2023

上海原油期货和期权市场发展报告

2023 Development Report of Shanghai Crude Oil Futures and Options Market

上海期货交易所 SHANGHAI FUTURES EXCHANGE
上海国际能源交易中心 SHANGHAI INTERNATIONAL ENERGY EXCHANGE

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Milestones

上海原油期货大事记

2018

2018.03.15 上期能源完成香港自动化交易服务（ATS）注册。

2018.03.26 原油期货作为中国首个国际化商品期货上市。

2018.06.20 国内首船期货原油卸至大连中石油国际储运有限公司指定交割库。

2018.11.15 获得新加坡金融管理局（MAS）批准，成为认可的市场经营者（RMO）。

2019

2019.03.26 发布原油价格指数。

2019.10.30 增加中石化海南原油期货交割存放点，核定库容 100 万立方米，启用 40 万立方米。

2020

2020.04.16 增加大连北方油品储运有限公司作为原油期货指定交割仓库，增加大连中石油国际储运有限公司国际储备库作为原油期货指定交割仓库存放点。

2020.04.17 增加中化弘润石油储运（潍坊）有限公司作为原油期货指定交割仓库。

2020.04.20 达上市以来最高持仓量 18.84 万手。

2020.04.24 增加中国石化集团石油商业储备有限公司广东省湛江市临港工业园兴港大道湛江商储分公司、河北省唐山市曹妃甸工业区曹妃甸商储分公司作为原油期货指定交割仓库存放点。

2020.05.19 达上市以来最高成交量 49.48 万手。

2020.06.03 上期所和上期能源被纳入欧洲证券及市场管理局（ESMA）的第三国交易场所交易后透明度评估正面清单。

2020.08.01 达上市以来单月最大交割量 1385.9 万桶。

2020.09.07 增加大连中石油国际储运有限公司广西中石油国际储备库作为原油期货指定交割仓库存放点。

2020.10.12 推出原油期货结算价交易指令（TAS），发布日中交易参考价（Marker Price）。

2020.12.01 穆尔班原油被列入上海原油期货的可交割油种之中。自 2021 年 6 月 1 日起，穆尔班原油可入库生成标准仓单，并用于期货交割。

2021

2021.02.03 增加大鼎油储有限公司位于浙江省舟山市定海区临城街道岙山东路油库成为原油期货存放点。

2021.02.09 同意青岛海业摩科瑞仓储有限公司位于山东省青岛市黄岛区董家口港区港润大道油库成为原油期货存放点。

2021.06.21 原油期权在上期能源正式挂牌交易。

2022

2022.05.10 发布原油期货月均结算价。

2022.06.21 同意国投（洋浦）油气储运有限公司位于海南省洋浦经济开发区化学工业园区园一路北侧的油库成为我中心原油期货存放点。

2022.06.24 巴士拉中质原油和图皮原油被列为上海原油期货的可交割油种。自 2022 年 11 月 1 日起，巴士拉中质原油、图皮原油可生成标准仓单，并用于期货交割。

2022.07.06 达上市以来最高成交量 51.6 万手。

2022.09.02 QFI 可参与原油期货、期权等品种交易。

2022.12.31 境外参与者涵盖 6 大洲（亚洲、非洲、欧洲、北美洲、大洋洲、南美洲）近 30 个国家和地区。

待续……

2018

2018.03.15 INE completed the registration for Hong Kong Automated Trading Services (ATS).

2018.03.26 Shanghai crude oil futures debuted as China' s first commodity futures product open to international investors.

2018.06.20 The first ship of deliverable crude oil futures was unloaded into the designated delivery storage facility of Dalian PetroChina International Warehousing & Transportation Co., Ltd.

2018.11.15 INE was approved by the Monetary Authority of Singapore (MAS) as a Recognized Market Operator (RMO).

2019

2019.03.26 INE launched the crude oil price index.

2019.10.30 Sinopec Hainan company became a storage site of crude oil futures delivery, with an approved capacity of 1,000,000 cubic meters and an active capacity of 400,000 cubic meters.

2020

2020.04.16 Dalian North Oil Petroleum Logistics Co., Ltd. became a designated delivery storage facility, and Dalian PetroChina International Warehousing & Transportation Co., Ltd. became a storage site of designated delivery storage facility.

2020.04.17 Sinochem-Hongrun Oil Staging (Weifang) Co., Ltd. was approved as a designated delivery storage facility for crude oil futures.

2020.04.20 The open interest hit a new high of 188,400 lots.

2020.04.24 Sinopec Petroleum Reserve Co., Ltd. Zhanjiang Branch at Lingang Industrial Zone, Xinggang Avenue, Zhanjiang, Guangdong Province, and Sinopec Petroleum Reserve Co., Ltd. Caofeidian Branch at Caofeidian Industrial Zone, Tangshan, Hebei Province became the storage points for designated delivery storage facility.

2020.05.19 The trading volume hit a new high of 494,800 lots.

2020.06.03 SHFE and INE were added to ESMA' s positive list for post-trade transparency as third-country trading venues.

2020.08.01 The monthly delivery quantity hit a new high of 13.859 million barrels.

2020.09.07 Guangxi PetroChina International Reserve Depot of Dalian PetroChina International Warehousing & Transportation Co., Ltd. became a storage site of designated delivery storage facility.

2020.10.12 INE launched TAS order and released the Marker Price.

2020.12.01 Murban crude oil was added as another deliverable crude oil, eligible to be loaded in for the issuance of standard warrants and futures delivery from June 1, 2021.

2021

2021.02.03 The depot of Dading Petroleum Logistics Co., Ltd. (located at Aoshan East Road, Lincheng Sub-District, Dinghai District, Zhoushan, Zhejiang) was approved as a physicals storage location for crude oil futures.

2021.02.09 The depot of Qingdao Haiye Mercuria Oil Terminal Co., Ltd. (located at Gangrun Avenue, Dongjiakou Port, Huangdao District, Qingdao, Shandong) was approved as a physicals storage location for crude oil futures.

2021.06.21 Crude oil options were listed on INE.

2022

2022.05.10 INE released the Monthly Average Settlement Price (MASP) for crude oil futures.

2022.06.21 The depot of SDIC Oil & Gas Terminal Yangpu Co., Ltd. located to the north of Park Road No. 1, Chemical Industry Park, Yangpu Economic Development Zone, Hainan Province, was approved as a storage facility of the deliverables for INE crude oil futures.

2022.06.24 Basrah Medium and Tupi were included as deliverable crudes for the Shanghai crude oil futures. As of November 1, 2022, the Basrah Medium crude oil and Tupi crude oil can be applied for standard warrants issuance and futures delivery.

2022.07.06 The trading volume of INE crude oil futures hit the record high of 516,000 lots since its listing.

2022.09.02 QFI was approved to trade crude oil futures and options products.

2022.12.31 INE posted participation of overseas traders from nearly 30 countries and regions across 6 continents (Asia, Africa, Europe, North America, Oceania, and South America).

To be continued……

获奖情况

2022 年 12 月，全球投资者集团旗下《期货期权世界》（FOW）主办的 2022 年度亚洲资本市场奖颁奖典礼（The Asia Capital Markets Awards 2022）上，上海期货交易所（简称上期所）及其子公司上海国际能源交易中心（简称上期能源，INE）荣获“年度最佳中国交易所奖”。在 2022 年亚洲能源风险奖（Energy Risk Asia 2022 Awards）颁奖典礼上，上期能源的原油期权合约获得“年度最佳创新奖”。

Honors

In December 2022, the Shanghai Futures Exchange (“SHFE”) and its subsidiary Shanghai International Energy Exchange (“INE”) won “Chinese Exchange of the Year” by the Futures and Options World (FOW) of the Global Investor Group at the Asia Capital Markets Awards 2022. INE crude oil options won “Innovation of the Year” at the Energy Risk Asia 2022 Awards.

02

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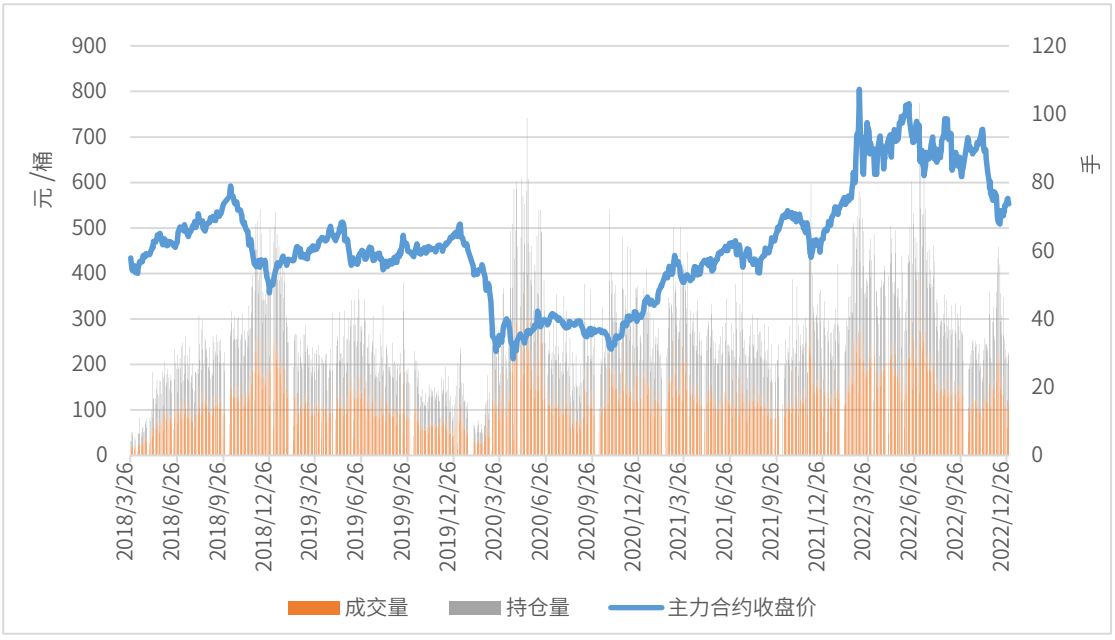
2022 年，受国际地缘政治因素和疫情的影响，以及美欧各国通胀高企并实施超预期加息，全球经济下行压力明显，国际油价波动加剧，呈现出快速大幅上升后震荡下跌的特点。期间，上海原油期货（品种代码：SC）价格总体与境外油价高度联动、有效反映区域现货市场变化，实现了成交规模的大幅增长。

一、上海原油期货价格与境外市场高度联动，同时较好地反映了区域现货基本面变化特点

（一）价格总体呈现先涨后跌、高位宽幅波动态势

2022 年，国际原油价格整体呈现先涨后跌、高位宽幅波动态势。上半年，俄乌局势持续升级，在欧美多国对俄罗斯实施多方面制裁下，俄罗斯石油出口受限。全球原油低库存叠加供给的不确定性推动国际油价快速大幅上涨并维持高位震荡。上海原油期货突破 820 元 / 桶，创上市 5 年来新高。下半年，俄罗斯石油供应从冲击中逐步恢复，全球经济高通胀、美联储大幅加息、美元升值、美债长短期利率倒挂推动大类资产价格下跌，油价震荡下行。截至 12 月 30 日，上海原油期货主力合约收于 562.8 元 / 桶（约合 80.81 美元 / 桶），较 2021 年底上涨 12.79%；ICE Brent 原油期货收于 85.91 美元 / 桶，CME WTI 原油期货收于 80.26 美元 / 桶，较 2021 年底分别上涨 8.31% 和 4.25%。

图1 上海原油期货运行概况

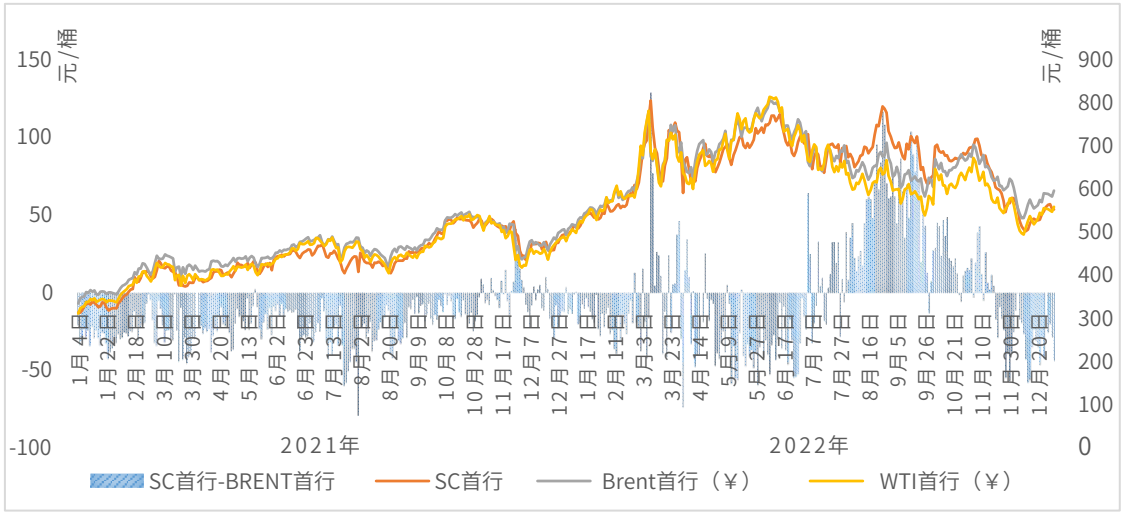


数据来源：上海国际能源交易中心

（二）境内外价差反映现货基本面差异，期货仓单量反映市场自身特点

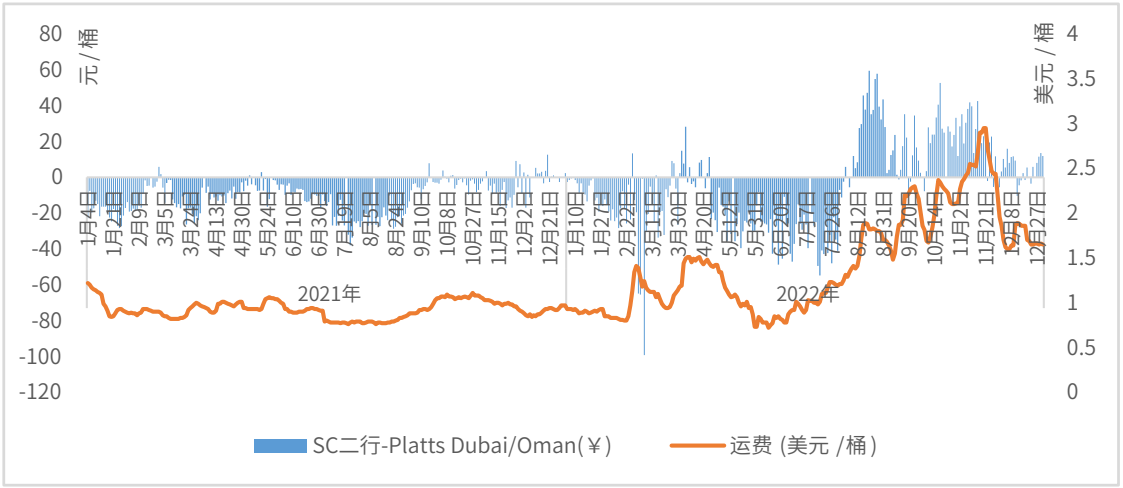
上海原油期货价格代表了中国乃至亚洲这一全球原油重要消费地和集散地价格。从长期看，上海原油期货价格走势与境外原油价格总体趋势保持一致，但从短期看，也能更快、更有效地反映出区域市场供需关系的变化。与境外主要原油期、现货价格相比，人民币计价和结算的上海原油期货价格中包含了不同油种间价差、油轮运费、人民币兑美元汇率等多重因素。2022 年俄乌冲突加剧的情况下，亚洲的原油进口需求产生结构性改变，同时，在运费大幅上涨、美元大幅升值等因素的共同作用下，上海原油期货价格与境外原油期货价差波动加剧。

图2 上海原油期货与境外原油期货价差



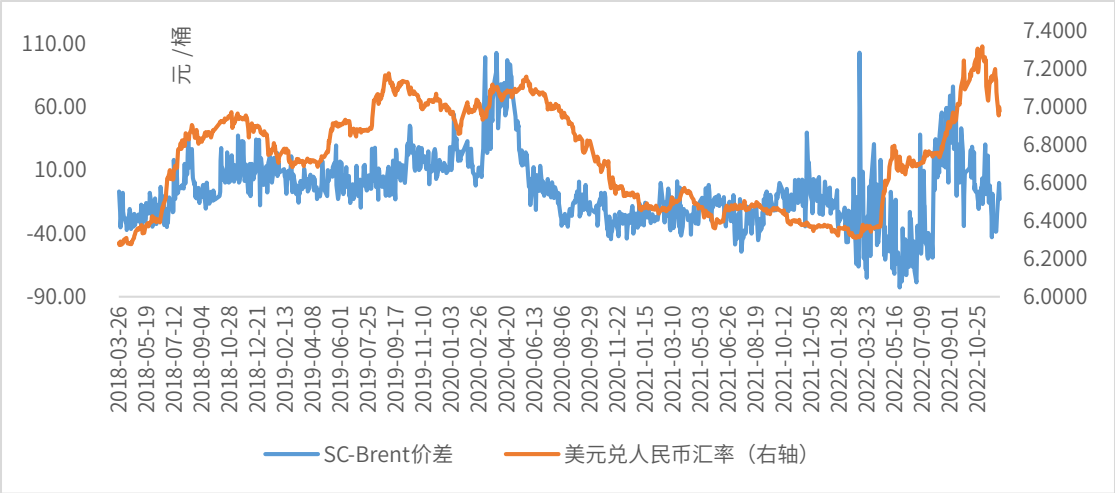
数据来源：上海国际能源交易中心、路透

图3 境内外价差与运费



数据来源：上海国际能源交易中心、普氏

图4 境内外价差与人民币汇率



数据来源：上海国际能源交易中心、路透

供需基本面对大宗商品价格具有主导性作用。欧美多国对俄罗斯石油实施制裁以来，国际原油贸易格局发生了深远变化。俄罗斯与欧洲的原油贸易量大幅萎缩，原本出口欧洲的俄罗斯原油更多流向亚洲，而中东原油则流向欧洲弥补供应缺口。根据 Kpler 数据显示，2022 年俄罗斯对亚洲的原油出口量为 233.6 万桶 / 日，较 2021 年的 143.9 万桶每日上涨 62.3%。

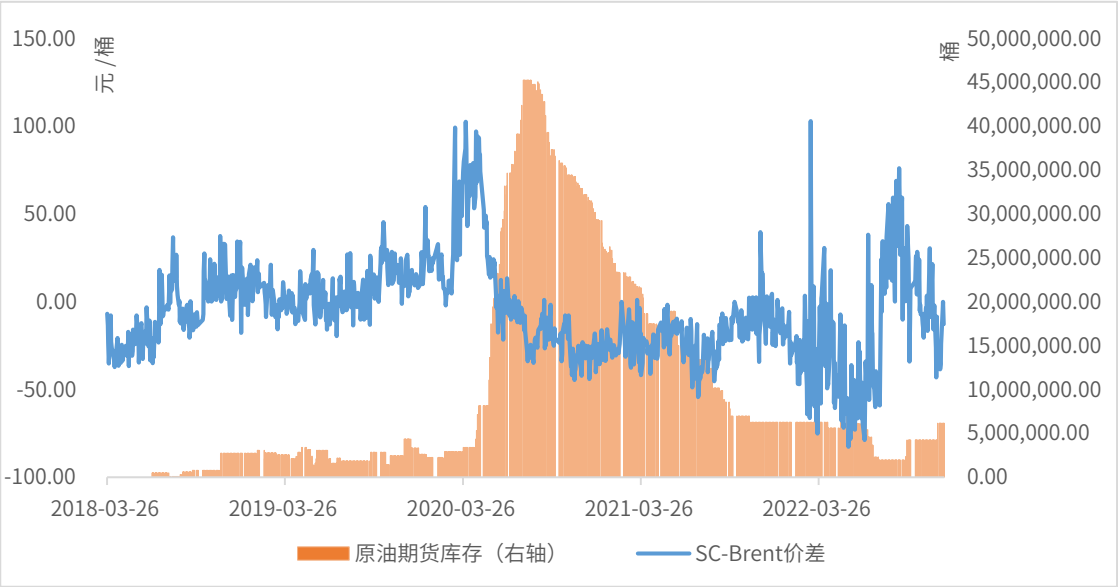
俄罗斯出口至远东地区的原油主要为 ESPO，是中东原油的重要替代。2022 年 4 月以来，ESPO 价格较中东原油深度贴水。ESPO 与中东原油的价差变化直接影响了亚洲市场对不同油种的进口需求，并推动原油贸易流向产生变化。上海原油期货价格间接地反映了这一变化。

具体看，2022 年 4-6 月，ESPO 对中东原油贴水 20-30 美元 / 桶，亚洲对于 ESPO 进口量大幅上升，替代了对中东原油的部分需求。同期，中国境内疫情快速扩散，各地加强对社会活动限制，境内成品油消费显著下降。受上述因素影响，以中东原油为主要交割油种的上海原油期货出库需求大幅减弱，拖累近月合约价格，使得上海原油期货较中东原油理论到岸价的贴水逐步扩大。境内外原油市场价差波动对境内外套利带来新的交易机会。随着境内外价差的持续走低，上海原油期货指定交割库弘润仓库的 85 万桶原油注销出库，并反输至青岛港复运出境。

7-8 月，随着亚洲对 ESPO 进口量的增加，ESPO 价格逐步回升，对中东原油价格贴水逐步收窄至 5 美元 / 桶左右。同期，中东原油进口需求明显回升，上海原油期货仓单陆续注销出库达 411.3 万桶，库存降至 197 万桶历史低位，带动上海原油期货价格快速走强并对中东原油理论到岸价小幅升水。

9-12 月，ESPO 与中东原油价差持续收窄至 2 美元 / 桶左右，在上海原油期货价格较中东原油理论到岸价升水情况下，819.6 万桶原油入库生成仓单。截至 2022 年底，上海原油期货库存上升至 1016.6 万桶的年内高位。

图5 境内外价差与期货库存



数据来源：上海国际能源交易中心、路透

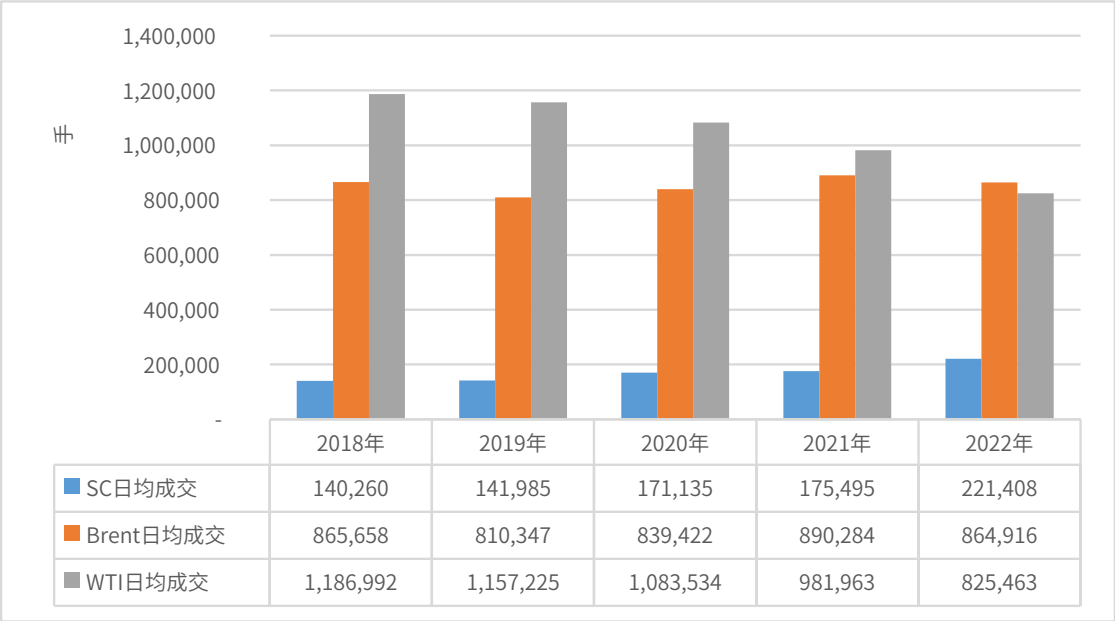
二、上海原油期货、期权实现联动发展

（一）原油期货市场规模持续扩大，市场结构进一步优化

随着国际油价波动加剧，境内外原油期货市场纷纷上调保证金比例。为防范市场风险，2022 年 3 月 9 日，上海原油期货保证金上调至 15%。在此情况下，市场避险和投资需求依然推动了原油期货市场成交规模快速上升。2022 年，原油期货总成交 5358.08 万手，成交金额 34.91 万亿元。日均成交量 22.14 万手，较 2021 年增长 25.60%；日均持仓量 6.93 万手（合 6930 万桶，约为中国日消费量的 5 倍左右），较 2021 年下降 8.09%。

交割方面，截至 2022 年底，原油期货指定交割仓库总启用库容达 6841.5 万桶，全年共交割 2407.1 万桶（含期转现）。交割出库的原油以报关进口为主，也有部分原油转运出境韩国、缅甸等国家和地区。此外，为满足现货市场变化和发展需要，上海国际能源交易中心于 2022 年 10 月引入了伊拉克巴士拉中质原油和巴西图皮原油作为可交割油种。

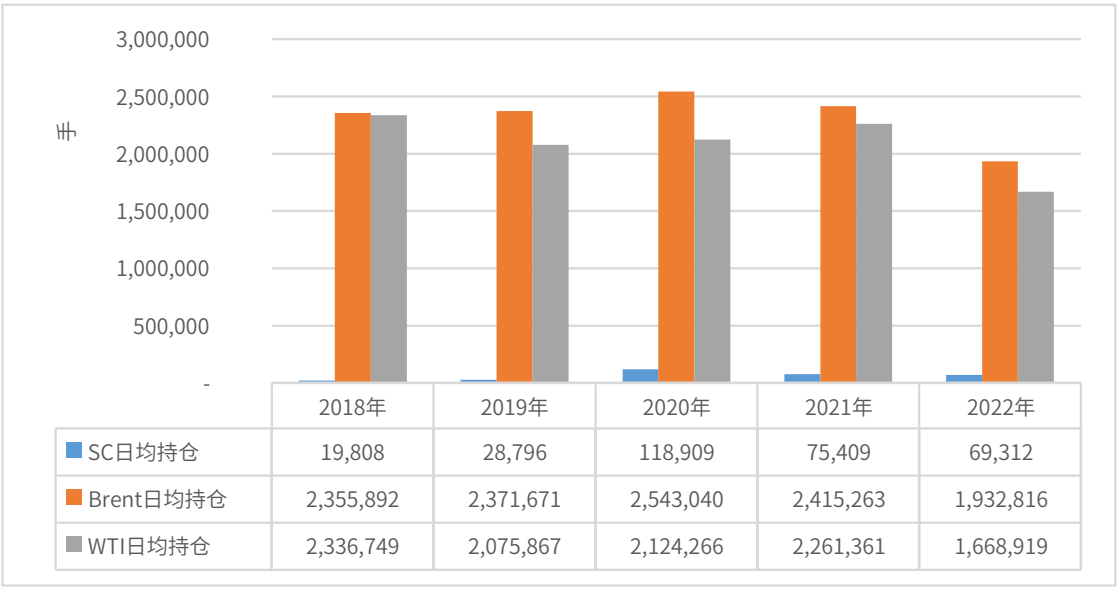
图6 境内外原油期货成交量对比[1]



	2018年	2019年	2020年	2021年	2022年
SC日均成交	140,260	141,985	171,135	175,495	221,408
Brent日均成交	865,658	810,347	839,422	890,284	864,916
WTI日均成交	1,186,992	1,157,225	1,083,534	981,963	825,463

数据来源：上海国际能源交易中心、路透

图7 境内外原油期货持仓量对比[2]



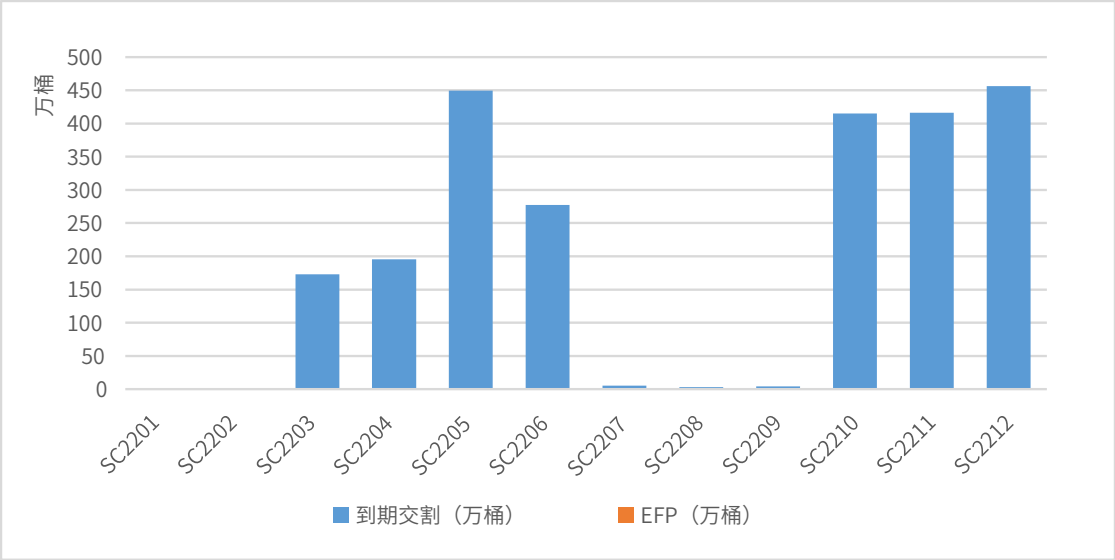
	2018年	2019年	2020年	2021年	2022年
SC日均持仓	19,808	28,796	118,909	75,409	69,312
Brent日均持仓	2,355,892	2,371,671	2,543,040	2,415,263	1,932,816
WTI日均持仓	2,336,749	2,075,867	2,124,266	2,261,361	1,668,919

数据来源：上海国际能源交易中心、路透

[1] 图中境内外市场日均成交量均按上海原油期货交易日对应的成交量进行统计。

[2] 图中境内外市场日均持仓量均按上海原油期货交易日对应的持仓量进行统计。

图8 原油期货合约交割量



数据来源：上海国际能源交易中心

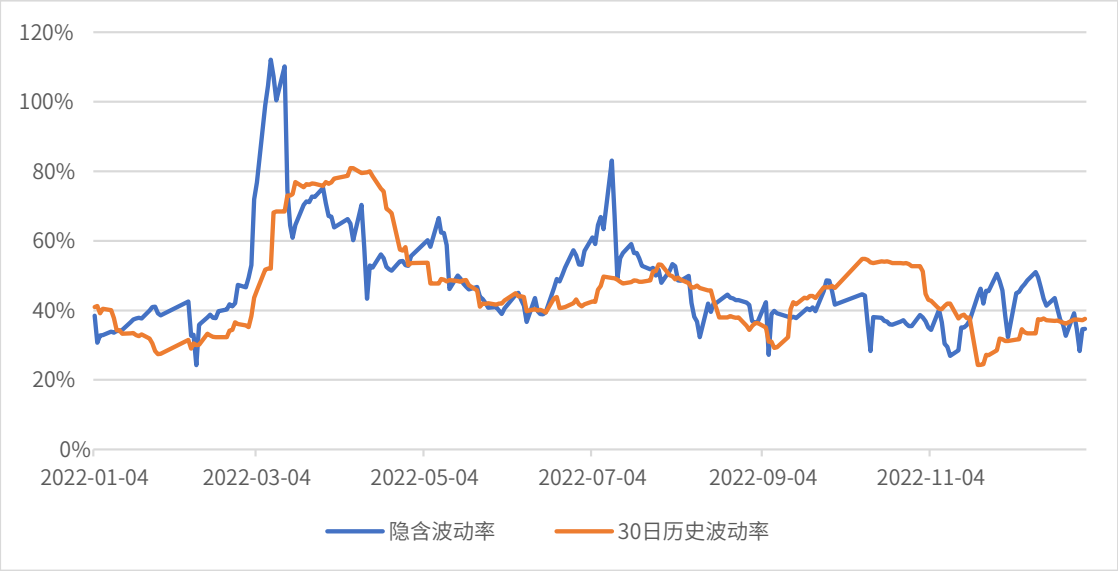
市场参与者结构方面，一般法人和特殊法人等机构参与者日均成交占比约 5 成，日均持仓占比超过 7 成。机构交易者的交易、持仓和套期保值比例位居境内已上市期货品种前列。境外交易者日均成交占全市场日均成交量约 1/4，日均持仓占比超过 3 成。2022 年 9 月，在当前特定品种的对外开放路径基础上，原油期货也开始允许 QFII 和 RQFII 直接参与交易，对外开放路径、境外交易者类型更加多元化。目前，跨国石油公司、贸易商、投资银行、基金和资产管理公司中的标杆性企业均参与了上海原油期货交易。境外交易者覆盖了六大洲近 30 个国家和地区。境外特殊参与者共 3 家，备案的境外中介机构达 78 家。

（二）原油期权市场影响初步显现

自 2021 年上市以来，原油期权成交持仓规模快速增长，期权定价合理，与标的市场联动紧密，产业客户参与积极，市场影响正在显现。2022 年，原油期权累计成交量 660.08 万手，累计成交额 635.91 亿元，日均成交量 2.73 万手，日均成交额 2.63 亿元，日均持仓量 2.18 万手。日均成交量、日均成交额和日均持仓量同比分别上涨 132.17%、232.17% 和 56.64%，呈现快速上升趋势。原油期权逐步得到国际市场的认可。在全球大宗商品行业权威媒体 Risk.Net 组织的 2022 年亚洲能源风险奖（Energy Risk Asia 2022 Awards）颁奖典礼上，原油期权合约获得“年度最佳创新奖”的殊荣。

价格方面，2022 年原油期权定价合理，主力系列隐含波动率基本处于 40%~80% 的区间，走势总体与标的期货的历史波动率一致，较好地反映出预期波动情况。

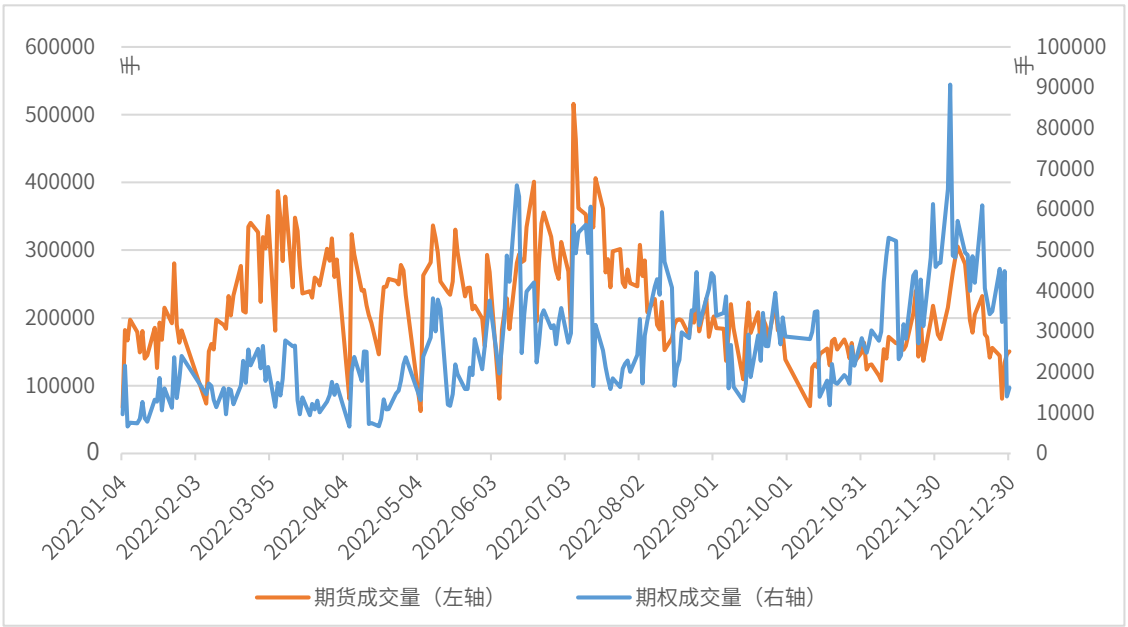
图9 2022年原油期权隐含波动率和历史波动率情况



数据来源：上海国际能源交易中心

原油期权和标的期货的成交量呈现良好联动。当标的期货成交量大幅变化时，期权的成交量也相应变化，期权、期货共同管理价格风险的特征明显。

图10 2022年原油期权和标的期货成交量情况



数据来源：上海国际能源交易中心

三、原油期货、期权助力产业健康发展

近年来，上海期货交易所深入推进原油期货、期权市场培育和服务实体经济工作，助力产业健康发展。

期货方面，为了给企业提供更好的价格参考，上海国际能源交易中心在 2022 年 5 月 10 日推出了原油期货月均结算价。此外，为拓展原油期货价格运用场景，还推出了“助实体、稳发展”项目，引导鼓励企业在原油、成品油和天然气等现货贸易中参考上海原油期货计价。

期权方面，自 2021 年启动期权“走进企业 服务实体”试点实践活动以来，支持产业企业利用场内期权管理风险，助力企业稳健运行。在支持原油产业客户方面，2022 年 15 家企业参与活动，利用原油期权管理风险，覆盖 300 万桶左右原油现货。2021 年上期所还启动了“期货稳价订单”试点项目，为企业“保供稳价”。能化品种方面，2022 年共落地 11 笔“期货稳价订单”业务，保障现货数量 27900 吨，涉及期权权利金 271 万元，参与的企业 5 家，均为原油行业内有较大影响力的企业。原油期权服务实体经济的功能正在显现。

历经 5 年发展，上海原油期货在市场规模日益上升的同时，规则制度和交易机制日趋完善，境内外交易者数量和类型日益丰富，反映中国市场供需更加直接和高效。为了更好满足市场交易需求，上海国际能源交易中心正加快推进天然气期货上市工作和成品油系列产品研发，建立完善产品体系和生态圈，切实服务实体经济风险管理需求。

境内外研究成果

Yang 等（2020）使用协整检验、线性和非线性因果关系检验研究 2018 年 3 月至 2019 年 2 月期间 INE 原油期货的定价效率。文章发现，INE 原油期货价格是 Oman 原油现货价格的格兰杰原因，而 WTI 和 Brent 现货价格是 INE 原油期货价格的格兰杰原因。文章从而得出结论：尽管 INE 原油期货市场的定价效率仍然低于 WTI 和 Brent 现货市场，但其在亚太地区已经变得有效。

参考文献：Yang, C., Lv, F., Fang, L., & Shang, X. (2020). The pricing efficiency of crude oil futures in the Shanghai International Exchange. Finance Research Letters, 36, 101329–. https://doi.org/10.1016/j.frl.2019.101329

Yang 和 Zhou（2020）使用 5 分钟频度日内数据研究 INE 原油期货上市后首 3 个月内，其与 WTI、Brent 和 Oman 原油期货之间的关系。通过 VECM-MGARCH 模型，文章发现，原油期货之间存在协整关系，并且在受到负面价格冲击时，INE 原油期货与国际原油期货市场之间的非对称相关性更强。文章还指出，INE 原油期货与主要原油期货（WTI 和 Brent）之间的联系比 Oman 原油期货更强，尤其是在其夜盘交易时段。

参考文献：Yang, J., & Zhou, Y. (2020). Return and volatility transmission between China’s and international crude oil futures markets: A first look. The Journal of Futures Markets, 40 (6), 860–884. https://doi.org/10.1002/fut.22103

Zhang 和 Ma（2020）采用 2018 年 3 月至 10 月期间的 15 分钟频度日内数据，使用 Hasbrouck（1995）信息份额和 Garbade-Silber 模型研究 INE 原油期货相较于 Brent 原油期货的价格发现情况，并且使用 Diebold 和 Yilmaz（2012）模型研究 INE、WTI 和 Brent 原油期货之间的风险转移和溢出情况。文章发现，INE 原油期货贡献了 48% 的信息份额，而 Brent 原油期货贡献了 52%，并且 INE 市场是三个原油市场中波动性溢出的最大传递者。

参考文献：Zhang, Y. J., & Ma, S. J. (2021). Exploring the dynamic price discovery, risk transfer and spillover among INE, WTI and Brent crude oil futures markets: Evidence from the high‐frequency data. International Journal of Finance & Economics, 26(2), 2414-2435.

Yang 等（2021）从风险溢出角度出发，通过数个 GARCH 模型获得风险值（VaR）的连接网络。文章发现，2018 年 3 月至 2020 年 4 月期间，国际原油期货市场高度互联互通，并且 INE 原油期货一直是 Brent 和 WTI 原油期货的净风险接受者，尤其是在 Covid-19 爆发之后。

参考文献：Yang, Y., Ma, Y.-R., Hu, M., Zhang, D., & Ji, Q. (2021). Extreme risk spillover between Chinese and global crude oil futures. Finance Research Letters, 40, 101743–101743. https://doi.org/10.1016/j.frl.2020.101743

Li，Huang 和 Li（2021）研究了 INE 原油期货与 Oman 原油和 OPEC 参考的一揽子原油现货之间的价格相关性，以及 INE 原油期货的对冲效果。采用 GO-GARCH 模型分析 2018 年 3 月至 2019 年 6 月期间的每日价格，研究发现，相较于 WTI 和 Brent 原油期货，INE 原油期货与现货市场之间的价格相关性更高，且 INE 对现货的对冲有效性也更高。

参考文献：LI, J., HUANG, L., & LI, P. (2021). Are Chinese crude oil futures good hedging tools? Finance Research Letters, 38, 101514–. https://doi.org/10.1016/j.frl.2020.101514

Lv，Yang 和 Fang（2020）研究 INE 原油期货与 Brent 和 WTI 原油期货相比，是否可以更好地帮助投资者对冲中国石油化工相关股票的风险。采用 2018 年至 2019 年数据以及 DCC、DECO 和 Block DECO 模型，研究发现，INE 原油期货在对冲风险和分散投资组合方面比 WTI 原油期货表现更好，但与 Brent 原油期货相比则不然。

参考文献：Lv, F., Yang, C., & Fang, L. (2020). Do the crude oil futures of the Shanghai International Energy Exchange improve asset allocation of Chinese petrochemical-related stocks? International Review of Financial Analysis, 71, 101537–. https://doi.org/10.1016/j.irfa.2020.101537

Yi，Yang 和 Li（2021）重点研究了 2018 年 3 月至 2020 年 6 月期间宏观经济不确定性对 INE 原油期货的解释和预测能力。作者使用 CARCH-MIDAS 模型解决数据频率差异的问题，发现在主要原油消费国——美国、中国和日本，以及主要原油出口国——英国、加拿大和俄罗斯的地缘政治风险、经济政策不确定性和传染病大流行等因素中，英国和日本的因素在预测 INE 原油期货波动中发挥的作用更大。

参考文献：Yi, A., Yang, M., & Li, Y. (2021). Macroeconomic Uncertainty and Crude Oil Futures Volatility–Evidence from China Crude Oil Futures Market. Frontiers in Environmental Science, 9. https://doi.org/10.3389/fenvs.2021.636903

Yu，Yang 和 Webb 用量化方法检验了 2018 年 3 月 -2022 年 3 月期间 INE 原油期货对 19 种亚洲原油现货价格的价格发现情况。研究表示，INE 原油期货对可交割和一些非可交割油种都具有价格发现能力；INE 原油期货对沙特的阿拉伯中质原油、科威特的科威特原油和伊朗的富鲁赞原油三种非可交割油种也具有类似于可交割油种的价格发现功能。

参考文献：Yu,Z.,Yang,J.,&Webb,R.(2022). Price Discovery in China's Crude Oil futures Markets: An Emerging Asian Benchmark? Journal of Futures Markets.https://onlinelibrary.wiley.com/doi/full/10.1002/fut.22384

上海原油期货年度之“最”

表1. 价格表现									
开盘价	最高价	最低价	收盘价	30日历史波动率（%）			期现价差（元/桶）		
				最高	最低	平均	最高	最低	平均
494.8	823.6	491.0	562.8	6.63	1.89	3.47	44.32	-93.6	-14.30

表2. 交易情况							
交易						持仓	
累计成交（万手）	累计成交额（万亿）	日均成交（万手）	日均成交额（亿）	最高成交（万手）	日盘占比(%)	日均持仓（万手）	最高持仓（万手）
5358.08	34.91	22.14	1442.56	51.60	32.58	6.93	8.96

表3. 交割								
累计交割(万桶,不含期转现)	累计交割额（亿元）	交割量最大合约	单月最大交割量（万桶）	交割量最大油种	最大油种交割量（万桶）	交割量最大油库	最大油库交割量（万桶）	期转现（万桶）
2407.1	157.9	SC2212	456.6	巴士拉轻油	1147.5	弘润	970.5	11.3

2023 Development Report of Shanghai Crude Oil Futures and Options Market

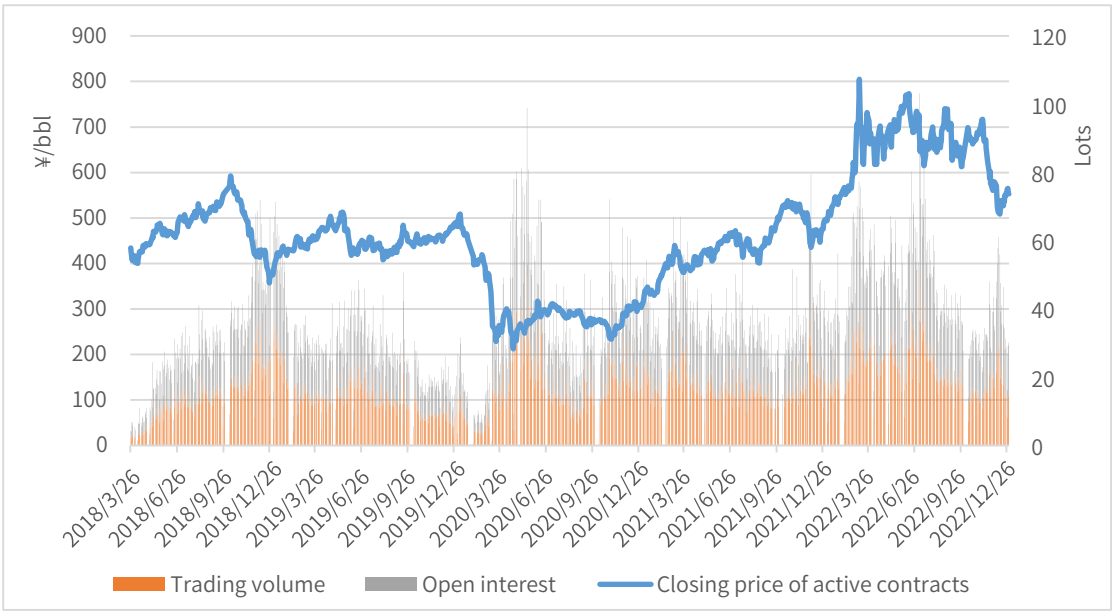
Over 2022, the global economic downturn became more pronounced under the whammy of international geopolitical crisis, the lingering Covid-19 pandemic, and the U.S. and Europe's aggressive interest rate hike in response to accelerating inflations. This added volatility to the global oil market, with oil prices surging sharply followed by a downtrend. Against this context, Shanghai crude oil futures (produce code: SC) showed significant growth in trading volume and maintained a high price correlation with overseas oil prices, offering an accurate picture of the supply-demand dynamics of the regional spot market.

1. High price correlation between Shanghai crude oil futures and overseas markets to better reflect the supply-demand dynamics of the regional spot market

(1) Sharp price surge before downtrend and wide fluctuations at a high level

Over 2022, the global crude oil price peaked before it took a downturn, and fluctuated within a wide range at a high level. In the first half of the year, oil prices soared due to low inventory and high uncertainties in oil supply as the USA and European countries sanctioned Russian oil export amid the Russia-Ukraine crisis. Shanghai crude oil futures exceeded RMB 820/barrel and hit a record high since its listing five years ago. In the second half of 2022, oil prices spiraled down as Russia gradually restore its oil export and the price of major asset classes are dropping due to the plaguing high inflation, Fed's interest rate hikes, strong USD, and inverted USD yield curve. As of December 30, the active contracts of the Shanghai crude oil futures closed at RMB562.8/barrel (US$80.81/barrel), up 12.79% from 2021. ICE Brent rose 8.31% year-on-year to US$85.91/barrel, and CME WTI 4.25% to US$80.26/barrel.

Figure 1:Shanghai Crude Oil Futures, 2018-2022

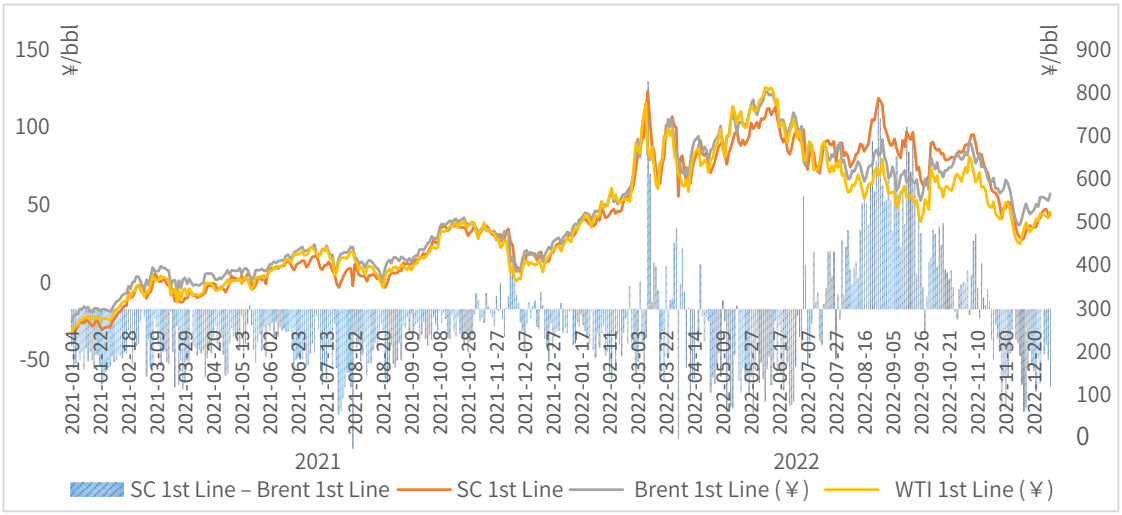


Source: INE

(2)Domestic-overseas price spread indicating supply-demand dynamics of the spot market and futures warrants indicating the market characteristics

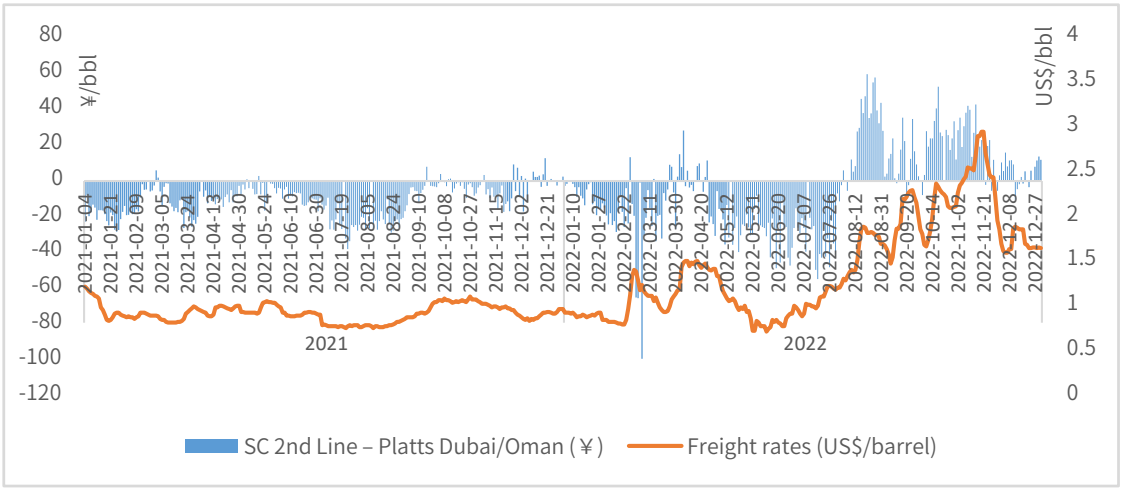
SC futures price represents the crude oil price in China and even Asia, an important crude oil consumption and distribution hub. The trends of SC futures and overseas markets are similar in the long-run, but the short-run discrepancies can better and more effectively reflected the movements in the supply and demand of the regional market. Compared with the prices of the major crude oil futures and spots in overseas markets, the price of the RMB-denominated and settled SC futures is influenced by multiple factors, including the price spread of different crudes, freight rates, and RMB/USD exchange rate. In 2022, the spread between SC futures and overseas crude oil futures became more volatile amid the worsening Russia-Ukraine crisis, the structural change in Asia' s crude oil import demand, the soaring freight rates, and the US dollar appreciation.

Figure 2: Spread between SC Futures and Overseas Crude Oil Futures



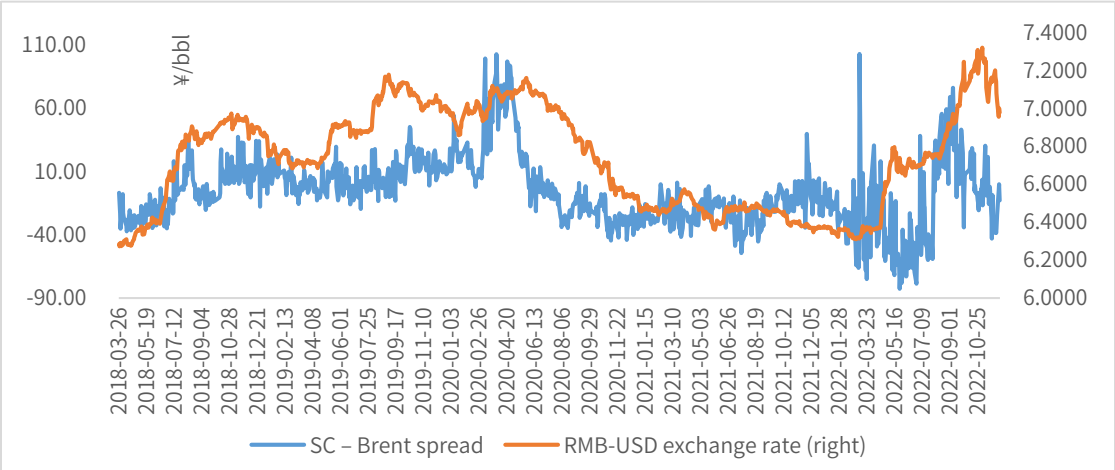
Source: INE and Reuters

Figure 3: Price Spread v. Freight Rates



Source: INE and Platts

Figure 4: Price Spread v. RMB-USD Exchange Rate



Source: INE and Reuters

The supply-demand fundamentals determine the commodity prices. The international crude oil trade has seen profound changes since the European Union and the U.S. announced sanctions on Russian crude. Russian crude export to Europe shrank dramatically and Asian countries imported more Russian crude, while the Middle East has been exporting more crude oil to Europe to fill the gap. Kpler statistics show that Russia exported 2.336 million barrels per day to Asia in 2022, up 62.3% from 1.439 million barrels per day in 2021.

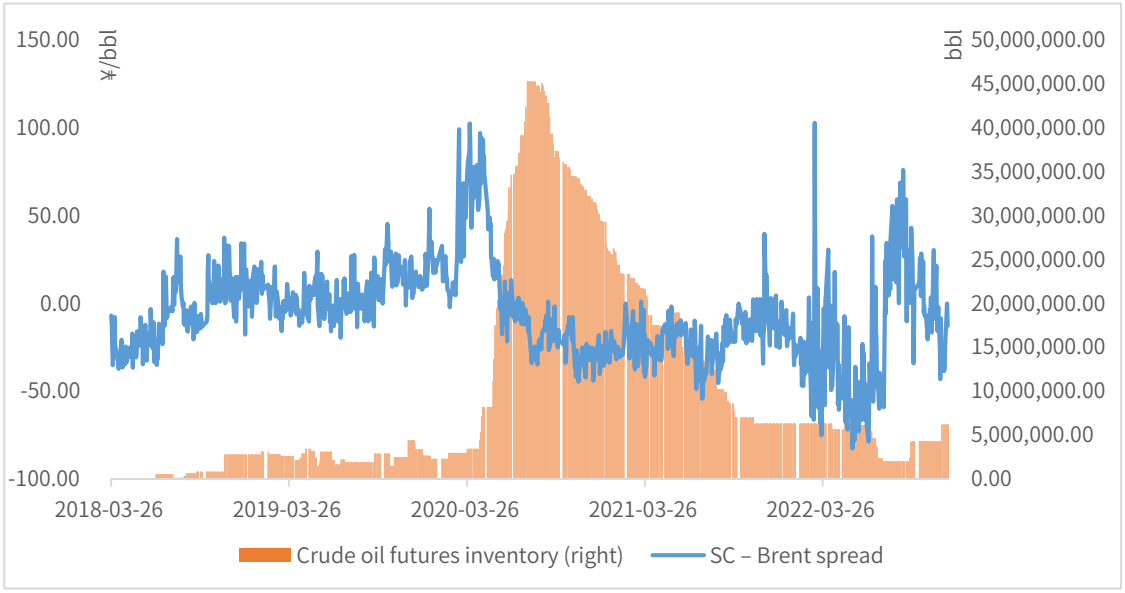
ESPO, an important substitute of Middle Eastern crude, is the primary crude that Russia exports to the Far East. Since April 2022, ESPO has been sold at a large discount compared with the Middle East crude. The spread between ESPO and Middle Eastern crude has a direct impact on the import demands of the Asian markets for different crudes, thus changing the crude oil trading direction. This change has been indirectly reflected by the SC futures price.

Specifically, from April to June 2022, as ESPO was sold at $20 to $30 discount per barrel compared with the crude imported from the Middle East, Asian imports of ESPO increased considerably, partially replacing the middle eastern crude. During this period, China' s domestic consumption of refined oil plunged as social distancing rules were implemented to curb Covid-19 spread. These factors weakened the demand for load-out of middle eastern crude as the deliverable for SC contracts, dragging down the prices of near-month contracts and widening the discount of SC contracts compared with the theoretical CIF price of the Middle Eastern crude. The spread fluctuation between the domestic and overseas crude oil markets created new opportunities for arbitrage. As the spread widened, warrants of 850,000 barrels of crude oil stored in Hongrun, a designated delivery storage facility for crude oil, were de-registered, and the underlying oil loaded out and transported to Qingdao Port for re-export.

In July and August, ESPO prices rebounded and the spread between the ESPO and the crude imported from the Middle East narrowed to US$5 per barrel as Asian import of ESPO climbed. China' s demands for the crude imported from the Middle East also recovered notably. As a total of 4.113 million barrels of crude oil warrants were deregistered and loaded out, the inventory fell to a historical low of 1.97 million barrels, driving a rapid uptick in the price of SC futures and making it slightly above the CIF price of the Middle Eastern crude.

From September to December, the spread between ESPO and the crude imported from the Middle East further narrowed to $2 per barrel. As the SC futures maintained a premium over the CIF of the Middle Eastern crude, 8.196 million barrels were loaded in and registered for warrant creation. By the year-end of 2022, the inventory for SC futures hit a year high of 10.166 million barrels.

Figure 5: Price Spread and Inventory



Source: INE and Reuters

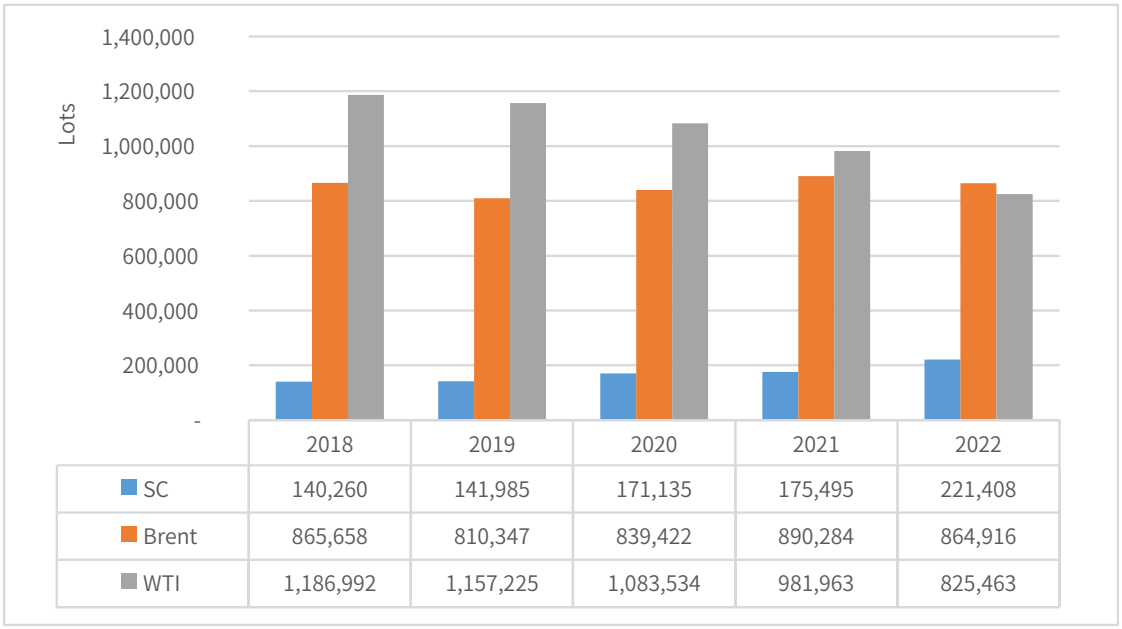
2. Development of Shanghai crude oil futures and options markets in synergy

(1) Further expansion of the crude oil futures market with improving market structure

Crude oil futures markets at home and abroad have marked up their margin requirements in the face of an increasingly volatile oil price. On March 9, 2022, the margin requirement for SC contracts was raised to 15% to prevent market risks. Despite the margin rise, demand for hedging and investment has pushed up the trading volume of crude oil futures. In 2022, the cumulative trading volume of SC futures stood at 53,580,800 lots and the cumulative turnover amount to RMB34.91 trillion. The average daily trading volume posted a 25.6% increase from 2021 to 221,400 lots, and the average daily open interest an 8.09% fall to 693,000 lots (equivalent to 69.3 million barrels, five times of the China' s daily consumption).

In terms of delivery, as of the end of 2022, the total active capacity of the designated terminals for crude oil futures reached 68.415 million barrels, and 24.071 million barrels (including EFP) were delivered over the year. Most of the crude oil delivered was imported through customs declaration, and a portion was re-shipped to South Korea, Myanmar, and other countries and regions. To address the changes and development needs of the spot market, the Shanghai International Energy Exchange ("INE") admitted the Iraqi Basrah Medium and Brazilian Tupi crude oil as the deliverables for SC futures in October 2022.

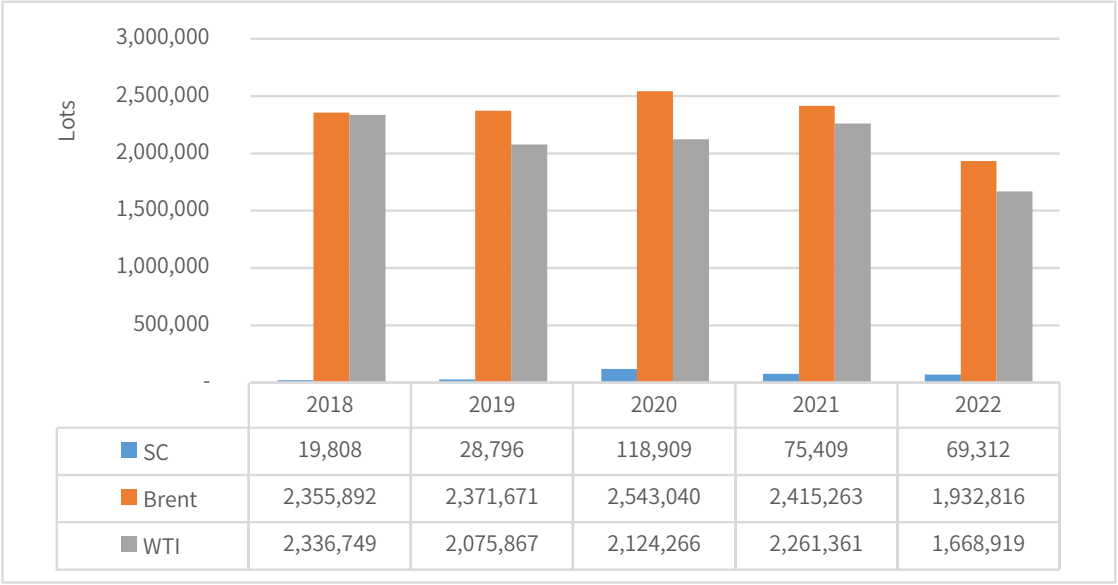
Figure 6: Daily Trading Volume of Domestic & Overseas Crude Oil Futures



	2018	2019	2020	2021	2022
SC	140,260	141,985	171,135	175,495	221,408
Brent	865,658	810,347	839,422	890,284	864,916
WTI	1,186,992	1,157,225	1,083,534	981,963	825,463

Source: INE and Reuters

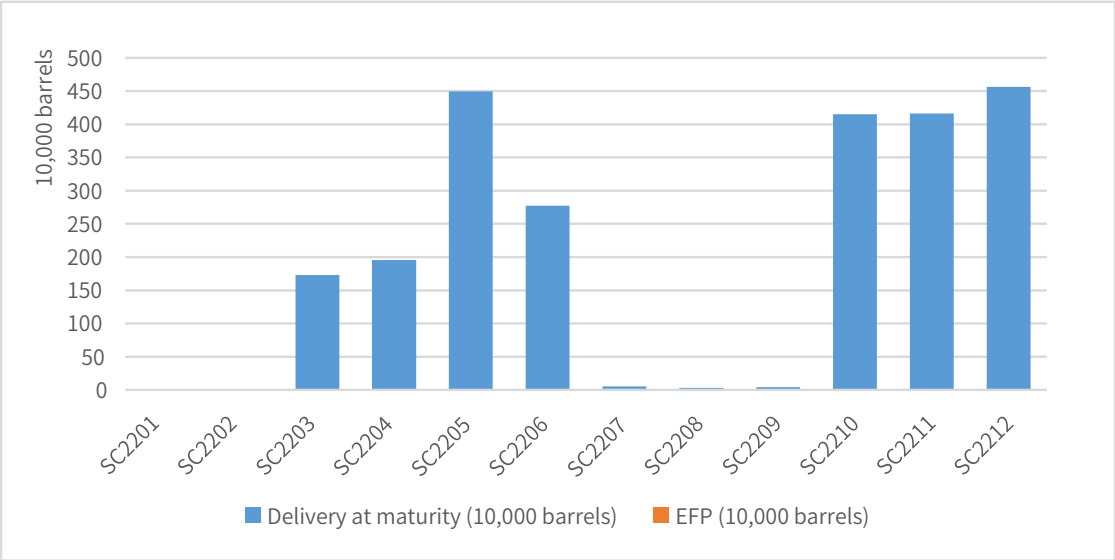
Figure 7: Daily Open Interest of Domestic & Overseas Crude Oil Futures



	2018	2019	2020	2021	2022
SC	19,808	28,796	118,909	75,409	69,312
Brent	2,355,892	2,371,671	2,543,040	2,415,263	1,932,816
WTI	2,336,749	2,075,867	2,124,266	2,261,361	1,668,919

Source: INE and Reuters

Figure 8: Delivery of SC Futures Contracts



Source: INE and Reuters

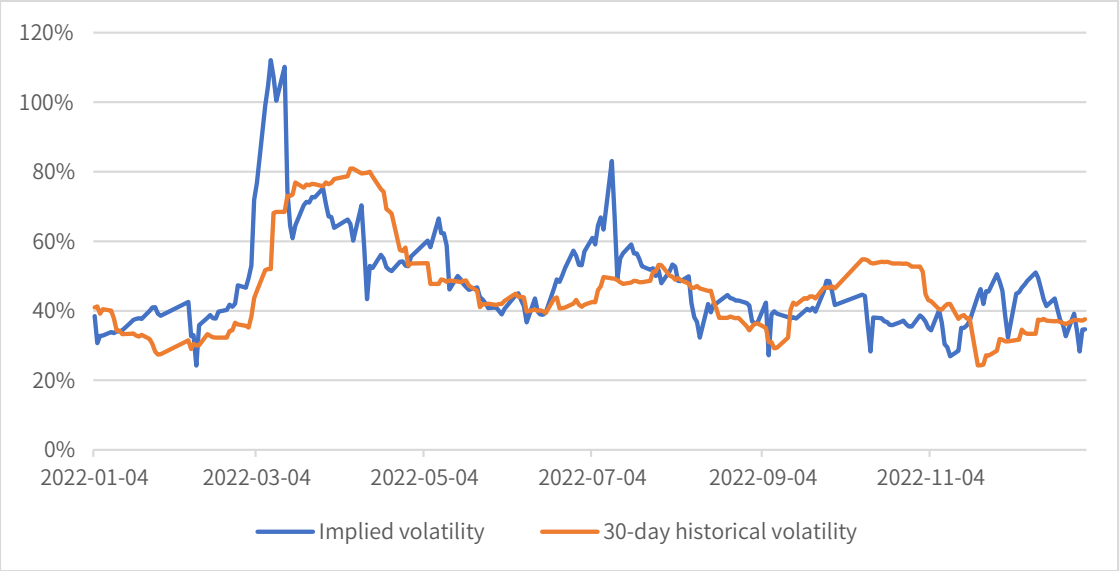
In terms of the participant structure, institutional participants including general corporate clients and special corporate clients have accounted for about 50% of the average daily trading volume and over 70% of the average daily open interest. SC futures has taken the lead in trading volume, open interest, and hedging percentage by institutional traders among the futures products listed in the domestic market. Overseas traders have accounted for about a quarter of the average daily trading volume and over 30% of the average daily open interest. In September 2022, SC futures became accessible to QFII and RQFII which were approved as direct traders. This arrangement further diversifies the channels of opening up the China' s futures market and the types of overseas investors. By now, almost all the benchmark multinational oil producers, traders, investment banks, funds and asset management companies have traded in the SC futures market. The SC has welcomed overseas participants from nearly 30 countries and regions across 6 continents, as well as 3 overseas special participants, and 78 overseas intermediaries.

(2) Preliminary achievements of the crude oil options market

Since its launch in 2021, Shanghai crude oil options have seen rapid growth in both the trading volume and the open interest. Featuring fair pricing, close connection with the underlying market, and active participation of industry clients, the market is growing influential. In 2022, the cumulative trading volume of crude oil options stood at 6,600,800 lots with a total turnover of RMB63.591 billion. The market grew rapidly with the average daily trading volume up 132.17% to 27,300 lots, the average daily turnover up 232.17% to RMB263 million, and the average daily open interest up 56.64% to 21,800 lots. Shanghai crude oil options have progressively won recognition in the global markets. It was honored with "Innovation of the Year" by Risk.Net, an authoritative media outlet of global commodities, at the Energy Risk Asia 2022 Awards.

In terms of pricing, crude oil options were fairly priced throughout 2022. The implied volatility of the active contracts stayed between 40% and 80%, with the trend in alignment with the historical volatility of the underlying futures contracts, offering a reliable reference for the expected volatility.

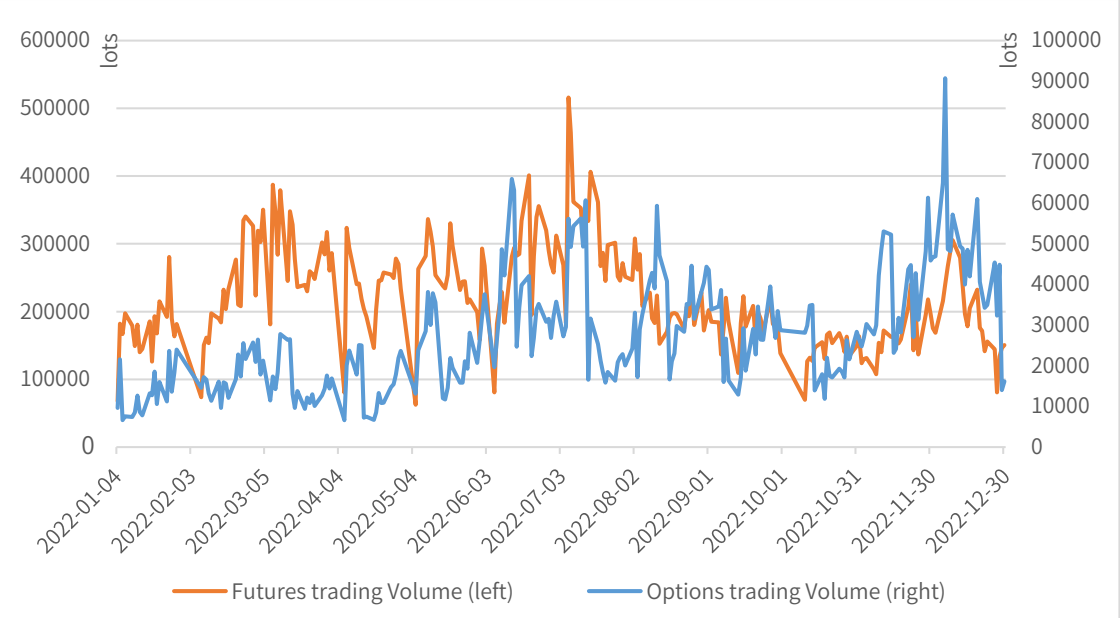
Figure 9: Implied Volatility and Historical Volatility of Crude Oil Options over 2022



Source: INE

The crude oil options and their underlying futures are highly correlated in trading volume. The trading volume of the underlying futures fluctuates with that of the underlying futures contracts, indicating the synergy of crude oil futures and options in price risk management.

Figure 10: Trading Volumes of Crude Oil Options and Futures over 2022



Source: INE

3、Crude oil futures and options in support of the healthy development of the industry

Over the years, the Shanghai Futures Exchange (“SHFE”) has been promoting the development of crude oil futures and options markets and offering support for the real economy, to bolster the healthy development of the industry.

To provide companies with more reliable price references, the INE introduced the Monthly Average Settlement Price (MASP) for Shanghai crude oil futures on May 10, 2022. It also launched a special program called “Supporting the Enterprises and Stabilizing the Industrial Development”, to expand the application scenarios of the futures prices and encourage enterprises to use the price of the SC as a reference during the spot trading in crude oil, refined oils, and natural gas.

In 2021, a pilot program of “Introducing Options to Enterprises and Serving the Real Economy” was launched to help industry companies manage risks with in-exchange options trading and operate in a robust manner. Under the program,15 oil related companies properly managed the risks relating to 3 million barrels of physicals through options trading. In 2021, SHFE’s pilot option promotion program of “Stable Price and Orders for SC Futures” helped assure oil supply and price stability for oil enterprises. In 2022, 11 transactions were executed under the “Stable Price and Orders for SC Futures” program, in which 5 influential crude oil companies traded 27,900 metric tons of physicals, with the premium amounting to RMB2.71 million. Crude oil options have played a prominent role in serving the real economy.

Over the past five years, Shanghai crude oil futures has witnessed a growing market and progressively improving rules and trading mechanism. With the increasing participation of different types of domestic and overseas traders, the market has served as a direct and effective indicator of the supply-demand dynamics of Shanghai crude oil market. To better address the trading needs of the market, the INE is stepping up the efforts in developing and launching natural gas futures and refined oil products, with a view to building a well-structured product line and ecosystem and supporting the real economy in risk management.

Domestic and Overseas Studies on INE Crude Oil Futures

Yang et al. (2020) investigated the pricing efficiency of INE crude oil futures for the period from March 2018 to February 2019 with cointegration and Granger causality tests. They found that the INE futures price was the Granger cause of the Oman spot price, and the WTI and Brent spot prices were in turn the Granger cause of the INE futures price. The paper thus concludes that although the INE crude oil futures market still shows lower pricing efficiency than the WTI and Brent spot markets, it is efficient in the Asia-Pacific region.

Reference: Yang, C., Lv, F., Fang, L., & Shang, X. (2020). The pricing efficiency of crude oil futures in the Shanghai International Exchange. Finance Research Letters, 36, 101329-. https://-doi.org/10.1016/j.frl.2019.101329

Yang and Zhou (2020) examined the relationship between INE crude oil futures (SC) and WTI, Brent, and Oman crude oil futures within the first three months of the listing of SC using intraday data at 5-minute intervals. With the help of the VECM-MGARCH model, the paper found a cointegrating relationship between these futures products, and that following a negative price shock, the asymmetric volatilities and correlations between SC and international crude oil futures markets became stronger. The paper also found that SC showed stronger linkage with WTI and Brent futures than Oman futures did, especially in the night trading hours.

Reference: Yang, J., & Zhou, Y. (2020). Return and volatility transmission between China’s and international crude oil futures markets: A first look. the Journal of Futures Markets, 40(6), 860-884. https://doi.org/10.1002/fut.22103

Zhang and Ma (2020) built the Hasbrouck (1995) information share model and Garbade-Silber model with the 15-minute interval intraday data from March to October 2018 to study the price discovery function of INE crude oil futures compared with Brent crude futures, and used the Diebold-Yilmaz model to measure the risk transfer and spillover effect among INE, WTI, and Brent futures markets. The results show that the INE crude oil futures contributed 48% of the information share, compared with the 52% share of Brent crude futures, and that the INE market was the largest transmitter of volatility spillover among the three markets.

Reference: Zhang, Y. J., & Ma, S. J. (2021). Exploring the dynamic price discovery, risk transfer and spillover among INE, WTI and Brent crude oil futures markets: Evidence from the high‐frequency data. International Journal of Finance & Economics, 26(2), 2414-2435.

Yang et al. (2021) built several GARCH models to obtain the value at risk (VaR) connectedness networks. They found that, between March 2018 and April 2020, the international oil markets were highly connected, with the INE crude oil futures persistently acted as a net receiver of the risks from Brent and WTI, especially following the Covid-19 outbreak.

Reference: Yang, Y., Ma, Y.-R., Hu, M., Zhang, D., & Ji, Q. (2021). Extreme risk spillover between Chinese and global crude oil futures. Finance Research Letters, 40, 101743-101743. https://doi.org/10.1016/j.frl.2020.101743

Li, Huang, and Li (2021) investigated the price correlations between the INE crude oil futures and the spot prices of Oman and the OPEC Basket, as well as the hedging effectiveness of the INE product. They analyzed the intraday prices from March 2018 to June 2019 with a GO-GARCH model and found that compared with WTI and Brent crude futures, INE crude oil futures showed higher price correlation with the spot markets and was a more effective hedging tool.

Reference: Li, J., Huang, L., & Li, P. (2021). Are Chinese crude oil futures good hedging tools? Finance Research Letters, 38, 101514-. https://doi.org/10.1016/j.frl.2020.101514

Lv, Yang, and Fang (2020) looked at whether investors can better hedge against the risks of Chinese petrochemical stocks with the INE crude oil futures compared with the Brent and WTI crude futures. By constructing the DCC, DECO, and Block DECO models based on the data from 2018 to 2019, they found that the INE futures provided superior hedging and portfolio diversification results versus WTI, but inferior results versus Brent.

Reference: Lv, F., Yang, C., & Fang, L. (2020). Do the crude oil futures of the Shanghai International Energy Exchange improve asset allocation of Chinese petrochemical-related stocks? International Review of Financial Analysis, 71, 101537-. https://doi.org/10.1016/j.irfa.2020.101537

Yi, Yang, and Li (2021) investigated whether the macroeconomic uncertainty factors can explain and forecast the INE crude oil futures market’ s volatility for the period from March 2018 to June 2020. The authors used the GARCH-MIDAS model to address the differences in data frequency and found that among the major oil consumers (the United States, China, and Japan) and the major oil exporters (the United Kingdom, Canada, and Russia), the geopolitical risk, economic policy uncertainty, and pandemics situation in the United Kingdom and Japan had greater predictive power for the volatility of the INE crude futures.

Reference: Yi, A., Yang, M., & Li, Y. (2021). Macroeconomic Uncertainty and Crude Oil Futures Volatility-Evidence from China Crude Oil Futures Market. Frontiers in Environmental Science, 9. https://doi.org/10.3389/fenvs.2021.636903

Yu, Yang, and Webb examined the price discovery performance of INE crude oil futures for the spot prices of 19 types of Asian crude oil from March 2018 to March 2022 using a quantitative approach. The study showed evidence of the price discovery function of INE crude oil futures for deliverable and some non-deliverable crudes. INE crude oil futures performs price discovery function for Saudi Arabian Medium crude, Kuwait crude, and Iran’ s Forozan crude in the way similar to other deliverable crudes.

Reference: Yu, Z., Yang, J., & Webb, R. (2022). Price Discovery in China's Crude Oil futures Markets: An Emerging Asian Benchmark? Journal of Futures Markets. https://onlinelibrary.wiley.com/doi/full/10.1002/fut.22384

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2022 Figures of Shanghai Crude Oil Futures

Table 1: Price Performance									
Opening Price	Highest Price	Lowest Price	Closing Price	30-Day Volatility (%)			Basis (¥/barrel)		
				Highest	Lowest	Average	Highest	Lowest	Average
494.8	823.6	491.0	562.8	6.63	1.89	3.47	44.32	-93.65	-14.30

Table 2: Trading							
Trading						Open Interest	
Cumulative trading volume (10,000 lots)	Cumulative turnover (RMB trillion)	Average daily volume (10,000 lots)	Average daily turnover (RMB 100 million)	Highest daily volume (10,000 lots)	Proportion of trading volume in the daytime trading session (%)	Average daily open interest (10,000 lots)	Highest daily open interest (10,000 lots)
5,358.08	34.91	22.14	1,442.56	51.60	32.58	6.93	8.96

Table 3: Delivery								
Cumulative delivery quantity (10,000 bbl, including EFPs)	Cumulative delivery amount (RMB 100 million)	Contract with the highest delivery quantity	Highest monthly delivery quantity (10,000 bbl)	Most delivered Crude Stream	Delivery volume of the most delivered crude stream (10,000 bbl)	Storage facility with the highest delivery quantity	Highest delivery quantity by storage facility (10,000 bbl)	EFP volume (10,000 bbl)
2,407.1	157.9	SC2212	456.6	Basrah Light	1,147.5	Hongrun	970.5	11.3

03

Crude Oil Futures Awards

原油期货获奖名单

上海国际能源交易中心优秀分析师

优秀原油产业服务团队奖

方正中期期货研究院能源化工研究中心

国投安信期货能源团队

光大期货能源研究团队

中银期货能源产业服务组

中泰期货济南分公司原油产业团队

优秀原油分析师奖

申万期货	董　超	建信期货	李　捷
海通期货	杨　安	中信期货	桂晨曦
方正中期	隋晓影	华泰期货	潘　翔
光大期货	钟美燕	东证期货	安紫薇
国泰君安	黄柳楠	中银期货	陆　茗
恒力期货	贺　涵		

2022年原油期货
交易量排名前二十会员名单

华泰期货有限公司	浙商期货有限公司
中信期货有限公司	申银万国期货有限公司
东证期货有限公司	新湖期货股份有限公司
中泰期货股份有限公司	徽商期货有限公司
国信期货有限责任公司	方正中期期货有限公司
国富期货有限公司	光大期货有限公司
国泰君安有限公司	东吴期货有限公司
银河期货有限公司	中信建投期货有限公司
海通期货股份有限公司	中辉期货有限公司
华闻期货有限公司	华安期货有限公司

2022年原油期货
交易量排名前二十境外中介机构名单

亮点国际期货有限公司

Straits Financial Services Pte. Ltd.

J.P. Morgan Securities plc

Goldman Sachs International

群益期货(香港)有限公司

Orient Futures International (Singapore) Pte. Ltd.

横华国际期货有限公司

亮点国际金融（新加坡）有限公司

Societe Generale International Limited

KGI Securities (Singapore) Pte.Ltd.

直达国际金融服务有限公司

ABN AMRO Clearing Bank N.V.

中一期货有限公司

中国新永安期货有限公司

ADMIS Singapore Pte. Limited

元大期货(香港)有限公司

Nanhua Singapore Pte.Ltd.

DBS Bank Ltd.

Phillip Nova Pte.Ltd.

Macquarie Futures (Singapore) Pte.Ltd.

Outstanding Analysts

Outstanding Industry Service Team Award

Investment & Consulting Department, Founder CIFCO Futures Energy and Chemical Engineering Research Group

Energy Division, SDIC Essence Futures

Energy Research Team, Everbright Futures

Energy Industry Service Team, BOCI Futures

Crude Oil Industry Team, Zhongtai Futures Jinan Branch

Outstanding Analyst Award

Shenwan Futures, Dong Chao

Haitong Futures, Yang An

Founder CIFCO Futures, Sui Xiaoying

Everbright Futures, Zhong Meiyan

Guotai Junan Futures, Huang Liunan

Hengli Futures, He Han

CCB Futures, Li Jie

CITIC Futures, Gui Chenxi

Huatai Futures, Pan Xiang

Orient Futures, An Ziwei

BOCI Futures, Lu Ming

Top 20 Members by Crude Oil Futures Trading Volume in 2022

Huatai Futures Co., Ltd.

CITIC Futures Co., Ltd.

Orient Futures Co., Ltd.

Zhongtai Futures Co., Ltd.

Guoxin Futures Co., Ltd.

Guofu Futures Co., Ltd.

Guotai Junan Co., Ltd.

Galaxy Futures Co., Ltd.

Haitong Futures Co., Ltd.

Huawen Futures Co., Ltd.

Zheshang Futures Co., Ltd.

Shenyin & Wanguo Futures Co., Ltd.

Xinhu Futures Co., Ltd.

Huishang Futures Co., Ltd.

Founder CIFCO Futures Co., Ltd.

Everbright Futures Co., Ltd.

Soochow Futures Co., Ltd.

China Securities Futures Co., Ltd.

Zhonghui Futures Co., Ltd.

Huaan Futures Co., Ltd.

Top 20 Overseas Intermediaries by Crude Oil Futures Trading Volume in 2022

Bright Point International Futures Limited

Straits Financial Services Pte. Ltd.

J.P. Morgan Securities plc

Goldman Sachs International

Capital CSC Futures (Hong Kong) Limited

Orient Futures International (Singapore) Pte. Ltd.

HGNH International Futures Co., Ltd.

Bright Point International Financial (SG) Pte. Ltd.

Societe Generale International Ltd.

KGI Securities (Singapore) Pte. Ltd.

DA International Financial Service Limited

ABN AMRO Clearing Bank N.V.

Zhongyi Futures Ltd.

China Xin Yongan Futures Co., Ltd.

ADMIS Singapore Pte. Limited

Yuanta Futures (Hong Kong) Co., Ltd.

Nanhua Singapore Pte. Ltd.

DBS Bank Ltd.

Phillip Nova Pte. Ltd.

Macquarie Futures（Singapore）Pte.Limited


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