Development of Crude Oil Reference Material Certified for the Concentrations of Sulfur, Iron, Nickel, Vanadium and Magnesium

Author's:

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The creation of a natural-matrix reference material for measuring the amounts of sulphur, iron, nickel, vanadium, and magnesium in crude oil is discussed in this work. In order to create the candidate material, the crude oil was homogenised and packaged. The generated reference material's homogeneity and stability were examined, and gravimetric and wavelength-dispersive X-ray fluorescence (WD-XRF) spectroscopy were used to characterise the sulphur content. Atomic absorption spectrometry (AAS) and inductively coupled plasma-optical emission spectrometry (ICP-OES) techniques were used to characterise the contents of iron, nickel, vanadium, and magnesium. Atomic absorption spectrometry (AAS) and inductively coupled plasma-optical emission spectrometry (ICP-OES) techniques were used to characterise the contents of iron, nickel, vanadium, and magnesium. The candidate reference material has good homogeneity and stability, according to statistical analysis of the data. The degree of agreement between characterization methods was sufficiently high to permit certification. Using a technique established by the National Institute for Standards and Technology, which involves merging data from two or more independent analytical methods, the certified values and their related uncertainties were statistically determined. crude oil has been developed by multiple analytical methods. Statistical analysis of the data showed that the reference material is sufficiently homogenous and stable. This reference material will be a useful tool for validation of the analytical methods, for quality control in crude oil analysis and for establishing traceability of the measurement results to the SI unit.

Linear and Non-Linear Modelling of Nigerian Crude Oil Prices

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The time plot's revelation of the series' upward and downward movement leads one to speculate that it displays a pattern of regime switching known as the cycle of expansion and contraction. The Augmented Dickey-Fuller test was employed to check for stationarity at lag one. Seven models were estimated for the linear model (univariate linear ARIMA (p, d, q)) and two models were estimated for the non-linear model (univariate non-linear MS-AR). AIC (2.006612), SC (2.156581), and the highest log-likelihood of (-150.5480) for the crude oil were used. Hamilton (2003) shows that the drops in real GDP in the US inresponse to various disruptions to crude oil production over the course of the second halfof the twentieth century were greater than the factor share argument would predict. Thus,our results also have important implications for central tenants of macroeconomics suchas business cycle theories. Hendry and Juselius (2000) suggested that "the impact ofstructural change in the world oil market is [a potential source] of non-stationarity".oil production contain a unit root, through the transmission mechanis m to real income viaenergy prices, business cycle theories describing output fluctuations as temporary deviations from long-run growth would lose their empiric noted, if real output contains a unit root, this "challenges a broad spectrum ofmacroeconomic theories designed to produce and understand transitory fluctuations"

- Source of data - Time plot.
- Linear models - Autoregressive (AR) models of order (p) , Stationarity conditions for AR (P) process .
- Moving Average (MA) model.
- Invertibility condition for (MA) model.
- Autoregressive-Moving-Average Models (ARMA).
- ARIMA model with differencing.
- Non-linear modelling - Markov switching model, Markov switching autoregressive model (MS-AR) .

Forecasting Model for Crude Oil Price Using Artificial Neural Networks

Author's:

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In the advanced global economy, crude oil is a commodity that plays a major role in every economy. As Crude oil is highly traded commodity it is essential for the investors, analysts, economists to forecast the future spot price of the crude oil appropriately. In the last year the crude oil faced a historic fall during the pandemic and reached all time low, but will this situation last? There was analysis such as fundamental analysis, technical analysis and time series analyses which were carried out for predicting the movement of the oil prices but the accuracy in such prediction is still a question. Thus, it is necessary to identify better methods to forecast the crude oil prices. This study is an empirical study to forecast crude oil prices using the neural networks A model must take a subset of the information provided, attempt to map it to the desired target, and then generate a forecast albeit with a given level of accuracy, or error ANN is chosen as a mapping model in this context and is seen as a nonparametric, nonlinear, assumption-free model . The neural network proved to be efficient in forecasting in the modern era. A simple neural network performs better than the time series models. As a result, it does not make assumptions about the issue before considering the facts. The network structure was selected after systematic rigors tests involved large number of experiments on the crude oil data. In addition, two groups of inputs were tested , crude oil futures data, and market data which include S&P500, gold price, Dollar index and heating oil price. The results show that using futures data mainly contracts 1, 2 months to maturity has outperformed all other inputs tested for one step forecast. Moreover, strong evidence was found in support of heating oil spot price to forecast crude oil spot price for multiple steps prediction

Quality and chemistry of crude oil

Author's:

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Crude oil composition (saturates, aromatics, and polar) of samples taken from several North American oil fieldsPakistan's Punjab and Sindh regions have been assessed using the ASTM (Americantechniques used by the Society for Testing and Material. Results from Punjab's North Region and the South RegionCrude oils from (Sindh) have been contrasted with one another. A crude oil is a naturally occurring mixture, consisting predominantly of hydrocarbons, sulphur, nitrogen and metals. Quality (Bawazeer et al., 1997) of the petroleum products is playing the major role of consumer satisfaction and speaks about the performance of the refineries. Crude oils are complex but mainly paraffinic, napthenic and aromatic (Wang et al., 1994). Crude oils contain all normal alkenes from (Khanorkar et al., 1996) C1 to C120. However, this percentage rises to 35% in highly paraffmic and decreases to zero in highly biograded oils (Ali et al., 1989). Methane is predominant component of natural gas and alkanes ranging from pentane to pentadecane are the chief constituents of straight run (uncrackcd) gasoline or petrol. Above C17, the alkanes are solid wax like substances and crude oils, which contain high concentrations of paraffin wax, will be viscous and have high cloud and pour points. These Paraffins consists of isoalkanes and methyl cycloalkanes Sindh crude is superior to Punjab crude.oils because they have a low pour point, low viscosity, low specific gravity, and low sulphur content. Allbased on total, the examined samples are of the sweet variety. North region crude oils are of sweet type while some samples of South region belong to sour type crude oils. North region crude oils belong to light crude oil class while one sample of South region belongs to medium class crude oils. North region (Punjab) crude oils have more saturates aromatics and polar contents than that of South region (Sindh) crude oils.

UNDERSTANDING CRUDE OIL PRICES

Author's:

James D. Hamilton NBER.

This article describes some of the key features of the oil market and then discusses the pricing of oil, highlighting the important role of the futures market. It also notes some related issues for the oil market. Topics discussed include the role of commodity speculation, OPEC, and resource depletion. This is true in terms of both production and financial market activity. In terms of statistical regularities, the paper notes that changes in the real price of oil have historically tended to be permanent, difficult to predict, and governed by very different regimes at different points in time. From the perspective of economic theory, we review three separate restrictions on the time path of crude oil prices that should all hold in equilibrium. The first of these arises from storage arbitrage, the second from financial futures contracts, and the third from the fact that oil is a depletable resource. We also discuss the role of commodity futures speculation. In terms of the determinants of demand, we note that the price elasticity of demand is challenging to measure but appears to be quite low and to have decreased in the most recent data. Income elasticity is easier to estimate, and is near unity for countries in an early stage of development but substantially less than one in recent U.S. data. We also relate the challenge of depletion to the past and possible future geographic distribution of production. Our overall conclusion is that the low price-elasticity of short-run demand and supply, the vulnerability of supplies to disruptions, and the peak in U.S. oil production account for the broad behavior of oil prices over 1970-1997. Although the traditional economic theory of exhaustible resources does not fit in an obvious way into this historical account, the profound change in demand coming from the newly industrialized countries and recognition of the finiteness of this resource offers a plausible explanation for more recent developments. In other words, the scarcity rent may have been negligible for previous generations but may now be becoming relevant Yet its pricing is relatively complex. Unquestionably the three key features in any account are the low price elasticity of demand, the strong growth in demand from China, the Middle East, and other newly indus-trialized economies, and the failure of global production to increase. These facts explain the initial strong pressure on prices that may have triggered commodity speculation in the price of petroleum.

Crude Oil Price Prediction using Artificial Neural Network

Author's:

Nalini Gupta, Shobhit Nigam

Predicting oil prices is now essential; it benefits many big and small businesses, people, and the government. The evaporative nature of crude oil, its price prediction becomes extremely difficult and it is hard to be precise with the same. Several different factors that affect crude oil prices. We propose a contemporary and innovative method of predicting crude oil prices using the artificial neural network (ANN). The main advantage of this approach of ANN is that it continuously captures the unstable pattern. This work indicates that the ANN model is an effective tool for crude oil price prediction and can be efficiently used for short term price forecasting by determining the optimal lags. The proposed model is powerful and highly suggested because investors can use it not only to initiate trades but also as an effective tool to judge various strategies relating.

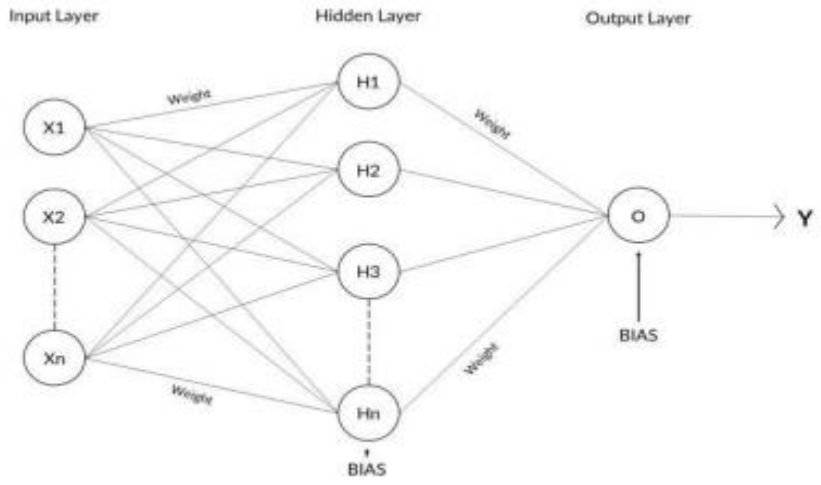

Fig. 1. Structure of the Artificial Neural Network

Computing systems based on artificial neural networks, also known as connectionist systems, are theoretically similar to, but not exactly the same as, biological neural networks found in the human body. An ANN performs its task by taking in examples and requires no programming with task-specific rules . A neural network's job is to create or develop an output pattern from an input pattern. An

artificial neural network (ANN) has an architecture which is parallelly-distributed with large number of nodes (neurons) and connections.

Fig. 2. Model development Diagram

We use the Back-propagation learning algorithm and the error signal is cultivated through the network in the backward direction by changing and managing weights of the network to maximize the performance of the network. The procedure is done until the network is able to provide desired responses.

In the suggested model, there is only one dependent variable, the closing price of crude oil which has been considered, since it's a time series, we have followed the model for general time series forecasting in conducting the experiments, which have been represented in the form as follows:

$$Y_t = f(X')$$

$$P' = \frac{p - Min}{Max - Min}(l - m) + m$$

Review JoPET Review on Chemical Separation of Crude Oil and Analysis of Its Components

Author's:

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Methane, ethane, propane, and butane, which are light hydrocarbons with carbon numbers 1 to 4, are present at standard pressure and temperature in gaseous form. Pentane and the heavier hydrocarbons, however, are present in liquid form, and the hydrocarbons are solid in the heavy fractions with higher boiling points. Additionally, the composition affects the viscosity. As an illustration, some types of oil are low viscosity, while others are very high viscosity . Because of their high viscosity, some unconventional oils, like the Athabasca sands, are found in semi-solid state and are typically combined with sand and water to make crude asphalt (bitumen). Oil has a strong, distinct fragrance that fluctuates in strength depending on how much sulphur is present in the chemical makeup of the substance. When exposed to ultraviolet light, some oils may glow, especially if the oil combination contains a range of polycyclic aromatic compounds. Different petroleum derivatives emit carbon dioxide (CO2) The circumstances and the phase diagram of the subsurface oil mixture determine the proportion of the gaseous, liquid, and solid components. A large number of papers with theoretical and practical application value have appeared. The hydrocarbons in petroleum are primarily made up of linear alkanes, with smaller amounts of cycloalkanes and aromatic hydrocarbons. Go to Based on the above collected results that were acquired by the techniques that we used for the separation and characterization of the crude oil samples in our laboratory, only two main products (fractions) have existed; diesel as a major product and gasoline as a minor product.

Analysis and forecasting of crude oil price based on the variable selection-LSTM integrated model

Author's:

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Memory Network (LSTM) is developed for crude oil price forecasting. Then six different forecasting techniques, random walk (RW), autoregressive integrated moving average models (ARMA), elman neural Networks (ENN), ELM Neural Networks (EL), walvet neural networks (WNN) and generalised regression neural network Models (GRNN) were used to forecast the price. sFinally, we Utilizing root mean squared error, compare and contrast the various outcomes. Therefore, systematic analysis of the characteristics of complex international oil markets and accurate capture of the new trend in international oil prices are critical. However, as the linkage between the markets, the uncertainty of the world economy and energy, the influence factors of oil price have become complex. It is difficult to point out which factors have the dominant effect on the oil price. How to forecast crude oil prices in a new and effective method is one problem that academics and practitioners are very concerned about all the time. Directional symmetry, mean absolute percentage error (MAPE), and RMSE (DS). Our According to empirical findings, the variable selection-LSTM technique performs better than baseline techniques for forecasting precision at both the level and direction. The statistical test results show that the prediction of 1 step in advance in-sample and 1 step in advance in out of sample. Compared with the prediction performance of the three variable extraction methods, the directional prediction accuracy and horizontal prediction accuracy of the BMALSTM integrated model are the best, followed by Spike and Slab-LASSO-LSTM and GLMNET-LSTM. This indicates that the variable selection-based machine learning integrated research framework proposed in this chapter significantly improves the forecasting performance of oil prices. In future research, we may introduce more independent variables with the help of internet search data, test our framework performance. Moreover, investor sentiment can be quantified in this process. In addition, different variable selection methods can be introduced more.

Forecasting of WTI crude oil using combined ANN

Author's:

Parviz Sohrab, Hesam Dehghani ,Ramin Rafie

The performance of the intelligent and fundamental ANN algorithm in predicting the future price of WTI oil is compared to that of the ANN-WOA algorithm. Compared to the ANN, the ANN-WOA model increased the WTI price prediction accuracy by up to 22%. The model error was effectively reduced by the ANN-WOA approach, which had an R2 value of 0.93 compared to the ANN method's R2 of 0.75. Because oil is one of the most critical inputs for production, any change in its financial indicators, such as prices, affects almost all producing and exporting countries. Oil prices significantly impact the environment, the economy, and oil exploration and exploitation activities. Sudden changes in oil prices are far more critical than in other financial and economic markets. Therefore, more accurate price forecasting is essential for many policies (Wu et al. 2021a). Therefore, considering that oil prices are one of the main sources of countries' financial markets and its forecasting and estimation helps a lot in budgeting and economic and political decisions of countries, many researchers have predicted it and the methods of forecasting oil prices are up to date (Dehghani and Zangeneh 2018). Consequently, in studies that predict price or other variables, strongly correlated variables can considerably boost the forecast's accuracy. features of the combination model had on the prediction of the WTI oil price. This is the first time that ANN-WOA method has been used to predict the price of metals and other industries in previous studies, this method is used to predict the price of WTI oil with the input parameters specified in this study. Therefore, in predicting the price of metals and other industries, parameters whose changes are consistent with the variable can be used to estimate better results. Also, deep learning methods can reduce model error due to the accuracy it has in the high amount of data.

The Complexity of Crude Oil Prices

Author:

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There have been numerous research conducted on the various factors that affect crude oil prices. Initially, this price increase was also attributed to more basic causes like OPEC production cuts and an increase in demand. A small decline caused by Asian economic crisis took place in 1997-1999, but after the US economy recovered from 9/11 attacks in 2001, the price of oil started to increase dramatically. Initially, this growth in prices was also attributed to fundamental factors such as OPEC cuts in production in combination with rise in demand. Undoubtedly, both in wealthy and developing nations, there was a steady increase in global demand. For instance, China's oil demand increased by 15% in 2004, according to EIA (2017). However, the same source states that global consumption growth was modest throughout the whole analysed period and did not outpace worldwide output growth. Kaufmann (2011) emphasises that supply side fundamentals may still be to blame for the rise in oil prices even when the volume of production was not changing much. For instance, if the economy were to strengthen, there would likely be a greater likelihood that oil markets would tighten in the future, raising predicted oil prices. Higher oil futures prices would reflect this shift in expectations. Non-OPEC nations are usually seen as price takers in oil production, and, on the contrary, OPEC nations are following some form of strategic behaviour. This means that sudden change in the market share of OPEC producers could generate a supply shock. In this essay, we go over three categories of variables that affect the price of crude oil. With evolution of financial markets driving mechanism has become more complex. Moreover, we should keep in mind that different factors are responsible for long-term trend and short-term price speculations.