。





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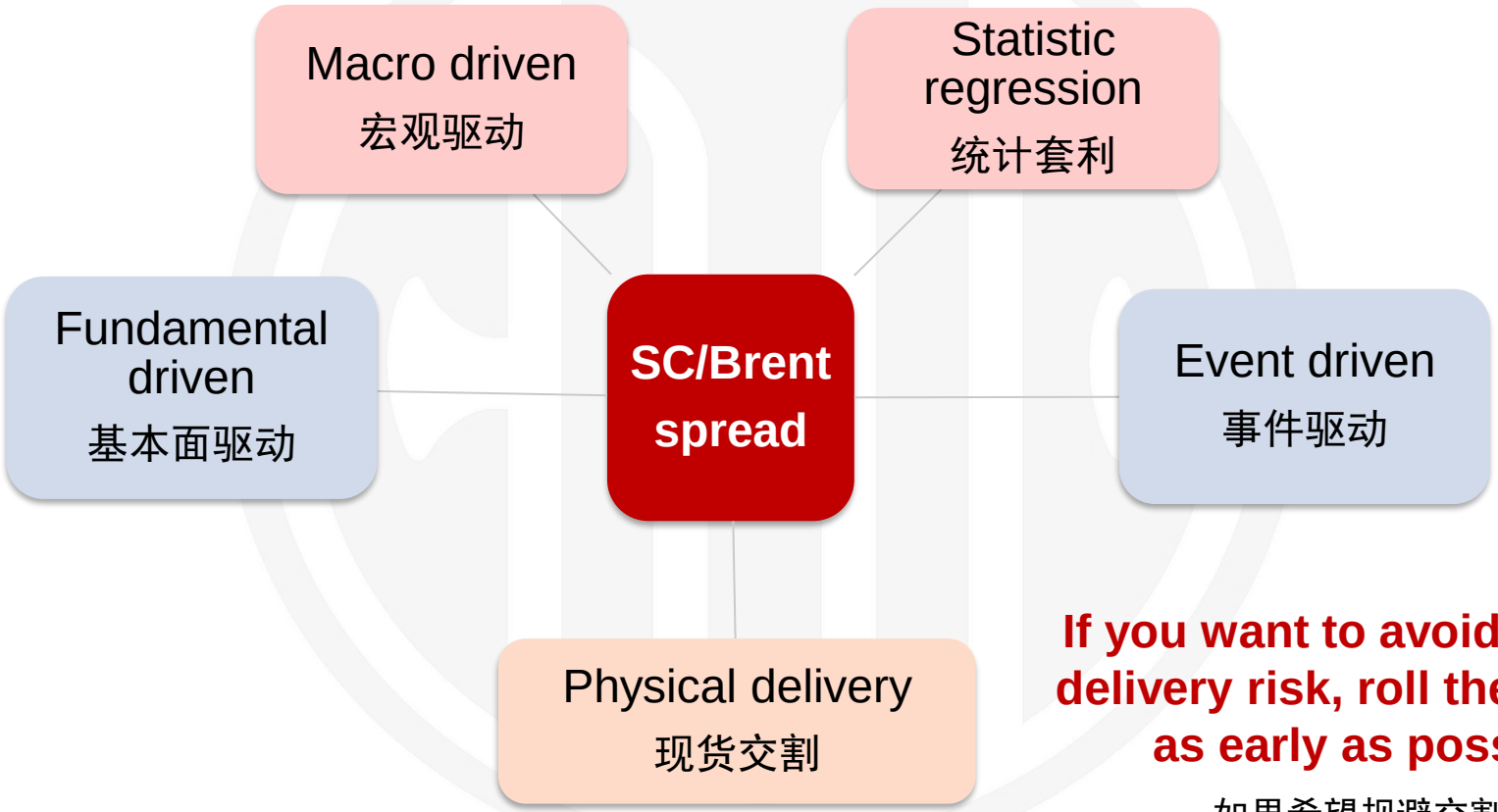
Arbitrage strategies 套利策略

SC → （Brent + Dubai swap / Brent EFS + Freight + other Fees）* Exchange rate



If you want to avoid physical delivery risk, roll the 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

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