China Crude Inventories as a Proxy for Economic, Financial Indicators

Oct 2019

This whitepaper focuses on using Ursa's China crude oil inventory data as a proxy to provide leading signals for macroeconomic, financial indicators. As the Chinese economy continues to move toward center stage in the global economy, many investors are looking for signals or insights into the overall health of the Chinese economy, as well as the ripple effect on larger global markets.

While understanding the Chinese economy is of paramount importance, transparency is difficult to come by. The unreliability of Chinese data has been well documented, with government statistical releases often being greeted with derision and disbelief.

Leveraging Ursa's China crude oil inventories measurements as an alternative measure to gauge the Chinese economy, we explore how this vital economic supply and demand indicator can provide a pulse on often-elusive larger macro trends, allowing market players to better identify market inflection points and help predict future volatility.

By leveraging our deep expertise in satellite radar technology – in particular Synthetic Aperture Radar (SAR) – Ursa is able to provide reliable weekly measurements across China's supply chains day or night, regardless of clouds or fog, 24/7.

This whitepaper represents an extension of our previous research demonstrating how Ursa's measurements of crude oil inventories using satellite radar can generate alpha for investors by leveraging alternative data.

We recently showed how this dataset can be a leading indicator to anticipate movement in global equity indices, single-name equities and exchanged-traded funds (ETFs) in the energy sector. Analysis has also indicated that this data provides leading signals to generate P/L on underlying energy assets, such as ICE Brent futures flat price movement and NYMEX WTI time spreads.

There are numerous factors that influence price activity or index movement such as economic data releases, central bank announcements, geopolitical events, natural disasters, government policy, regulatory updates, corporate news, and collective investor sentiment. However, interestingly enough, when isolating the relationship of Ursa's China crude oil inventories to particular economic and financial health indicators from March 2018 through August 2019 – *ceteris paribus* – **strong correlations emerge**.

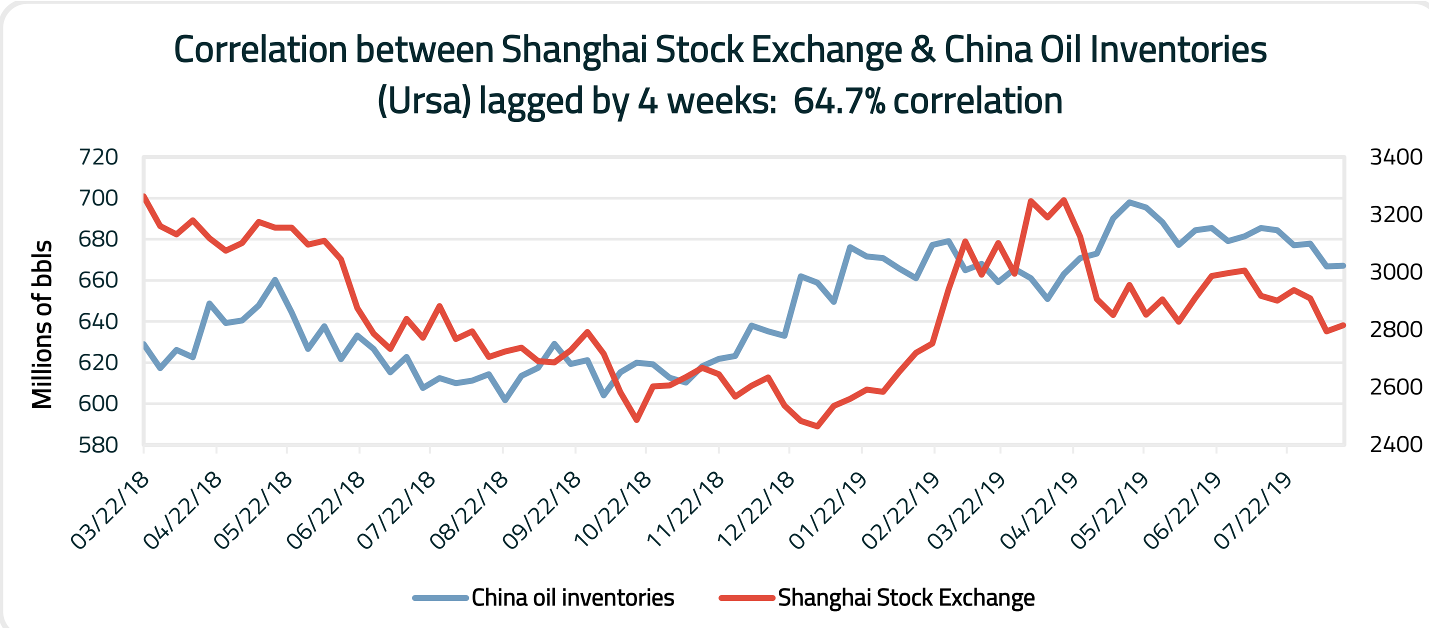
The complexity of markets is continuously evolving. Below are a few ways to leverage alternative data to support informed trading strategies and manage risk.

"Ursa has moved from a premier deep dive in oil price movements to helping traders unravel volatile macroeconomic developments."

Former Managing Director | Morgan Stanley

What do China's crude oil inventories say about China's GDP, manufacturing robustness, equity and bond markets?

I. Shanghai Stock Exchange



Shanghai Stock Exchange Hypothetical Trading Scenario

The Shanghai Stock Exchange (SSE), the largest stock exchange in mainland China, is a widely quoted barometer for the Chinese economy.

Chinese crude oil inventories within Ursa's coverage yield a positive correlation of 64.7% to the Shanghai Stock Exchange with 4-week predictability.

A timing advantage of this magnitude can represent a significant competitive advantage. For portfolio managers, macro funds, or long-term investors looking for a bellwether of the Chinese economy, Ursa's insights can be revolutionary in their indicative nature.

In other words, as Ursa measures oil inventories declining in China, this serves as a leading indicator of a falling SSE four weeks out. As supplies rise, the SSE rises (and vice versa) with a 4-week leading indication.

Let's look at a Shanghai Stock Exchange hypothetical trading scenario to generate P/L with this time advantage.

Suppose the trend of inventories builds from December 2018 through mid-January 2019 leads you to have a bullish view on the Shanghai Stock Exchange 4 weeks out. In mid-January, you decide to go long 125,000 shares of the iShares MSCI China ETF (ticker: CNYA) – offering exposure to a basket of Chinese equities designed to track the performance of the Shanghai Stock Exchange – at a price of $24.20/share, with the intent of holding for a 4-week period (given the 4-week predictability outlined above). ***When you closed out your position at the end of the 4-week holding period, the CNYA share price rose 9.46% to $26.49/share, and you would have realized a profit of $286,250.***

However, suppose you weren't receiving Ursa's China measurements. You had missed the SSE market's bullish momentum in Q1 2019, yet decide to go long 125,000 shares of CNYA in early March at a price of $28.62/share as to 'not be late to the party.' One month later, your position has still done well and appreciated by 5.94% to a price of $30.32/share. However, you would not have been privy to having a near real-time pulse on a material inflection point occurring in Chinese oil inventories swinging from supply builds to storage drawdowns, which would be reflected 4 weeks later in a material inflection point in the SSE's market from bullishness to bearishness. One month later, in mid-May, the CNYA position you're still holding is now trading at $26.27/share. ***Had you been receiving Ursa's China measurements, a loss on your book of -$293,750 (-8.21%) could have been avoided.***

II. China Manufacturing Purchasing Managers' Index (PMI)

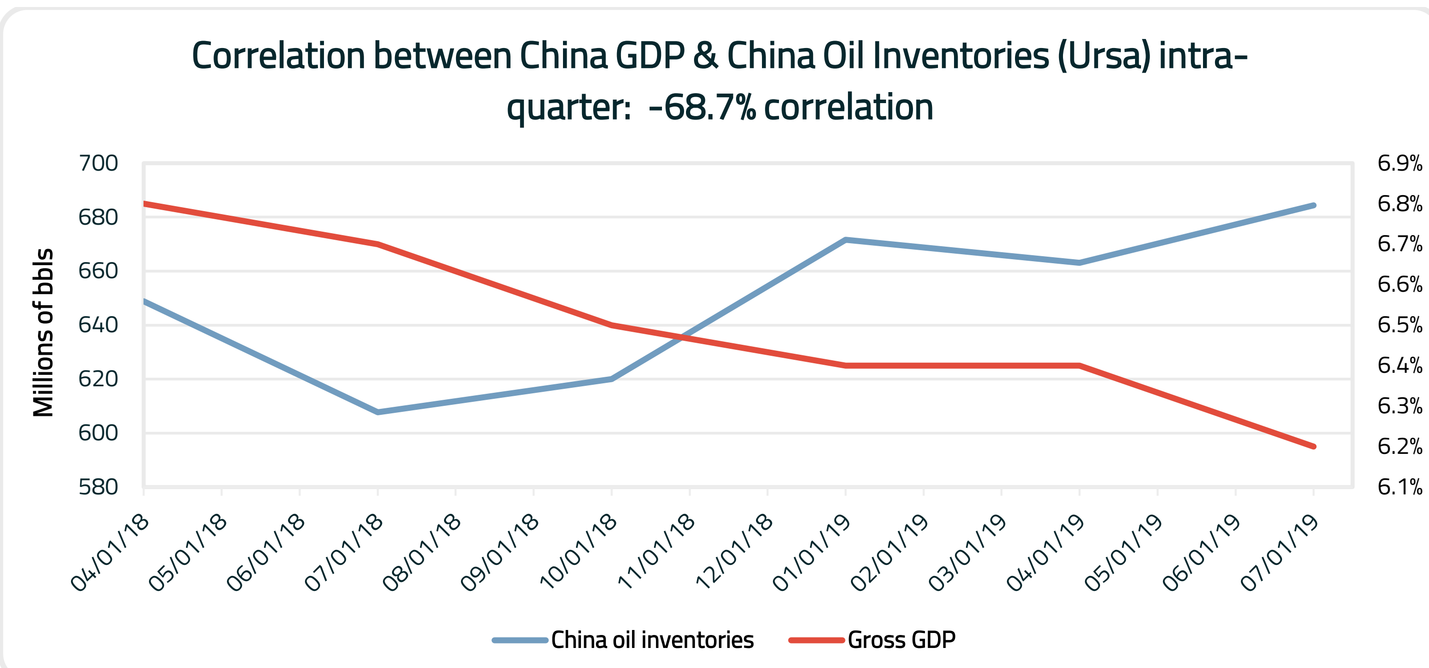
China's Manufacturing Purchasing Managers' Index (PMI) provides an early indication each month of economic activities in the Chinese manufacturing sector. Compiled by the China Federation of Logistics & Purchasing (CFLP) and China Logistics Information Centre (CLIC) based on data collected by the National Bureau of Statistics (NBS), a higher than expected reading is typically positive/bullish for the CNY (Chinese Yuan; currency) while a lower than expected reading is typically negative/bearish for the CNY.

Chinese crude oil inventories within Ursa's coverage yield an inverse correlation of -60.3% to the China Manufacturing PMI intra-month.

Ursa's weekly inventory measurements can represent a significant competitive advantage for portfolio managers, macro funds, or long-term investors looking for a bellwether of the Chinese economy.

In other words, as Ursa measures oil inventories rising in China, this serves as a leading indicator of a falling China PMI. As supplies rise, the China PMI declines (and vice versa), providing market participants with a leading signal on the robustness of the Chinese manufacturing sector as a proxy for macroeconomic activity.

III. China GDP

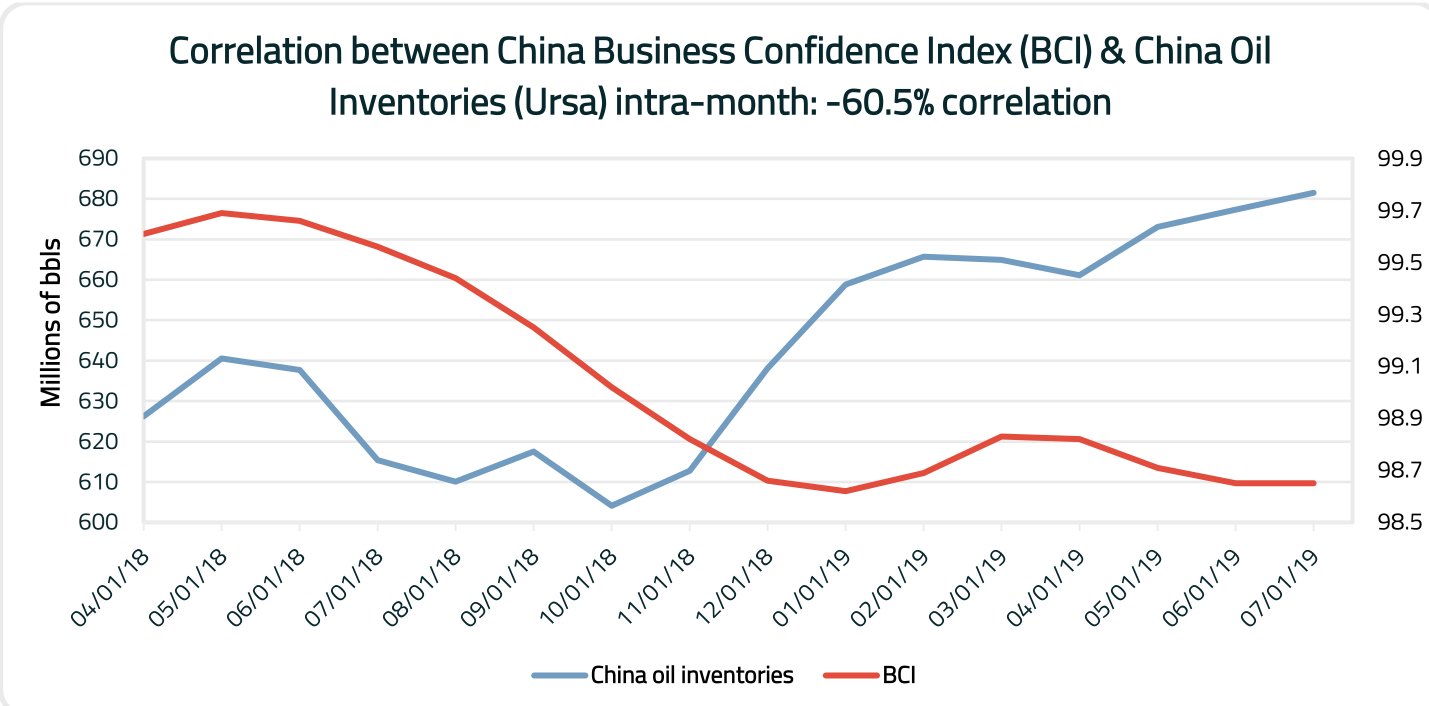


Chinese crude oil inventories within Ursa's coverage yield an inverse correlation of -68.7% to the quarterly release of China's GDP.

In other words, as Ursa measures oil inventories rising in China, this serves as a leading signal of falling GDP in China, potentially beckoning a weakening Chinese economy. As supplies rise, China's GDP declines (and vice versa), providing market participants with a leading signal on the health of the Chinese economy intra-quarter.

Ursa's *weekly* inventory measurements can represent a significant competitive advantage for portfolio managers, macro funds, or long-term investors looking for a bellwether of the Chinese economy ahead of traditional statistical releases.

IV. China Business Confidence Index (BCI)



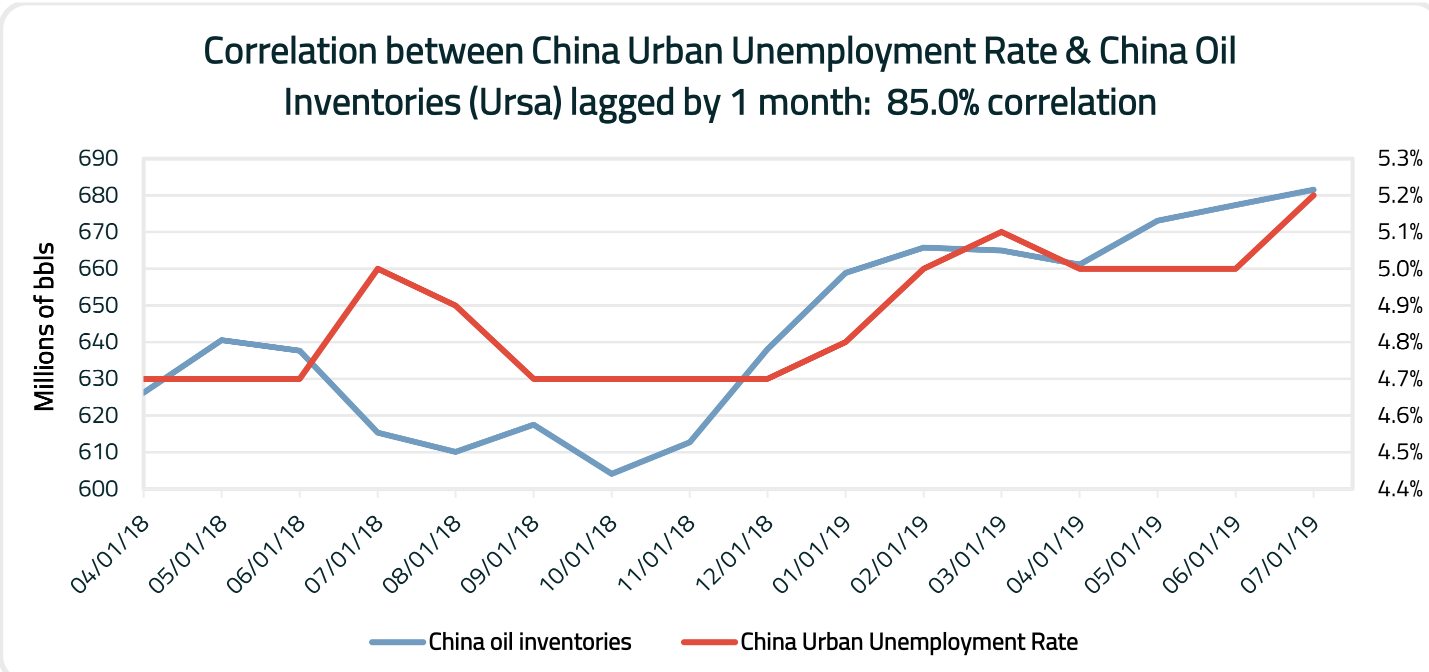
The Business Confidence Index (BCI) provides an indicator on future developments in the Chinese industrial sector. Often monitored to gauge output growth and to anticipate turning points in economic activity, numbers above 100 suggest an increased confidence in near future business performance, and numbers below 100 indicate pessimism towards future performance.

Chinese crude oil inventories within Ursa's coverage yield an inverse correlation of -60.5% to the monthly release of China's Business Confidence Index (BCI).

Ursa's weekly inventory measurements can represent a significant competitive advantage for portfolio managers, macro funds, or long-term investors looking for a bellwether of the Chinese economy.

In other words, as Ursa measures oil inventories rising in China, this serves as a leading indicator of a falling Business Confidence in China, potentially signaling pessimism from the business sector regarding demand-side strength and future performance of the Chinese economy. As supplies rise, China's Business Confidence Index declines (and vice versa), providing market participants with a leading signal on the pulse of the Chinese economy intra-month.

V. China Urban Unemployment Rate



As the Wall Street Journal has recently noted, one result of the tit-for-tat tariffs filtering into China's economy has been the Chinese government's tightening of access to data that has proved reliable in the past, in some cases stopping the release of indicators that paint an unfavorable picture. For example, in December, a manufacturing index for the trade-intensive Guangdong province was suspended after trailing national figures for months. China's National Bureau of Statistics (NBS) said the local government that produced the index didn't have permission to do it.

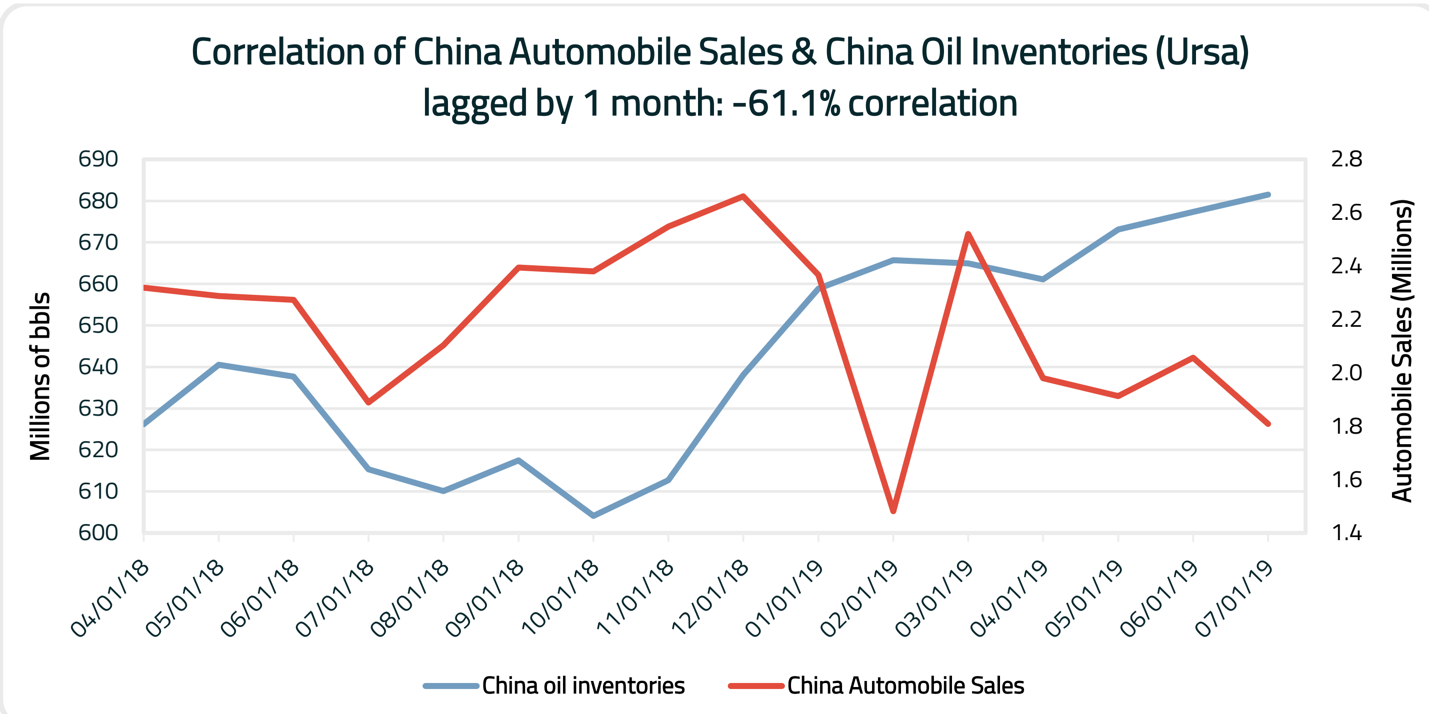
One official measure of China's unemployment rate has hovered between 3.5% and 4.5% for the last 15 years, a pattern that has led many economists to conclude it is unreliable. Approximately two years ago, China began publishing an unemployment rate for urban areas derived from a labor survey that many authorities and market participants deem more accurate. It recently showed a higher reading of 5.2%, though it has also moved in a fairly tight range.

Chinese crude oil inventories within Ursa's coverage yield a positive correlation of 85.0% to the monthly release of China's Urban Unemployment Rate with 1-month predictability.

Ursa's weekly inventory measurements can represent a significant competitive advantage for portfolio managers, macro funds, or long-term investors looking for a bellwether of the Chinese economy.

In other words, as Ursa measures oil inventories rising in China, this serves as a leading indicator of a rising Urban Unemployment in China, potentially signaling the ripple effect of a slowing demand-side of the economy contributing to higher unemployment. As supplies rise, China's Urban Unemployment rises (and vice versa), providing market participants with a leading signal on the health of the Chinese economy with a 1-month leading indication.

VI. China Automobile Sales



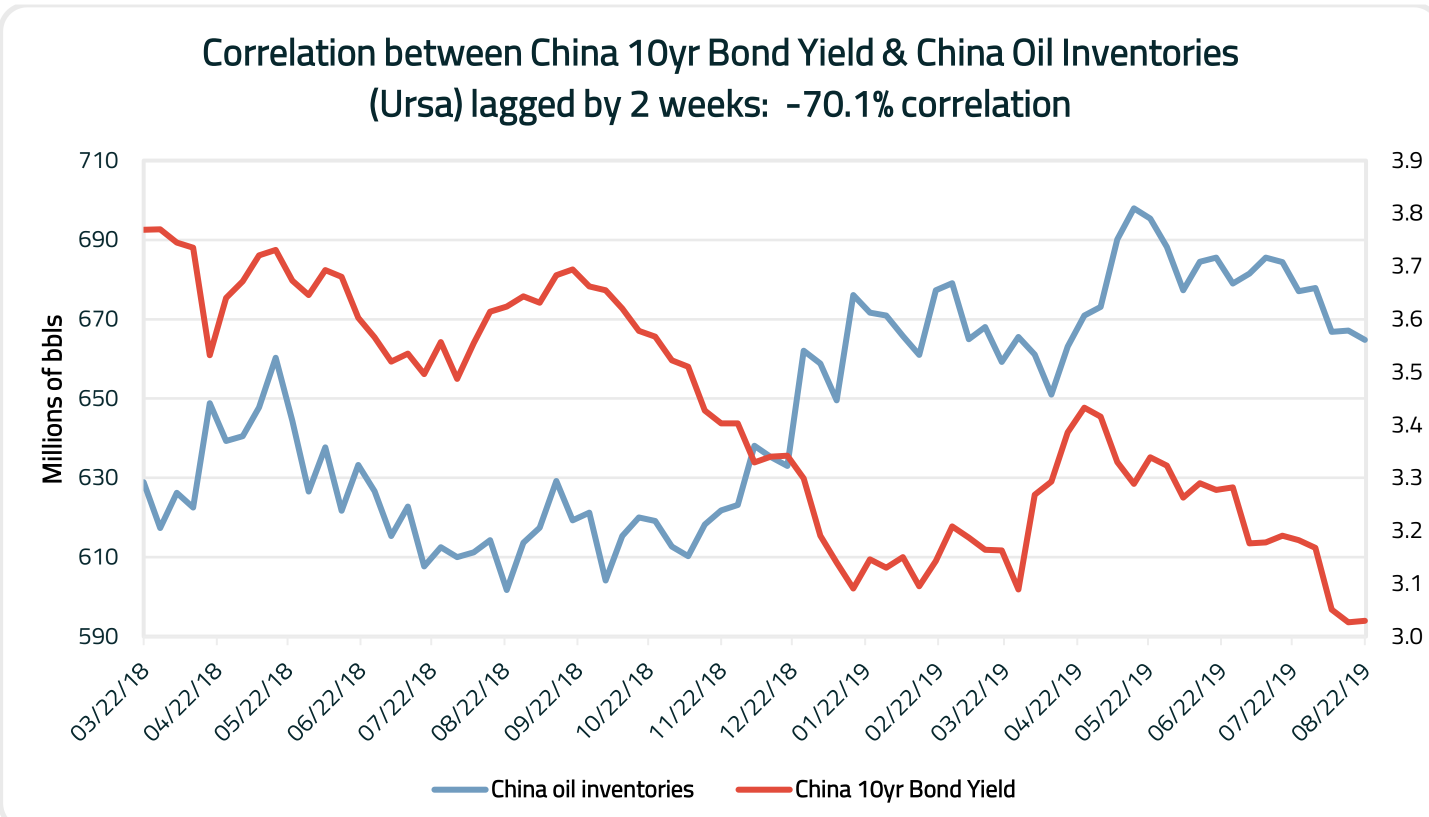
China's automotive sector, which makes up about a 10th of GDP, has been in a slump since late 2018. The China Association of Automobile Manufacturers, the organization that publishes official sales numbers and forecasts, had earlier estimated that 2019 sales would be flat year-on-year. In the first seven months of the year, they fell 12.8%. Despite that, the official forecast is now for a 5.4% full-year decline in the world's largest automobile market, exacerbating concerns over China's economic slowdown and growing impact of an ongoing trade war with the United States.

Chinese crude oil inventories within Ursa's coverage yield an inverse correlation of -61.1% to the monthly release of China's Automobile Sales with 1-month predictability.

Ursa's weekly inventory measurements can represent a significant competitive advantage for portfolio managers, macro funds, or long-term investors looking for a bellwether of the Chinese economy.

In other words, as Ursa measures oil inventories rising in China, this serves as a leading indicator of falling Automobile Sales in China, potentially signaling a more fragile Chinese economy. As supplies rise, China's Automobile Sales decline (and vice versa), providing market participants with a leading signal on the health of the Chinese economy with a 1-month leading indication.

VII. China 10yr Bond Yield



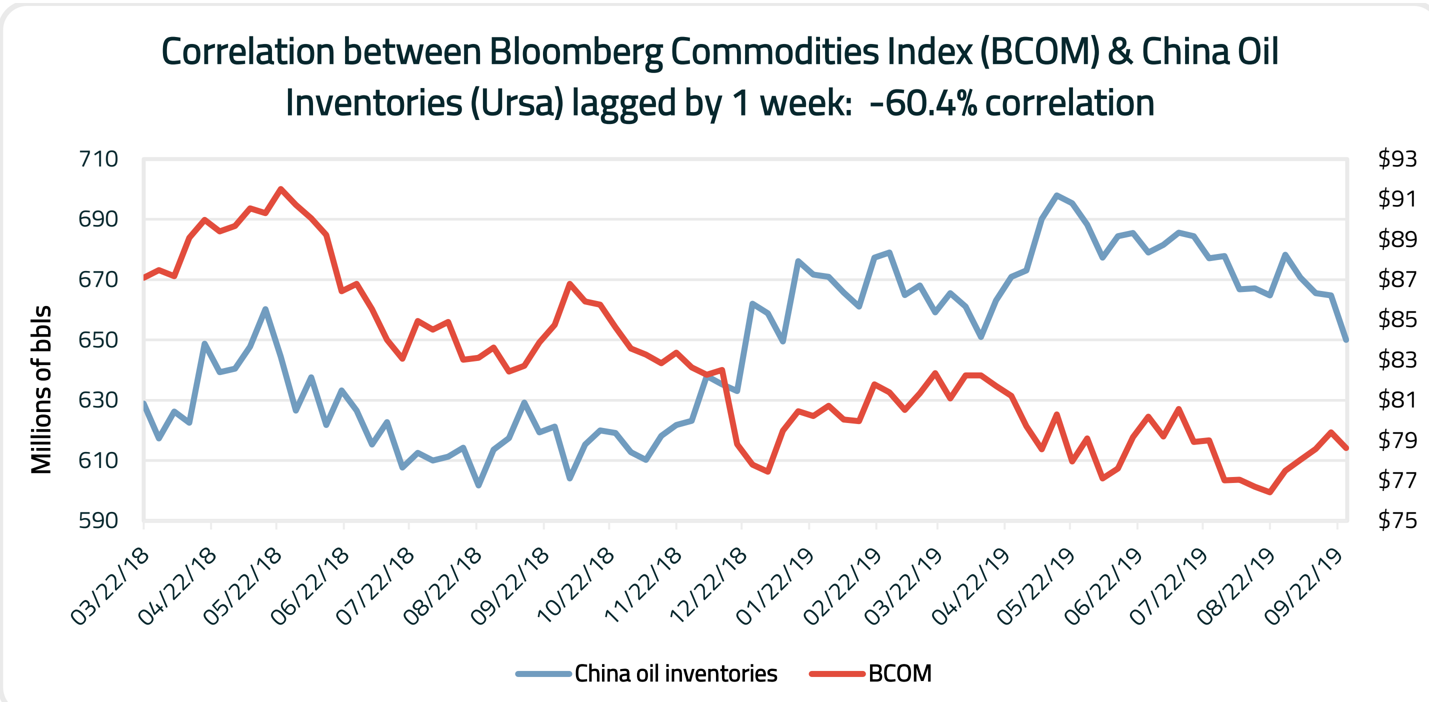
Yield falls as demand for bonds increases and prices rise. It is a sign of growing investor anxiety about where the global economy may be headed, in a classic case of investors flocking to safe assets (risk-off mode) even though the returns may be low.

Chinese crude oil inventories within Ursa's coverage yield an inverse correlation of -70.1% to China's 10yr Bond Yield with 2-week predictability.

In other words, as Ursa measures oil inventories rising in China, this serves as a leading indicator of a falling China 10yr Bond Yield, potentially signaling pessimism regarding future performance of the Chinese economy given weaker demand-side signals. As supplies rise, China's 10yr Bond Yield falls (and vice versa), providing market participants with a leading signal on the robustness of the Chinese bond market and a proxy for other important financial matters with a 2-week leading indication.

What do China's crude oil inventories say about other macro, global indicators?

I. Bloomberg Commodities Index (BCOM)



Bloomberg Commodities Index Hypothetical Trading Scenario

The Bloomberg Commodities Index (BCOM) provides diversified exposure to physical commodities via commodity futures contracts, including energy, grains, industrial and precious metals, softs and livestock. "China's influence across global commodity markets is without parallel," said Wood Mackenzie, a commodities consultancy in a recent report. Given the prominence of China as the world's biggest commodity importer, its staggering demand for commodities can have a material impact on commodity prices. The Asian giant is still one of the world's top energy consumers and the world's largest crude oil importer, accounting for 14% of global consumption in 2018.

Historically, the Bloomberg Commodities Index (BCOM) and crude oil inventories have been strongly inversely correlated. Looking at a greater than 14-year historical time series (Jan 2005-Aug 2019), one observes a -84.8% correlation to the International Energy Agency (IEA)'s crude oil inventories in OECD countries.

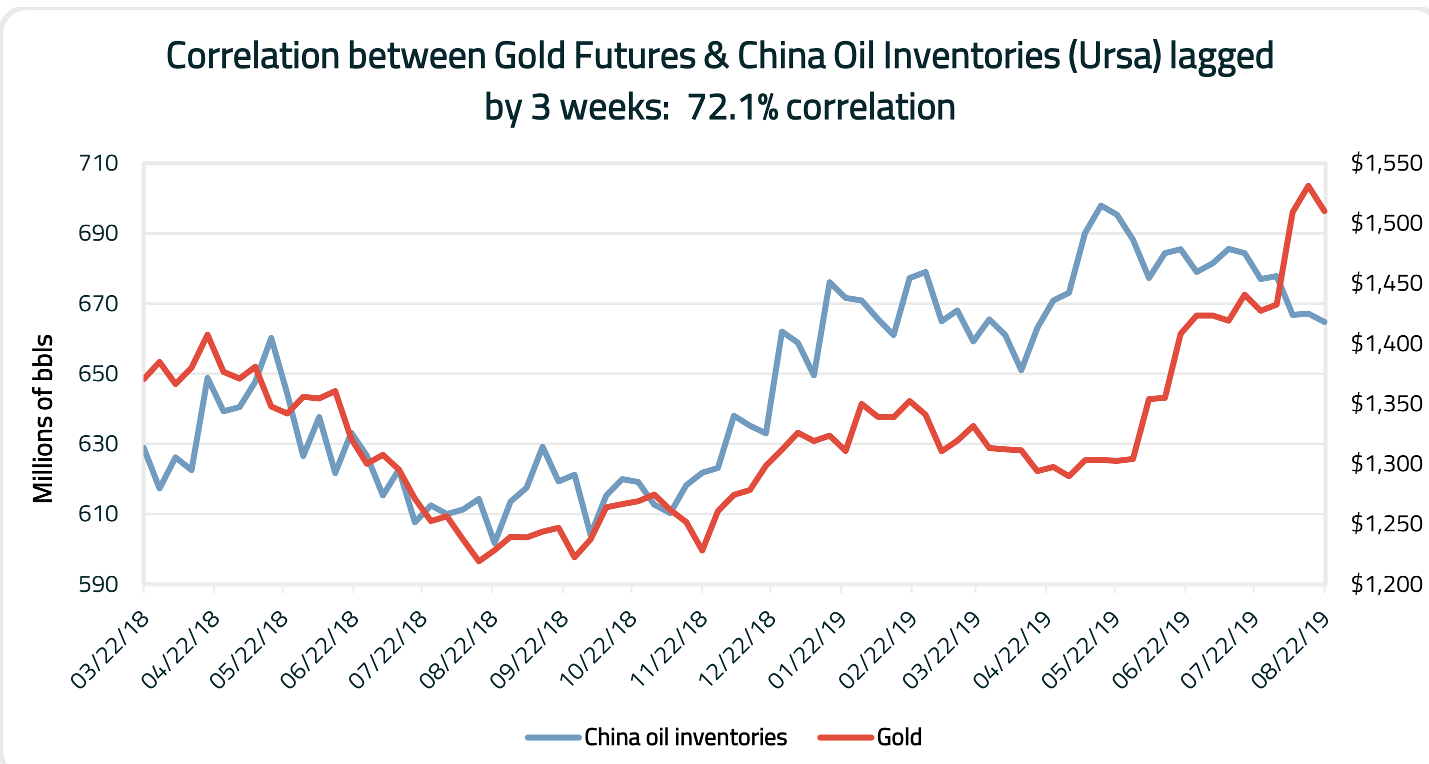
Chinese crude oil inventories within Ursa's coverage yield an inverse correlation of -60.4% to the Bloomberg Commodities Index (BCOM) with 1-week predictability.

In other words, as Ursa measures oil inventories decreasing in China, this serves as a leading indicator of a rising BCOM one week out. As supplies fall, the BCOM rises (and vice versa) with a 1-week leading indication.

Let's look at a BCOM hypothetical trading scenario to generate P/L with this time advantage.

Suppose the recent trend of inventories draws in early-to-mid June 2019 leads you to have a bullish view on the BCOM one week out. In mid-June, you decide to go long 60,000 shares of the BCOM at a price of $77.11/share, with the intent of holding for a 1-week period (given the 1-week predictability outlined above). ***When you closed out your position at the end of the 1-week holding period, the BCOM index price rose 4.0% to $80.19/share, and you would have realized a profit of $184,800.***

II. Gold Futures



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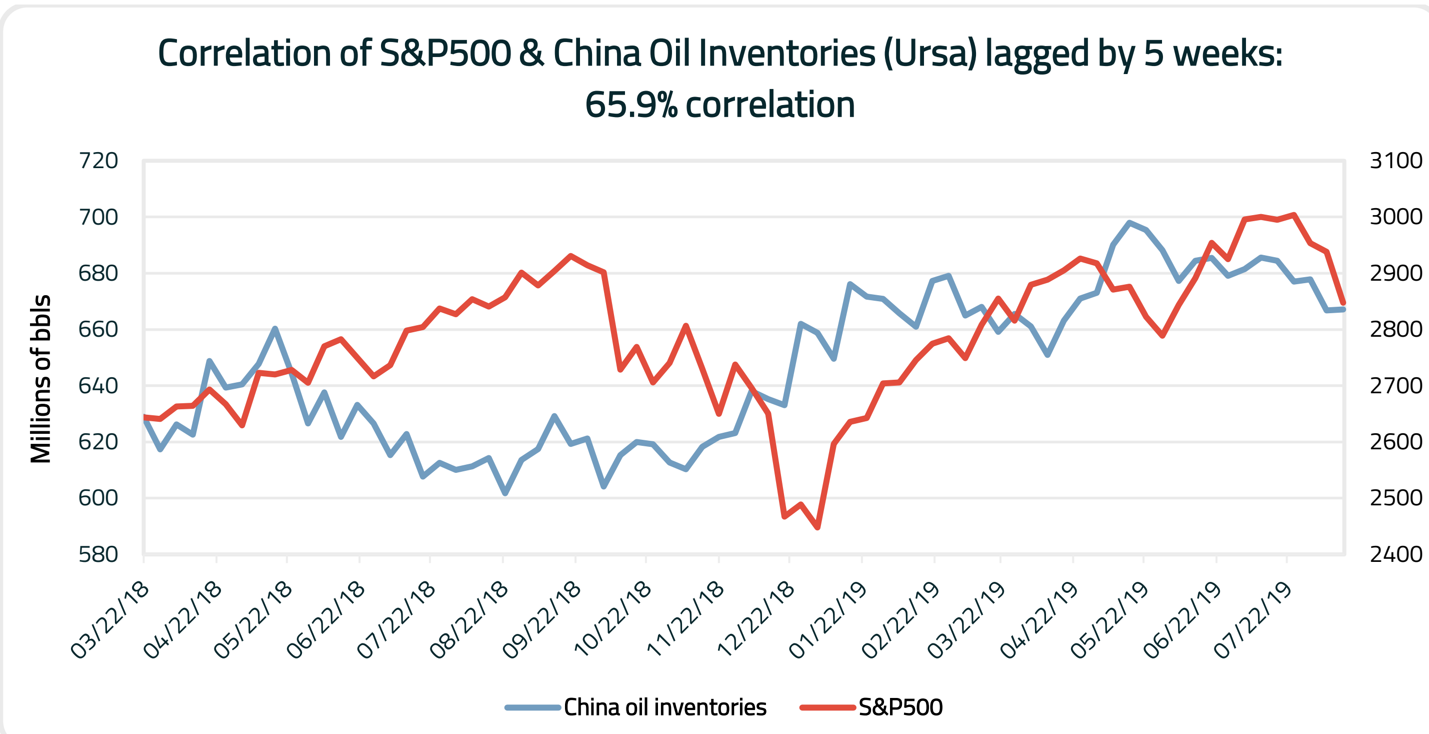
In times of turmoil, gold is considered a safe-haven asset. Recent equity volatility shows gold's allure as a store of value remains strong.

Chinese crude oil inventories within Ursa's coverage yield a positive correlation of 72.1% to Gold Futures with 3-week predictability.

Ursa's weekly inventory measurements can represent a significant competitive advantage for portfolio managers, macro funds, or long-term investors looking for a bellwether of the Chinese economy.

In other words, as Ursa measures oil inventories rising in China, this serves as a leading indicator of rising price of Gold Futures, potentially signaling a weakening demand-side of the Chinese economy leading market participants to more risk-off scenarios and a flight to safety. As supplies rise, Gold Futures rise (and vice versa), providing market participants with a leading signal on the macro risk-on/risk-off trend.

III. United States Stock Market – S&P500



S&P500 Hypothetical Trading Scenario

The S&P500 Index – a market-capitalization weighted index of the 500 largest US publicly traded companies – is widely regarded as the best gauge of large-cap US equities and represents a common US stock market benchmark.

Historically, the S&P500 and crude oil inventories have been strongly positively correlated. Looking at a greater than 14-year historical time series (Jan 2005-Aug 2019), one observes a 73.8% correlation to the International Energy Agency (IEA)'s crude oil inventories in OECD countries.

Chinese crude oil inventories within Ursa's coverage yield a positive correlation of 65.9% to the S&P500 Index with 5-week predictability.

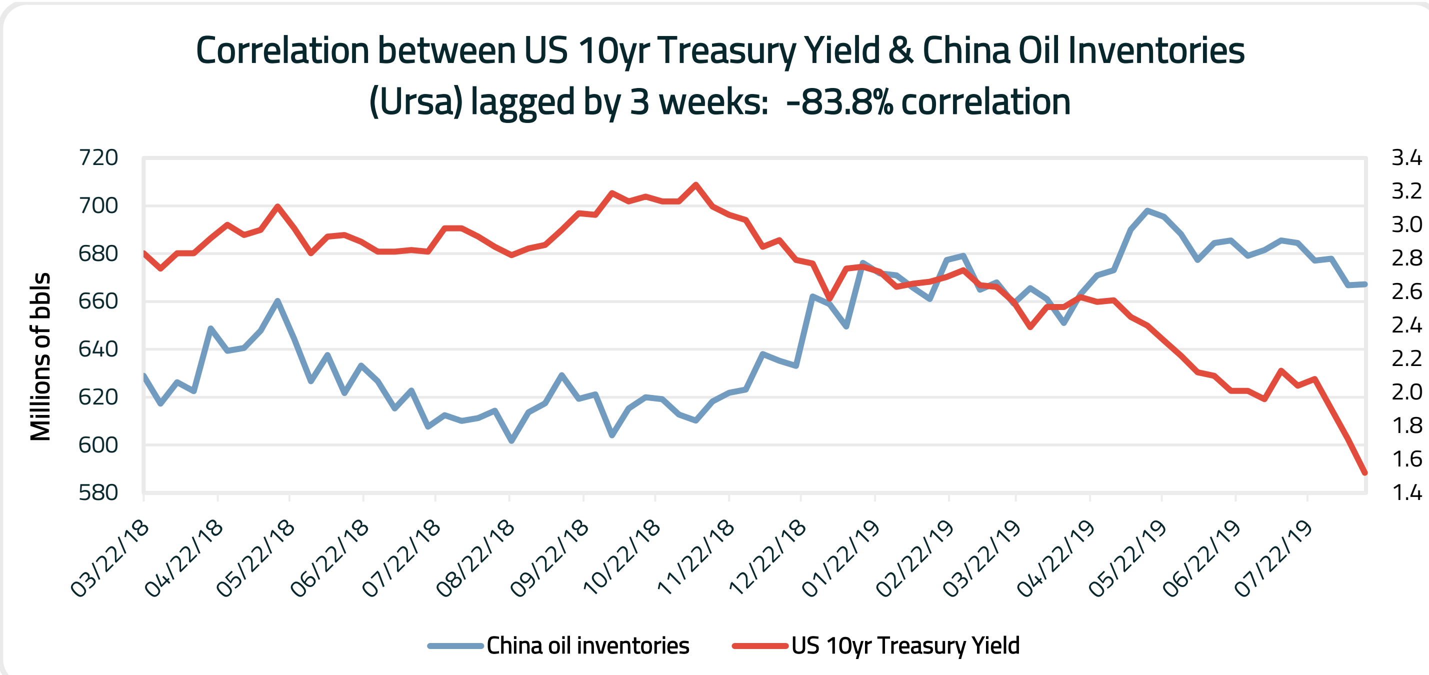
In other words, as Ursa measures inventory drawdowns across China, this serves as a leading indicator of a falling S&P500 five weeks out. As supplies fall, the S&P500 Index falls (and vice versa) with a 5-week leading indication.

A timing advantage of this magnitude can represent a large competitive advantage for market participants across the financial sector who are looking for a bellwether of the American stock market. For portfolio managers, macro funds, or long-term investors, Ursa's insights can be indicative of future trends, whether they may be upcoming headwinds or tailwinds.

Let's look at a S&P500 hypothetical trading scenario to generate P/L with this time advantage.

Suppose the recent trend of inventories builds from April through mid-May 2019 leads you to have a bullish view on the S&P500 5 weeks out. In mid-May, you decide to go long 50,000 shares of the Fidelity S&P500 Index Fund (ticker: FXAIX) – offering exposure to a basket of common stocks comprising the S&P500 Index – at a price of $100.16/share, with the intent of holding for a 5-week period (given the 5-week predictability outlined above). ***When you closed out your position at the end of the 5-week holding period, the FXAIX share price rose 2.91% to $103.07/share, and you would have realized a profit of $145,500.***

IV. United States 10yr Treasury Yield



The US 10yr Treasury yield is a closely watched indicator of investor sentiment about the US economy, often viewed as the safest investment (relative to stocks and other securities) given its backing by the US government. Treasury bond prices and yields move in opposite directions – falling prices boost yields and rising prices lower yields. A falling yield indicates rising demand for Treasury bonds, meaning investors would rather put their money in lower risk, lower reward investments; a rising yield suggests the opposite.

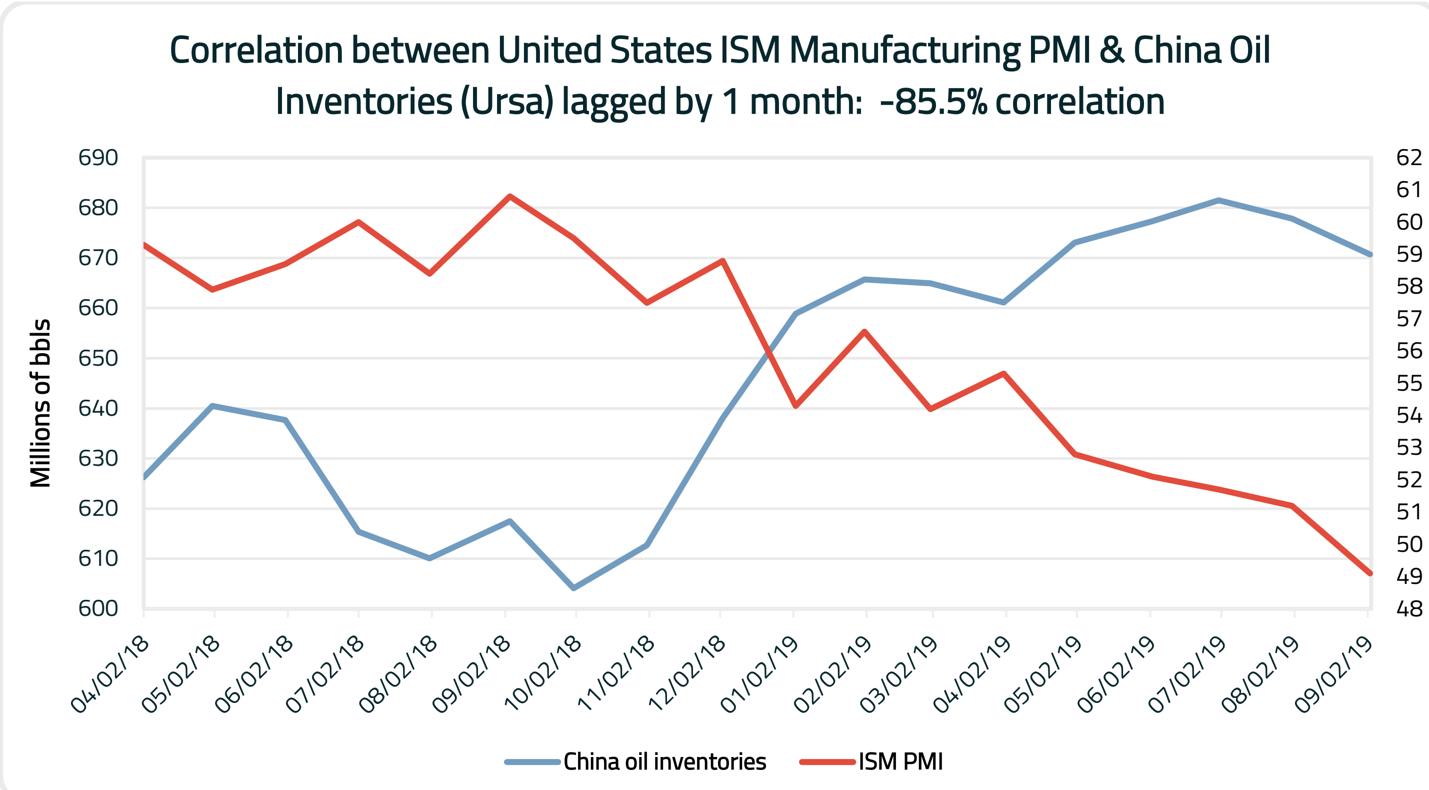
Historically, the US 10yr Treasury yield and crude oil inventories have been inversely correlated. Looking at a greater than 14-year historical time series (Jan 2005-Aug 2019), one observes a -55.6% correlation to the International Energy Agency (IEA)'s crude oil inventories in OECD countries.

Chinese crude oil inventories within Ursa's coverage yield an inverse correlation of -83.8% to the US 10yr Treasury Yield with 3-week predictability.

Ursa's weekly inventory measurements can represent a significant competitive advantage for portfolio managers, macro funds, or long-term investors looking for a bellwether of the US economy.

In other words, as Ursa measure oil inventories rising in China, this serves as a leading indicator of falling US 10yr Treasury Yields, potentially signaling the ripple effect of a slowing demand-side of the Chinese economy contributing to a macro trend towards flight-to-safety US-government backed bonds. As supplies rise, US 10yr Treasury Yields decline (and vice versa), providing market participants with a leading signal on the macro risk-on/risk-off trend.

V. United States ISM Manufacturing Purchasing Managers' Index (PMI)



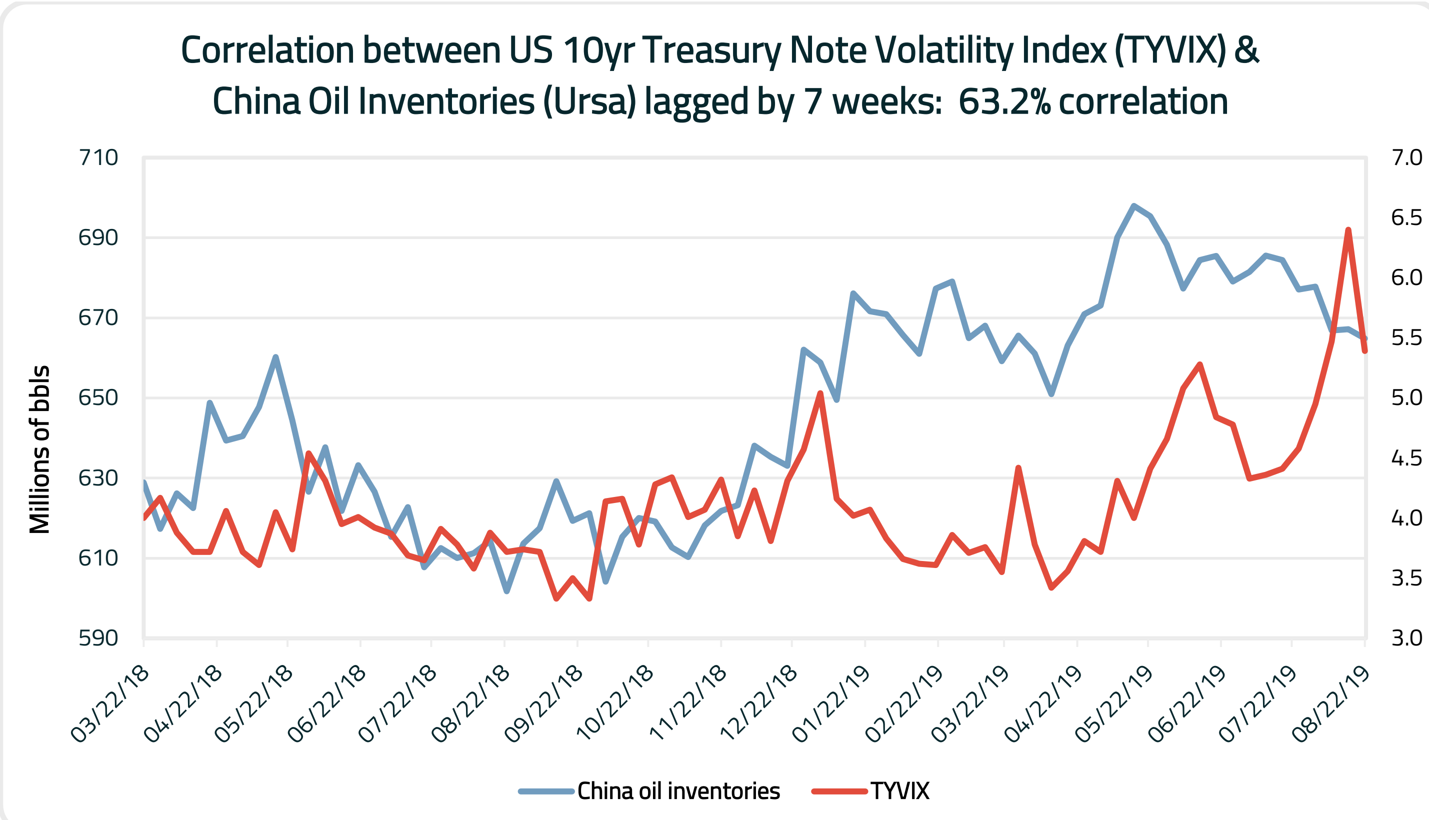
The US ISM Manufacturing Purchasing Managers' Index (PMI) is a closely watched indicator of recent US economic activity, monitoring changes in production levels month-to-month. The PMI can greatly influence investor and business confidence. A PMI Index greater than 50 indicates expansion in the manufacturing segment of the economy in comparison with the previous month. A reading of 50 indicates no change. A reading below 50 suggests a contraction of the manufacturing sector.

Chinese crude oil inventories within Ursa's coverage yield an inverse correlation of -85.5% to the United States ISM Manufacturing Purchasing Managers' Index (PMI) with 1-month predictability.

Ursa's weekly inventory measurements can represent a significant competitive advantage for portfolio managers, macro funds, or long-term investors looking for a bellwether of the US economy.

In other words, as Ursa measures oil inventories rising in China, this serves as a leading indicator of a falling US ISM Manufacturing PMI, potentially signaling the ripple effect of a slowing demand-side of the Chinese economy contributing to a macro trend of slowing economic activity. As supplies rise, the PMI declines (and vice versa), providing market participants with a leading signal on the robustness of the US manufacturing sector as a proxy for macroeconomic activity.

VI. US 10yr Treasury Note Volatility (TYVIX)

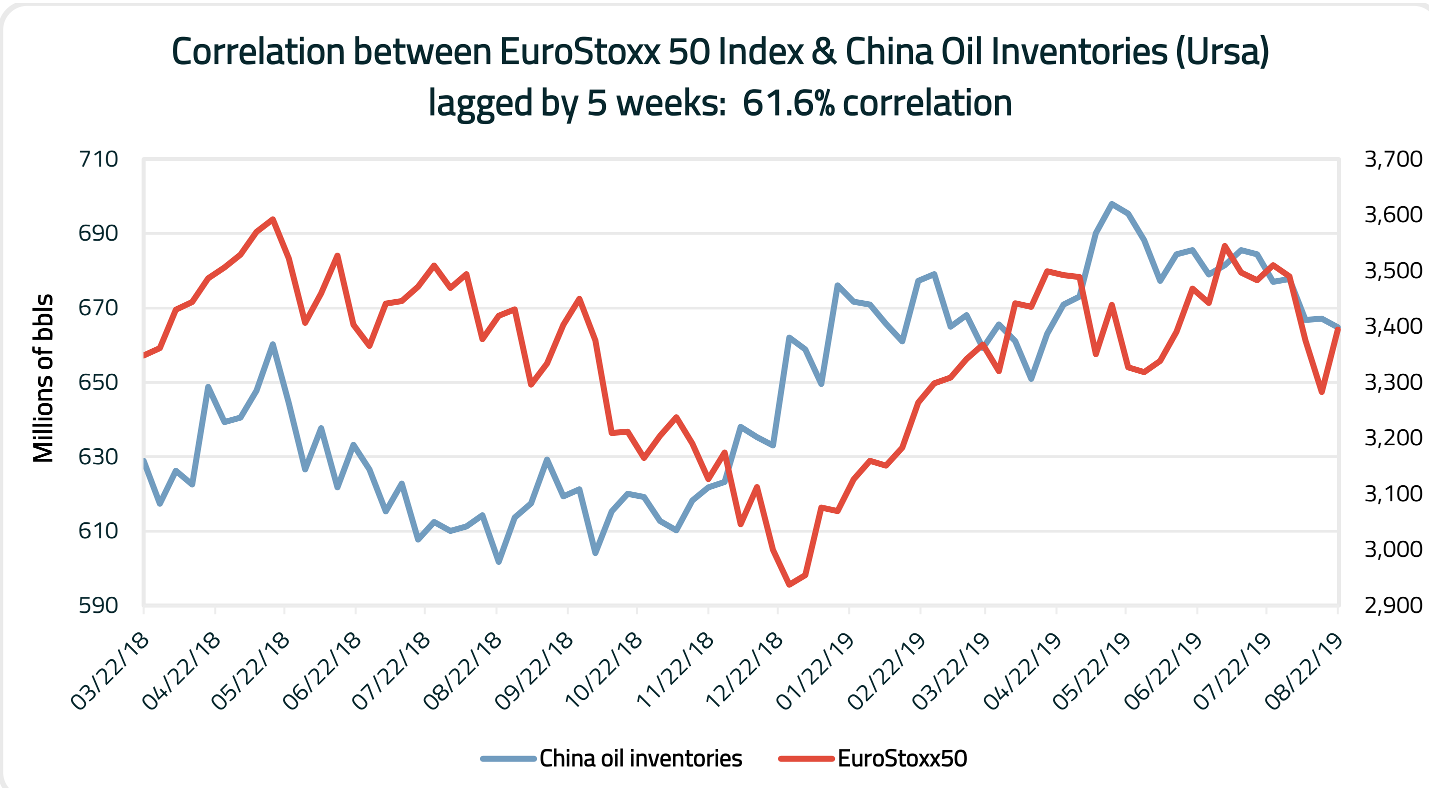


The US 10-year Treasury Note Volatility Index (TYVIX) measures the expected volatility of the price of 10yr Treasury Note futures (the most actively traded of all US futures on US Treasuries), providing a measure of expected volatility specific to the fixed income market. TYVIX represents the variability of percentage changes in the price, as opposed to the yield of 10yr Treasury notes. Price and yield volatility are related to each other through duration, and yield volatility is typically higher than bond price volatility. Potential users of futures on the TYVIX index could include mortgage-backed securities investors, large credit managers or large bond funds, hedge funds, global macro participants seeking to hedge against adverse interest rate movements or express their views on forthcoming monetary policy events.

Chinese crude oil inventories within Ursa's coverage yield a positive correlation of 63.2% to the US 10yr Treasury Note Volatility Index (TYVIX) with 7-week predictability.

In other words, as Ursa measures inventories rising across China, this serves as a leading indicator of a rising TYVIX seven weeks out. As supplies rise, the TYVIX rises (and vice versa) with a 7-week leading indication, potentially signaling the ripple effect of a slowing demand-side of the Chinese economy contributing to macro risk-on/risk-off trend.

VII. European Stock Market – EuroStoxx 50



The EuroStoxx 50 Index, comprised of the Eurozone's 50 largest companies by market cap, is a leading market index for investors seeking macro exposure to European stock market.

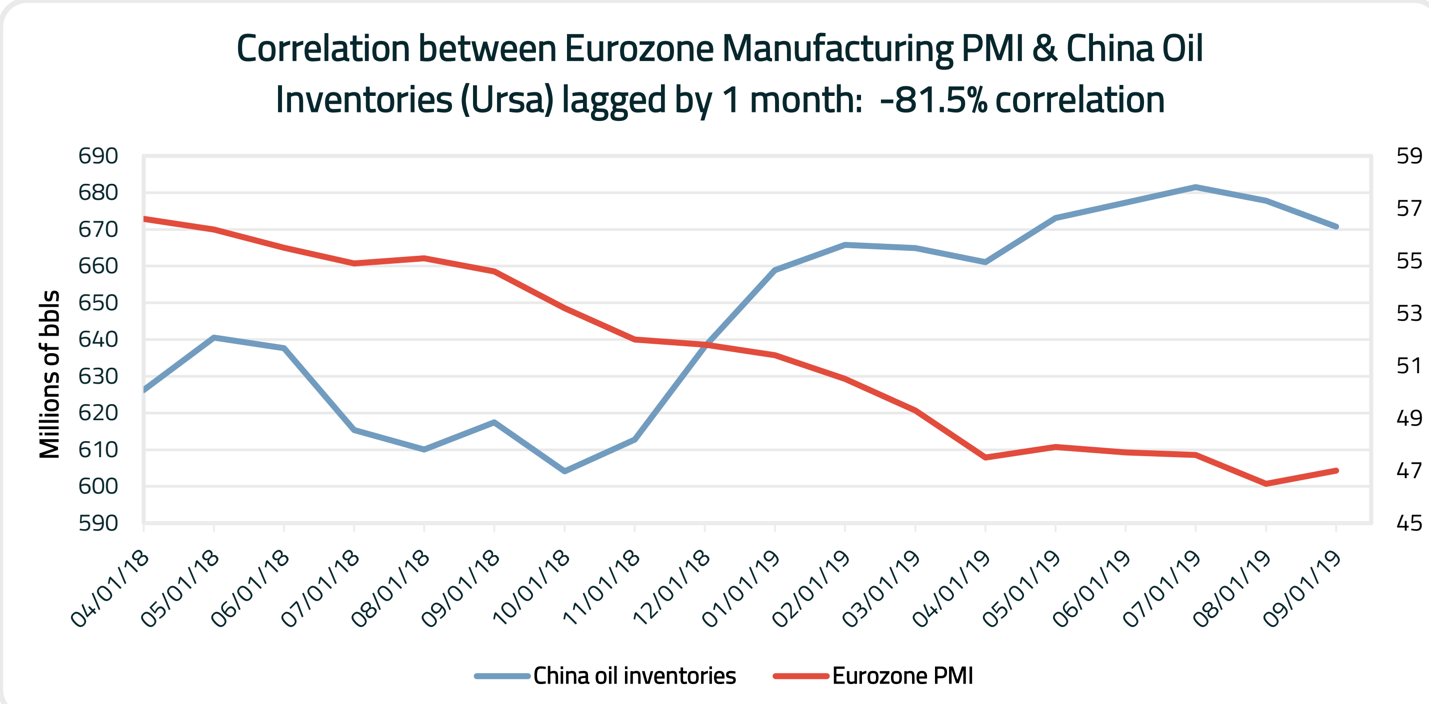
Historically, the EuroStoxx50 Index and crude oil inventories have been strongly positively correlated. Looking at a greater than 14-year historical time series (Jan 2005-Aug 2019), one observes a 62.8% correlation to the International Energy Agency (IEA)'s crude oil inventories in OECD countries.

Chinese crude oil inventories within Ursa's coverage yield a positive correlation of 61.6% to the EuroStoxx 50 Index with 5-week predictability.

Ursa's weekly inventory measurements can represent a significant competitive advantage for portfolio managers, macro funds, or long-term investors looking for a bellwether of the European economy.

In other words, as Ursa measures oil inventories falling in China, this serves as a leading indicator of a falling EuroStoxx 50 Index, potentially signaling the ripple effect of a globalized economy moving in tandem. As supplies rise, the EuroStoxx50 Index rises (and vice versa), providing market participants with a leading signal on the direction of the macro European stock market.

VIII. Eurozone Manufacturing PMI



The Eurozone Manufacturing Purchasing Managers' Index (PMI) is an indicator of the performance of the Eurozone's manufacturing sector. National data are included for Germany, France, Italy, Spain, the Netherlands, Austria, Ireland and Greece. These countries together account for an estimated 90% of the Eurozone's manufacturing activity. The Eurozone PMI can influence investor and business confidence. A PMI Index greater than 50 indicates expansion in the manufacturing segment of the economy in comparison with the previous month. A reading of 50 indicates no change. A reading below 50 suggests a contraction of the manufacturing sector.

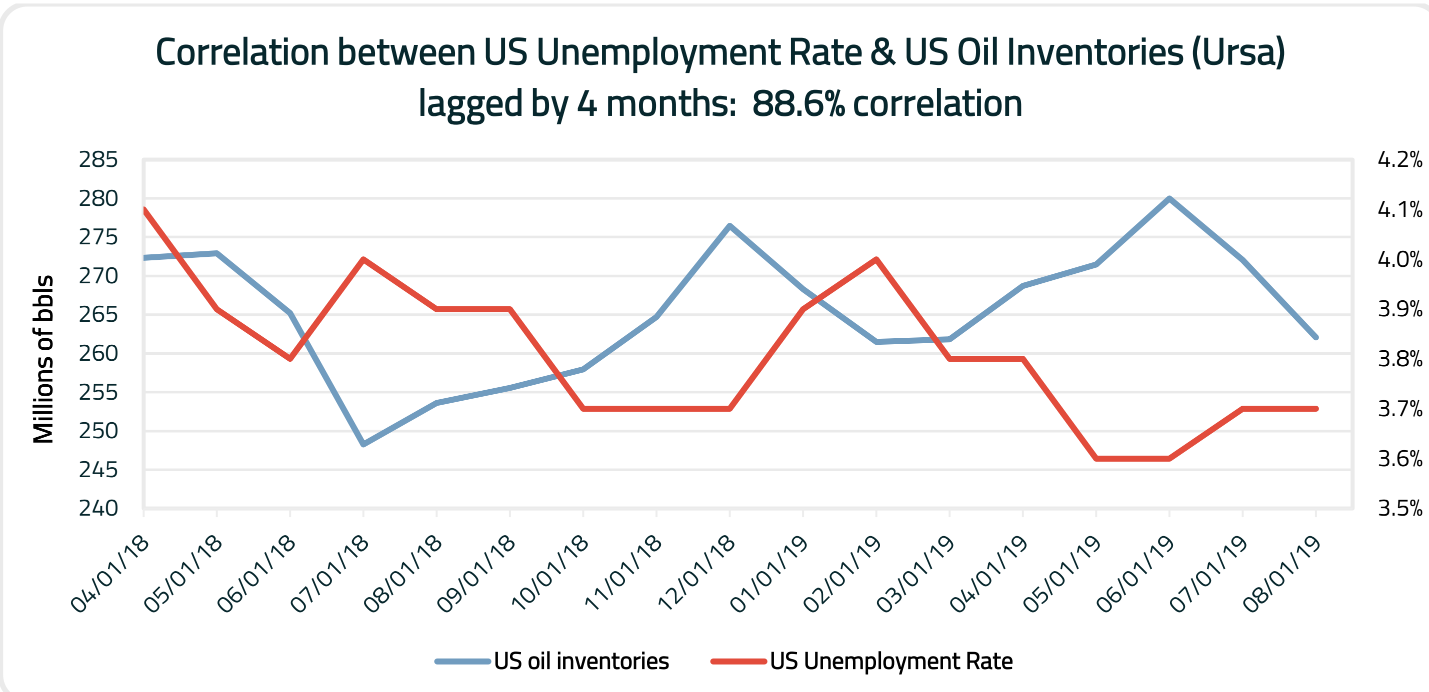
Chinese crude oil inventories within Ursa's coverage yield an inverse correlation of -81.5% to the Eurozone Manufacturing Purchasing Managers' Index (PMI) with 1-month predictability.

Ursa's weekly inventory measurements can represent a significant competitive advantage for portfolio managers, macro funds, or long-term investors looking for a bellwether of the European economy.

In other words, as Ursa measures oil inventories rising in China, this serves as a leading indicator of a falling Eurozone Manufacturing PMI, potentially signaling the ripple effect of a slowing demand-side of the Chinese economy contributing to a macro trend of slowing economic activity. As supplies rise, the PMI declines (and vice versa), providing market participants with a leading signal on the robustness of the European manufacturing sector as a proxy for macroeconomic activity.

Bonus Insights

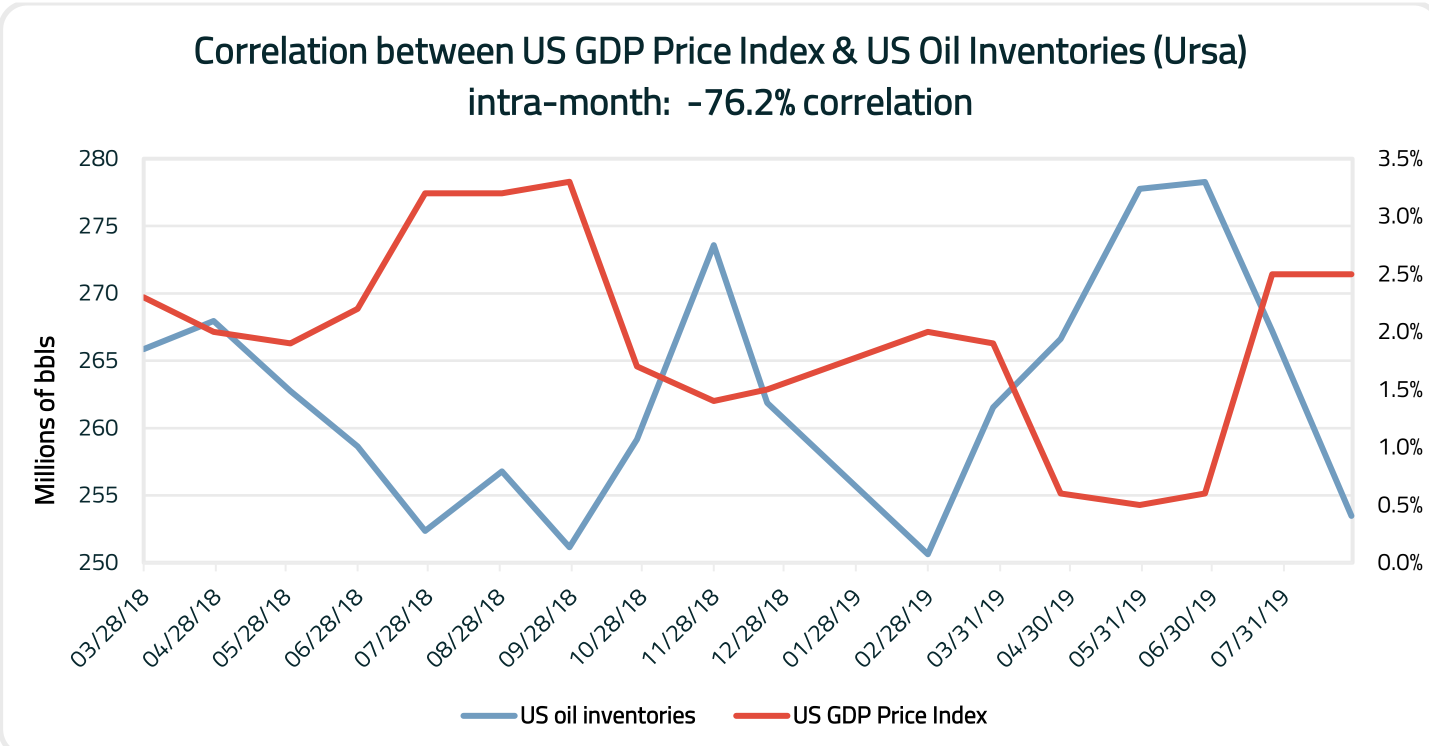
I. United States Unemployment Rate



US crude oil inventories within Ursa's coverage yield a positive correlation of 88.6% to the monthly release of the United States Unemployment Rate with 4-month predictability.

In other words, as Ursa measure oil inventories rising in the US, this serves as a leading indicator of a rising unemployment in the US, potentially signaling the ripple effect of a slowing demand-side of the economy contributing to higher unemployment. As supplies rise, US Unemployment rises (and vice versa), providing market participants with a leading signal on the health of the US economy with a 4-month leading indication. As noted in a recent Thomson Reuters article, "Oil rises on a fall in US unemployment rate, as an increase in US jobs eased financial market concerns that the slowing economy was on the brink of a recession amid lingering trade tensions."

II. United States GDP Price Index (Inflation)



The United States GDP Price Index measures inflation in the prices of goods and services produced in the US, as well as goods and services exported to other countries. It is a common measure used to gauge inflation for the US economy overall.

US crude oil inventories within Ursa's coverage yield an inverse correlation of -76.2% to the monthly release of the US GDP Price Index intra-month.

Ursa's weekly inventory measurements can represent a significant competitive advantage for portfolio managers, macro funds, or long-term investors looking for a bellwether of the US economy.

In other words, as Ursa measures oil inventories falling in the US, this serves as a leading indicator of rising inflation in the US, potentially signaling the ripple effect of a more robust demand-side of the US economy contributing to rising inflation. As supplies falls, US inflation rises (and vice versa), providing market participants with a leading signal on price inflation trends in the US economy.

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Daniel Baruch is the Director of Global Energy Markets & Business Development at Ursa. His background is across energy commodity markets with experience in crude oil & NGLs at Glencore, natural gas & power at Morgan Stanley, and alternative investments portfolio management at AllianceBernstein. He can be reached at Daniel.Baruch@UrsaSpace.com