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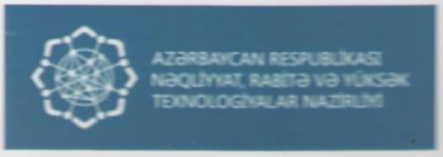

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Proceedings of the 6^{th} International Conference on Control and Optimization with Industrial Applications (COIA 2018)

PREFACE

This volume of Proceedings contains selected papers from the 6^{th} International Conference on Control and Optimization with Industrial Applications (COIA 2018) held in Baku, Azerbaijan, on July 11-13, 2018. The conference, which was organized by the Ministry of Transport, Communications and High Technologies of the Republic of Azerbaijan, and the Institute of Applied Mathematics of Baku State University has received more than 300 abstracts. Following a review process, 222 of these were accepted for presentation at the conference. We thank all participants for their contributions to the Conference program and for their contributions to these Proceedings.

The topics that are covered in the conference include Control Theory, Optimization, Intelligent Systems, Fuzzy Control, Numerical and Computational Methods, Network and Telecommunications, Mathematical Modelling and Simulation, Applications in Industrial Processes and Economics, and Identification.

Reviewing and evaluating the submitted abstracts to COIA 2018 was a challenging undertaking that relied on the goodwill of many researchers who are experts in the topical areas covered by the conference. More than 65 researchers were involved in that process, and we thank them for their time and effort in reviewing the submissions and in providing useful feedback to the authors, which the final versions of the papers included in these Proceedings have benefited from.

We would like to express our deep appreciation to the conference sponsor, Ministry of Transport, Communications and High Technologies of the Republic of Azerbaijan for their financial support.

As this conference is being closed, we look forward to the next one in the series, the 7^{th} International Conference on Control and Optimization with Industrial Applications, which will be held in 2020.

Aliev Fikret
Tamer Başar

The 6th International Conference on Control and Optimization with Industrial Applications, 11-13 July, 2018, Baku, Azerbaijan

CRUDE OIL PRICE FORECASTING TECHNIQUES IN THE WORLD MARKET

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ABSTRACT. The existing forecasting methods is studied in the research by considering all these cases and forecasting of mean oil price in the world market for medium and long-term period with Trend, ARIMA, Holt, ARCH / GARCH models have been forecasted for the 2018-2020.

Keywords: Crude oil prices, forecasting methods, ARIMA, Holt, ARCH /GARCH models.

AMS Subject Classification: 62P20, 91B76.

1. Introduction

It is an unavoidable fact that oil prices like other energy resources play an important role in the development tendency of the world. However, no exact method is known in the science to accurately forecast oil prices. The experience indicates that information possessed by international institutions for an accurate forecast of crude oil prices does not reflect the reality. However, researches are being conducted towards this direction. The challenge in terms of oil price forecasting is associated with political factors together with economic factors. As mentioned earlier, oil price forecasting is performed by international institutions. However, prices which are forecasted by these institutions do usually not reflect the reality. These diversions get more critical during an economic crisis and with political ambitions.

2. Methodology

International institutions use econometric models together with fuzzy and artificial neuron expert assessment systems which are characterized with their availability and accuracy by for forecasting crude oil prices. However, there is not an accepted idea which method should be used. Quantitative and qualitative methods exist for oil price forecasting. Quantitative variables which affect oil prices are employed through quantitative methods for crude oil price forecasting. This method is divided into econometric and non-standard techniques.

Econometric models include the followings: 1.Time series models; 2.Financial models; 3.Structural models.

The most applied non-standard models for crude oil price forecasting are artificial neuron systems [2] and support vector machines [1].

A qualitative method assesses the impact of wars and natural catastrophes on the price of oil. These methods have been increasingly used for oil price forecasting in the recent academic

literature. It is important to note that many qualitative methods exist for oil price forecasting. These models include model like Delphi method, believe networks, fuzzy logic, and expert systems as well as web text mining. Time series models are used for future oil price forecasting based on historical information. These models are usually used under the following cases: (1) If the provided data (statistical indicators) possesses a systematic pattern like autocorrelation; (2) If there are many explanatory variables and their mutual relationship requires the establishment of a more complicated model; (3) If explanatory variables forecasting is required for forecasting dependent variable (dependent variable forecasting takes much time in terms of explanatory variables forecasting).

Time series models are divided into three main categories:

1. Simple models; 2. Exponential smoothing models; 3. Autoregressive models (ARIMA); 4. Holt model; 5. ARCH/GARCH models.

In general, structural models for oil price forecasting are classified as followings:

1.OPEC behavioral models; 2.Reserves model; 3.Combination of OPEC behavioral and reserve models; 4.Demand and supply models; 6. Non-oil models.

There are a number of forecasting methods. Econometric forecasting is the most widely applied one among then in practice. The world oil market price is affected by multiple factors [3]. Among these factors, there are political factors along with economic factors. Assessment of impact of multiple factors on oil prices is more effective with structural modeling. However, use of this type of models in forecasting makes some difficulties. The difficulties are due to the fact that forecasts of the factors affecting the oil price is also needed. On the other hand, there are affective quality factors that not only availability of their forecasts, but also presence of the statistics of the retrospective time is problematic. Thus, the error in forecasting of any of the affective factors may lead to greater error in the outcome indicator. The existing forecasting methods is studied in the research by considering all these cases and forecasting of mean oil price in the world market for medium and long-term period with Trend, ARIMA, Holt, ARCH / GARCH models have been preferred. The following indicators in the existing models that valid for forecasting are compared: Root Mean Squared Error and Mean Absolute Error.

Considering the continuous changes in the world, building of short-term and retrospective forecasts can be considered reasonable. In the study, forecast of the world oil market price was made by means of the trend and ARIMA (Auto Regressive Integrated Moving Average) models. It should be noted that initial forecasting of the average oil price, including the price of AzerLight oil in the world market by means of Trend, ARIMA models has proved itself and deviated from the factual values more than the forecasts of the international organizations [4].

An econometric model was developed based on the annual data of 1975-2017.

The econometric model was obtained as follows.

$$AOP\_MEAN = -15.8113291652 + 1.36381483826 * @TREND - 27.4644306826 * DUMMY2008 - 27.1897200003 * DUMMY2015 \quad (1)$$

(Std. Error) (8.410049) (0.236180) (4.703029) (4.590126).

R-squared=0.960661; Adjusted R-squared=0.954105; Durbin-Watson stat=2.116437; Prob(F-statistic)= 0.000000.

3. Results

It should be noted that for the purpose of elimination of autoregression and moving average during the current period, the AR factors of set 1 and 9, and MA of set 10 were included.

Where, AOP_MEAN – Brend and WTI average oil price, DUMMY2008 and DUMMY2015 are artificial variations and characterize the sharp decline of oil prices due to the crisis occurred in 2008 and 2015 respectively.

The statistical characteristics of (1) and relevant tests have shown that the model is adequate. The R-squared and the adjusted R-squared are significantly closer to each other and to the unit.

10^{55}-11^{10}	**J. Ali, F. Ali** Convergence and stability of new iterative scheme in Banach space and application
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Section 6. APPLICATIONS IN INDUSTRIAL AND ECONOMICS
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10^{55}-11^{10}	**G.G. Abdullaeva, I.Kh. Mirzazadeh** Organization of monitoring for toxic poisonings
11^{10}-11^{25}	**N. Ismayilova, E. Ismayilov** "Soft" features and SVM for hand-printed characters redeep learning for COPD analysis using lung sounds
11^{25}-11^{40}	**M.H. Mammadova, Z.G. Jabrayilova** Methods for evaluation of human resources performance in virtual organizations
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12^{10}-12^{25}	**B. E. Soylu, M.S. Guzel, I.N. Askerzade** A new deep learning based system for facial gesture analysis

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CERTIFICATE

This is to certify that

Prof. YADULLA HASANLI

participated and presented in COIA-2018 an oral talk entitled

CRUDE OIL PRICE FORECASTING TECHNIQUES IN THE WORLD MARKET

Fikret Aliev F.Aliev

Chief of Organizing Committee