



ICE Crude & Refined Oil Products

IntercontinentalExchange (ICE) is a leading operator of regulated exchanges and clearing houses serving global markets for agricultural, credit, currency, emissions, energy and equity index products.

ICE Futures Europe, formerly the International Petroleum Exchange (IPE), was formed in 1980 and is the home of the benchmark Brent and Gasoil futures and options contracts. Today, ICE's markets serve an important role for global crude and refined oil trading and risk management.

ICE Futures Europe hosts trading in more than half of the world's traded oil futures volume due to the rising importance of ICE Brent and Gasoil futures in the context of the broader oil markets. ICE also lists the North American benchmark West Texas Intermediate (WTI) Crude futures contract. In total, more than 800 energy contracts are available in ICE's global energy markets, covering crude oil, refined petroleum, natural gas, power, natural gas liquids and liquefied natural gas.

THE GLOBAL CRUDE OIL MARKET

The international crude oil market is the source of the primary feedstock for creating refined petroleum products produced in oil refineries across the world. Global production and consumption has been increasing and more than 80 million barrels of crude oil is produced each day based on IEA statistics for 2013.

Crude oil is not a homogenous commodity. Over 500 distinct global crude pricing hubs have been identified, but this large and varied group of crude grades rely heavily on a small number of liquid, transparent price markers, on which the global crude oil pricing system is anchored.

These marker grades include Brent, Dubai and WTI. In recent years, Brent crude has become the world's most commonly referenced crude oil price benchmark and a large proportion of global physical oil trade is priced at a differential to the Brent oil complex. It is estimated by price reporting agencies and oil producers that approximately 60% of the world's traded oil is priced off of the Brent complex.

to the pipeline terminus at Cushing, Oklahoma, U.S. When crude oil was discovered in the Permian basin of West Texas and New Mexico in the 1920s, pipelines were laid to Cushing and to refining centres along the U.S. Gulf Coast. Gulf Coast crude oil shipped to the north could connect to this pipeline system, along with Canadian crude moving southwards.

The network of pipelines and storage tanks at Cushing made WTI Light Sweet crude oil at Cushing a natural price marker for U.S. pipeline crude oil. As such, pipeline scheduling is a key factor in the U.S. crude oil market. The scheduling period is the window after the 25th day of the previous month and before the start of the next month. Crude oil priced for the next month's delivery flows is delivered at that price in the following month. That fixed price serves as the basis for swaps against crude oil priced in the daily posting market. The posting or posting-plus market involves daily prices set by crude oil resellers and constitutes the floating leg of the pipeline market.

FIGURE 3: CRUDE OIL PRICING WORLDWIDE



GROWTH IN U.S. LIQUIDS PRODUCTION AND THE WTI/BRENT SPREAD TRADE

In the United States, the dynamics of the crude market have changed since 2010 as unconventional crude and liquids have seen an explosive growth in production from shale oil fields in Texas, North Dakota and also from increased Canadian imports. This increased supply of crude oil is arriving into a system, which has, until now, been based on a south to north flow of crude and refined oil products (imported crude oil arrives to the Gulf coast where it enters the refining system and is subsequently transported north to the major population centres).

This resulted in bottlenecks and oversupply at the Cushing pipeline nexus, which in turn created price discounts for U.S. oil grades. In mid

2010, WTI and Canadian heavy crude started to trade at a discount to other global crude oils, such as Brent, Dubai and also to U.S. Gulf oil such as Light Louisiana Sweet (LLS), where more international grades are relevant due to oil imports.

Pipeline reversals, construction of new pipelines in North America and the adaptability of road and rail to transport crude oil reduced the bottleneck issue and the resulting arbitrage. On this basis, the price difference between WTI and Brent (known as the "Brent/WTI spread") moved back from more than \$20/barrel to only a few dollars below parity.

In the Americas, WTI crude remains the most important basis series of financial contracts for U.S. crude pricing. However, other North American benchmarks are also used for the pricing of physical crude with the Argus Sour Crude Index (ASCI) used for Arab Gulf and Latin American imports into the U.S. Gulf (as well as for domestic U.S. sour crude). LLS is a coastal crude grade, and along with other U.S. domestic grades (such as Mars) is increasingly used for the pricing of physical crude contracts and some forward contracts.

As a coastal U.S. crude oil, LLS tends to correlate more closely with Brent. A number of U.S. based end-user and refiner product hedgers use Brent for product hedging due to its relevance to global fundamentals and because it is internationally arbitrated to U.S. refined oil product exports or oil imports. U.S. refined product exports and oil imports are not constrained by pipeline infrastructure, or restrictions on exporting U.S. crude. Refined oil product spreads to Brent for cracks, as well as outright and Futures against U.S. domestic prices such as ASCI, Mars, LLS are used as effective hedging strategies.

DUBAI/OMAN ('PLATTS DUBAI') CRUDE OIL

Dubai/Oman is the pre-eminent price marker for Middle Eastern crude oil grades, as well as throughout Asia. Rather like the BFOE basket of North Sea crudes, Dubai is also a co-mingled group of crude oils, consisting of Dubai, Oman and Upper Zakum (from Abu Dhabi), any of which can be physically delivered into the system, at a range of appropriate differentials.

Having a structure based on a basket of crudes has helped the system to evolve and grow, despite the decline of underlying production for Dubai crude itself, which has ageing oil fields with a limited output of cargoes. The Dubai marker is used to price grades in Asia, excluding those which reference Brent due to its deep liquidity or because the

grades are closer to Brent in quality. Westbound crude exports from the Persian Gulf to Europe are often priced against an average of trades in the ICE Brent crude oil futures contract; this methodology is known as the Bwave (Brent Weighted Average).

Asian refined oil products use Dubai as the marker for crude margin instruments or 'cracks', and the Brent/Dubai spread is the world's leading sweet-sour crude price marker, tradable on-screen as an arbitrage to Brent, as well as being an important contract for refiners using the heavier, more sour grades compared to sweeter, lighter crudes.

Where regional markers lose pricing power, Brent has been seen to be used as an alternative. In Asia, Brent also has a role in the pricing of crude at a differential, for example following the decline of alternative sweet crude markers such as APPI (Asian Petroleum Price Index) Tapis or Minas. The link between Dubai and Brent through the liquid Brent/Dubai (sweet/sour) spread helps refiners to assess processing alternatives as well as provide the opportunity for regional grades to price their own flat price crude oil using Brent's deep liquidity pool, to which a small differential is then applied for the quality of the local grade.

In Russia, exports are moving increasingly eastwards and trading volumes for East Siberia Pacific Ocean (ESPO) contracts are rising, however, the physical crude in this region is often priced as a spread to the core Platts Dubai price. In Malaysia, Indonesia, Vietnam and Australia, Brent is often used as a preferred price marker and as a result new Asia product spreads to Brent have emerged.

CRUDE SPREAD TRADING AND PRICE RELATIONSHIPS

A large part of crude oil trading is focused around 'spread' trading, and there are many inter-product, inter-month and inter-quality spreads available to trade. One of the most well known and traded spreads is the Brent / WTI spread, which is the difference in price of WTI minus Brent. The importance of the WTI / Brent trade, a spread between a waterborne cargo in the North Sea and a pipeline transported and delivered crude in Cushing, mid U.S., demonstrates the underlying and historical significance of both the Brent and WTI futures contracts.

In October 2011, due to bottleneck and storage issues in Cushing, Oklahoma, WTI reached a record discount to Brent of U.S. \$27.88/barrel and this discount for WTI extended to other international grades of both light and heavy crude oil including LLS, Mars, ASCI, and Dubai.

Prior to 2010, the WTI/Brent spread was a function of the inward freight differential of a few dollars for Brent compared to WTI, when Brent-referenced crudes from the eastern Atlantic seaboard readily moved across the Atlantic to meet U.S. gasoline demand. However since 2010, the spread has represented more the cost of transporting WTI from its storage locations in PADD II southwards towards the primary refining centre of the Gulf of Mexico, against the prevailing direction of U.S. pipeline capacity.

FIGURE 4: BRENT/WTI SPREAD*



Source: ICE

The Platts Dubai price marker is the most heavily traded on an inter-month or quality spread basis and leans on Brent with its widely traded and highly liquid derivative structure. Dubai also leans on Brent as a reactive price to global signals and therefore as a key flat price guide, in particular at the front of the forward price curve.

Asian refiners may therefore use the Brent/Dubai spread to establish the relative costs and yields for globally available and transportable light sweet crude versus medium sour (Arab Gulf) crudes, and also to assess the relative pricing power of complex and hydro-skimmed refineries.

The Brent/Dubai spread (as is the case with many sweet/sour spreads) tends to spike in favour of the more expensive sweet crude oil during times of maximum refinery demand. The value of sour crude oil is also affected by the relative value of fuel oil because high sulphur crude oils typically yield a relatively higher volume of fuel oil.

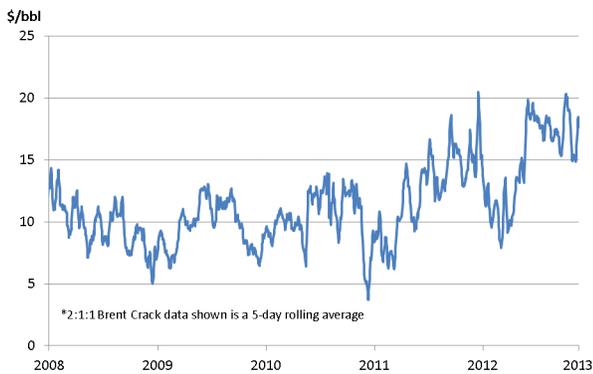
FIGURE 5: BRENT/DUBAI SPREAD*



Source: ICE, Platts

Another important relationship, and one that has an effect on the price trend of Dated Brent is the refining margin, or crack spread, between Dated Brent and second-month New York Harbour heating oil and gasoline prices. Dated Brent prices tend to track the “2/1/1” crack spread, or two barrels of Brent refined into one barrel each of heating oil and gasoline. This close relationship suggests changes in U.S. refined products have a tradable impact on Dated Brent prices.

FIGURE 6: TRANSATLANTIC CRACK*



Source: Reuters, Platts

For each price marker and related spreads, trading activity tends to flow up and down the forward price curves, and across the curves in order to test relative values in ‘box’ trade. A change in one area of the microstructure creates the possibility of price changes in another part of the same or a related price curve.

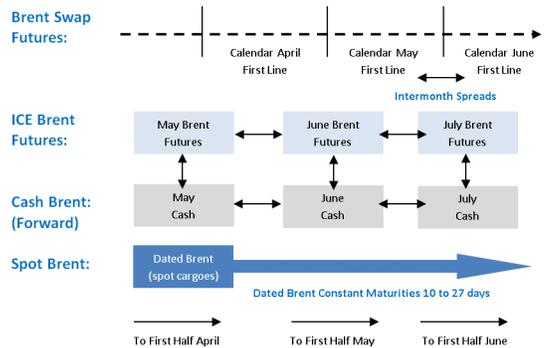
BRENT CRUDE OIL BENCHMARK INSTRUMENTS - SPOT, FORWARD PHYSICAL AND FUTURES

In the case of crude oil, benchmarks or price markers are often based on a range of underlying instruments, some of which may serve as alternative benchmarks in their own right.

Looking at the Brent complex for example, it consists of spot physical (Platts Dated Brent), cash BFOE (forward physical cargoes), ICE Brent futures and options as well as many inter-product, inter-month and inter-quality spread trading opportunities. The Cash or Forward BFOE market (forward physical cargoes) is the underlying physical market for the ICE Brent futures contract, and is also the parent of Platts Dated Brent until it acquires a vessel, loading dates and cargo number. Either Dated Brent or ICE Brent futures are considered to be versions of the benchmark Brent price.

Brent weekly or monthly Contracts for Difference (CFDs), inter-month spreads (in futures, cash and swaps), Exchange of Futures for Physical (EFPs), Dated Brent to Frontline swap, ICE Brent first line swaps, are just a few additional examples of instruments used to explore spread values and generate long, forward price curves. These instruments combine to create a robust, liquid and valued price matrix for the Brent market and its global participants.

FIGURE 7: THE ICE BRENT COMPLEX AND RELATED INSTRUMENTS



PRICE RELATIONSHIPS ACROSS GLOBAL OIL MARKETS AND INSTRUMENTS

A complex and inter-dependent set of price relationships exist across the entire matrix of global oil markets and products, including physical oil and related derivatives contracts. These price relationships are based on many fundamental factors, such as supply, demand, geographical, time and quality arbitrages across the globe which underpin the market and prices in all grades and regions. In addition, due to inter-product spread pricing, greater liquidity in one oil market can help price less liquid oil markets at a differential.

For example, a refined product ‘crack’ (differential) to Brent, such as Naphtha CIF NWE Cargoes vs. Brent 1st Line Swap, allows the more liquid Brent market to provide as much as 95-99% of the outright price of Naphtha cargoes, a less liquid outright price market which

derives liquidity from the Brent crude complex. In the Brent market, participants contribute to liquid markets and provide tight bid/offer spreads for the proportion of the Naphtha flat or outright price.

This approach, which grew naturally from the hedging requirements and operations of market participants, helps to improve liquidity in both the spot physical and related derivative markets. The most common aggregator oil products have the highest liquidity, and are therefore key instruments for price discovery and hedging purposes. However, due to the diverse nature of the oil market, which has more than 500 crude grades and thousands of product permutations, there is a degree of trade off between liquidity and basis risk in instrument choice. There is also a trade off between choosing an exact product hedge or a more liquid, close proxy instead.

The global hierarchy of oil crude and refined products, which includes relationships, price and liquidity, can generally be characterised by example relationships in the table below, although it must be noted that these relationships are variable, fluid and change frequently.

Since the 1980s, oil has evolved to become an efficient market which is flexible and adaptable to changing global economic and refining conditions.

Liquidity is generally higher towards the top of the figure, although Futures such as Gasoil tend to exceed liquidity of non-exchange benchmarks, even crude ones, although spread pricing relationships apply upwards, downwards and across these categories in almost all directions as markets test price constantly across both physical and derivative markets:

FIGURE 8: GLOBAL OIL AND REFINED PRODUCT HIERARCHY AND INTER-RELATIONSHIPS

Region	Global			Asia			U.S.		
Primary Crudes	Brent Crude Future			Dubai, Sweet/Sour Diff			Wti Crude Future		
Ancillary Crudes	Urals			Espo			Lls, Mars, Asci		
Cracks To Refined Products Below:									
Primary Refined Oil Products	Gasoil Future (Eu)	Eurobob Gasoline Barges	Fuel Oil 3.5% R'dam Barge	S'pore 0.05% Gasoil	S'pore 180 Cst Fo	Nyh Rbob Future	Nyh Heating Oil Future	Usgc 3% Fo	
Spreads/'Diffs' (Including Some Cracks) To Products Below:									
Secondary Refined Oil Products	10Ppm Diesel Barges R'dam ----- 0.1% Nwe Cargoes ----- Jet Cargo Cif Nwe	Naphtha Cif Nwe ----- Gasoline Fob Nwe Cargoes	Fo 1% Cargoes Nwe ----- Fo 1% Cif Med Cargoes	Jet (Regrade) Fob S'pore	S'pore 380Cst Fuel Oil	Rbob To Euro Oxy Gasoline	Usgc Jet ----- Nyh Heat Barge	Usgc 1% Fo	

CRUDE AND REFINED FUTURES AND OPTIONS ON ICE FUTURES EUROPE

Exchange traded futures and options have an important role in price discovery, risk transfer and management. In a highly interconnected and data-driven world, electronic futures markets provide transparency and access to market participants to react to changes in global fundamentals and events.

ICE offers over 800 energy futures and options contracts, all tradable on ICE's state-of-the-art trading infrastructure which offers a web based front end known as WebICE. WebICE's accessibility and functionality was inspired by ICE's drive to bring transparency and electronic trading to the energy markets, with each function designed to meet the specific needs of traders, risk managers and back-office personnel.

Once accepted by a clearing firm or a licenced, regulated futures brokerage, it is possible to trade in ICE's diverse energy markets. For regulatory and reporting purposes, a market participant not in the petroleum business will be classified as non-commercial and a market participant in the petroleum business will be classified as a commercial or hedger trader.

In a futures trade, the trader and the counterparty to the trade must post initial or original margin to a futures commission merchant (FCM) or clearing member. Minimum margin requirements are set by ICE Clear Europe but the FCM or clearing member can demand addition funds as margin. For more information on margin rates please visit the ICE website: [ICE Clear Europe Risk Management »](#)

If the market moves in favour of the trader – higher for a long position (or commitment to take delivery of oil or to offset the contract by selling it prior to delivery), or lower for a short position (or commitment to deliver oil or to offset the contract by buying it prior to delivery), then funds in the trader’s account increases. The trader may withdraw these funds down to the initial margin level, depending on the account agreement in place.

If the market moves adversely – lower for a long position or higher for a short position – the trader will be required to post additional funds, called “variation margin”, with the FCM or clearing member in order to sustain the initial margin. These margin calls assure both the FCM or clearing member and ICE Clear Europe, the clearing house of performance of the trade. All futures accounts are marked-to-market daily and participants deficient in their margin obligations can have positions liquidated involuntarily.

As the clearing house for all trades executed on ICE Futures Europe, ICE Clear Europe stands as the central counterparty to every futures contract traded on the exchange. The clearing house matches long and short positions anonymously and guarantees financial performance.

ICE FUTURES EUROPE – ICE’S LONDON BASED LEADING ENERGY FUTURES EXCHANGE

Brent and Gasoil, the world’s crude and refined oil future benchmarks, are available for trading on ICE Futures Europe, ICE’s London-based, futures exchange for the global energy markets. The exchange also offers futures and options on North American benchmarks: WTI crude, New York Harbor Heating Oil and RBOB Gasoline futures. ICE Futures Europe is regulated by the Financial Conduct Authority in the U.K.

ICE Futures Europe also provides trading for hundreds of other global crude and refined oil futures and options, as well as UK and European natural gas and power, natural gas liquids, liquefied natural gas and the world’s leading carbon emissions market. North American natural gas and power futures and options, including Henry Hub, are available to trade on the same trading screen but via ICE’s U.S. exchange, ICE Futures U.S.

All ICE energy products are cleared at ICE Clear Europe, ICE’s London based clearing house, which clears an average of more than 3 million energy contracts every day.

TRADE AT SETTLEMENT (TAS)

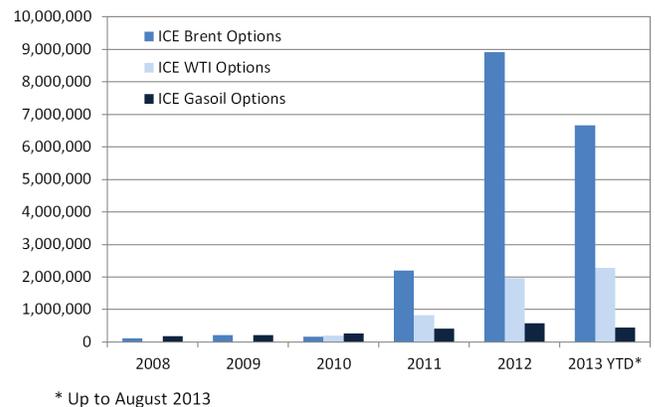
Brent crude oil futures can be traded at settlement, known as TAS. As is the case of all markets where the TAS facility is available, this is an invaluable feature for traders who are trying to match cash market deals to the ICE Futures Europe settlement price. A related facility, also designed with the needs of the cash market hedger in mind, is the 16:30 afternoon minute marker. ICE Futures Europe sets out an official marker price for the front-three contract months at 16:29 – 16:30 London local time to coincide with the Platts Market on Close window.

OPTIONS

In addition to futures contracts, options on futures contracts are available on the ICE trading platform. For example, Brent options are available for consecutive months up to and including February 2020. Each American-style option settles into the underlying futures contract. Trading ceases three business days prior to the scheduled cessation of trading for the relevant contract month of Brent futures.

Trading activity in ICE’s range of oil options contracts has increased in recent years as users adopt options strategies to hedge their price risk.

FIGURE 9: ANNUAL ICE OPTIONS VOLUMES



RISK TRANSFER USING FUTURES AND OPTIONS

Risk transfer is the second purpose of a futures market. For example, any producer of Brent-basis crude oil, any holder of Brent-basis inventories or any party at risk if the price of Brent-basis crude oil declines is ‘long’ the market. These market participants can offset risk by going ‘short’ a futures contract. A refinery or any user of crude oil at risk if the price of Brent-basis crude oil increases is short the market and can offset risk by going long a futures contract.

The mechanics and financial flows are identical to those outlined above. A Brent-basis crude oil producer at risk to prices falling can acquire a financial asset, the short futures position, which will rise in value as the market declines. The opposite is true for a refinery at risk to prices rising; in this case a long futures position will rise in value as the market rises.

While the financial flows should offset the economic gains and losses of the physical Brent-basis crude oil position, there are two important things to remember. First, even though futures prices converge to cash prices at expiration, the convergence process is subject to what is called “basis risk”, or differences due to changes in hedging demand, location of the crude oil and quality differentials.

Secondly, while the economic gains on, for example, a storage tank of crude oil are real, they are not realised until the crude oil is sold. If this inventory is hedged with a short futures position and the market rises, the storage operators will have to keep posting additional funds in the margin account.

Nothing in the above discussion of hedging reveals when or at what price to hedge. This is one of the reasons options are valuable to hedgers. While the Brent-basis crude oil producer may wish to have downside protection or a price floor, that same producer probably wants to participate in any future price increases. The producer concerned about a decline in the value of Brent-basis crude oil between now and the time he expects to be able to deliver that crude oil in June could buy a June \$100 put option, which is the right, but not the obligation, to receive a short position in a June future at \$100 for a \$5.22 premium paid, or \$5,220 per lot.

The purchased put guarantees the producer the right to sell the June future for an effective price of \$94.78 per barrel (the \$100 strike price less the premium paid of \$5.22). This right gives him protection if Brent crude oil prices have fallen by the expiry of the June option, but at the same time preserves his ability to profit should the price of Brent crude oil move higher over the period.

The refiner wishing to cap the price of Brent-basis crude oil but not be exposed to margin calls should the price continue to rise can do an opposite trade and buy a June \$100 call option for \$5.49, which is the right, but not the obligation, to receive a long position in a June future at \$100 for a \$5.49 premium paid, or \$5,490 per lot. The purchased call gives the refiner the right to buy the June future

at an effective price of \$105.49 per barrel (again, the strike price of \$100 plus the premium paid of \$5.49), offering protection against an unfavourable rise in the price of Brent crude oil while preserving the ability to take advantage if prices in fact decline.

It should be noted that the risk profile for sellers of options is different than for buyers of options. For buyers, the risk of an option is limited to the premium or purchase price paid to buy the option. For sellers, the risk profile is unknown and can be potentially quite large. Options trading can become complex quickly and involves the interplay of time remaining to expiration, the volatility of the commodity, short-term interest rates and a host of expected movements collectively called “the Greeks.”

ICE OIL FUTURES AND OPTION CONTRACT SPECIFICATIONS

[ICE Brent Crude »](#)

[ICE WTI Crude »](#)

[ICE Gasoil »](#)

[ICE Low Sulphur Gasoil »](#)

[ICE Heating Oil »](#)

[ICE RBOB Gasoline »](#)

The full list of more than 800 global energy contracts, including additional crude and refined oil products, available for trading and clearing at ICE, can be found on the ICE website:

theice.com/crude

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TRADING & TECHNOLOGY

ICE's electronic trading tools, high-speed connectivity and mobility options provide unparalleled speed and flexibility for executing risk management strategies. > [Learn More](#)

ICE Crude Futures	WTI	April 2	↓	2	101.62	101.64	3	101.62	101.57	101.58	101.11	101.7	0
ICE Crude Futures	WTI	Jun 13	↑	2	100.02	100.84	3	100.03	99.95	100.60	101.50	231	0
ICE Crude Futures	WTI	Dec 14	↑	2	100.33	100.38	3	100.28	99.95	100.25	100.25	232	0
ICE Crude Futures	WTI	Dec 14	↑	2	91.33	91.43	1	0.00	100.66	100.67	100.81	63	0
ICE Crude Futures	WTI	Dec 14	↑	2	94.4	94.2	1	0.00	99.05	100.00	0.00	18	0
ICE Crude Spr	WTI	Jun 12	↓	2	98.48	98.52	2	0.00	0.00	84.28	0.00	18	0
ICE Crude Spr	WTI	Jun 12	↓	12	-0.4	-0.39	0	99.50	-99.32	99.67	99.67	233	0
ICE Crude Spr	WTI	Dec 12	↓	7	-0.92	-0.92	3	-0.28	-0.58	100.67	-0.47	427	0
ICE Crude Spr	WTI	Jun 12	↓	7	1.23	1.38	3	1.38	1.25	1.26	0.91	1	0
ICE Crude Spr	WTI	Dec 12	↓	2	-0.29	-0.29	18	1.38	1.25	1.26	1.25	33	0

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