

SPRINGER BRIEFS IN ECONOMICS

Adalat Muradov
Yadulla Hasanli
Nazim Hajiyeu

World Market Price of Oil Impacting Factors and Forecasting

 Springer

SpringerBriefs in Economics

SpringerBriefs present concise summaries of cutting-edge research and practical applications across a wide spectrum of fields. Featuring compact volumes of 50 to 125 pages, the series covers a range of content from professional to academic. Typical topics might include:

- A timely report of state-of-the art analytical techniques
- A bridge between new research results, as published in journal articles, and a contextual literature review
- A snapshot of a hot or emerging topic
- An in-depth case study or clinical example
- A presentation of core concepts that students must understand in order to make independent contributions

SpringerBriefs in Economics showcase emerging theory, empirical research, and practical application in microeconomics, macroeconomics, economic policy, public finance, econometrics, regional science, and related fields, from a global author community.

Briefs are characterized by fast, global electronic dissemination, standard publishing contracts, standardized manuscript preparation and formatting guidelines, and expedited production schedules.

More information about this series at <http://www.springer.com/series/8876>

Adalat Muradov • Yadulla Hasanli
Nazim Hajiyev

World Market Price of Oil

Impacting Factors and Forecasting

 Springer

Adalat Muradov
Azerbaijan State University of Economics
Baku, Azerbaijan

Yadulla Hasanli
Azerbaijan State University of Economics
Baku, Azerbaijan

Nazim Hajiyeu
Azerbaijan State University of Economics
Baku, Azerbaijan

Harvard University
Cambridge, MA, USA

ISSN 2191-5504 ISSN 2191-5512 (electronic)
SpringerBriefs in Economics
ISBN 978-3-030-11493-0 ISBN 978-3-030-11494-7 (eBook)
<https://doi.org/10.1007/978-3-030-11494-7>

Library of Congress Control Number: 2019932991

© The Author(s), under exclusive licence to Springer Nature Switzerland AG 2019

This work is subject to copyright. All rights are reserved by the Publisher, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, reuse of illustrations, recitation, broadcasting, reproduction on microfilms or in any other physical way, and transmission or information storage and retrieval, electronic adaptation, computer software, or by similar or dissimilar methodology now known or hereafter developed.

The use of general descriptive names, registered names, trademarks, service marks, etc. in this publication does not imply, even in the absence of a specific statement, that such names are exempt from the relevant protective laws and regulations and therefore free for general use.

The publisher, the authors, and the editors are safe to assume that the advice and information in this book are believed to be true and accurate at the date of publication. Neither the publisher nor the authors or the editors give a warranty, express or implied, with respect to the material contained herein or for any errors or omissions that may have been made. The publisher remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

This Springer imprint is published by the registered company Springer Nature Switzerland AG
The registered company address is: Gewerbestrasse 11, 6330 Cham, Switzerland

ISBN

In the book, the dynamics of the world market price of oil has been analyzed in the historical aspect, influencing factors classified and new trends in development of the world economy in the modern world analyzed. Medium and long-term forecasting was carried out by means of econometric models under the theoretical and methodological bases of forecasting oil price.

The book can be used for adoption of proper decisions of governmental authorities, including in forecasting of the state budget. Also, it may be useful for economist scholars, doctoral students and higher school students.

Introduction

In the light of new trends and challenges in the global economy, development of scientifically and practically substantiated forecast indicators of the factors influencing the price of crude oil of great strategic importance in the world markets for the medium and long-term periods, as well as understanding of the existing and expected processes and assessment of their effectiveness, are necessary.

In this respect, it is necessary to perform a complex review of reliable forecast outcomes, considering the main economic and noneconomic factors affecting the world market prices of oil, to obtain such forecasts and to develop an adequate forecasting methodology.

To develop adequate forecasting methods, firstly, the dynamics of the scope of demand and supply and the prices of oil in the economic-world market; oil reserves and dynamics of exploitation of major oil-offering subjects (Organization of the Petroleum Exporting Countries (OPEC), Russia, the USA, etc.); economic development dynamics of major oil-requesting countries (the USA, China, Japan, Germany, India, etc.); creation of alternative energy sources and their applicability to production; assessment of the impacts of the transmission mechanisms of natural-environmental-solar activity indicators on world oil prices; and study of perspectives on political conflicts, terror, polarization, globalization, and democratization processes are the main requirements.

In the first chapter of this volume, the factors influencing oil prices, the impact of solar activity on oil prices, and forecasting by econometric models—as well as theoretical aspects of trend models and forecasting methods for oil prices—are analyzed in a broad spectrum from scientific and practical viewpoints, and analytical summarizations are made.

In the second chapter, the details are collected and processed to build econometric models under the theoretical analyses carried out in the first chapter in a logical sequence. It should be noted that the influence of solar activity on oil prices and the trend models of the daily oil price are established and tested.

In the third chapter, autoregressive integrated moving average (ARIMA), Holt, and trend models are set up to forecast oil prices in the world markets for the

medium and long-term periods. Moreover, oil prices in the world markets and the price of Azeri Light oil in the world market are forecast for the long-term period.

It should be noted that the information collected for forecasting the factors influencing crude oil prices in the world markets for the medium and long-term periods are processed in Microsoft Excel and the econometric models are executed in the EViews 8 applied software package.

The scientific and practical forecast indicators obtained from the models set up to forecast the world oil market price and the price of Azeri Light oil in the world market, and the proposals made, may be used in speeding up socioeconomic development, in the processes of preparation of state budgets and production and implementation of state programs, in the actions to be taken in this regard and the respective assessments to be carried out, in preparation of the action plans of the Azerbaijan Oil Fund and the State Oil Company of the Azerbaijan Republic for the medium- and long-term periods, in formation of the country's macroeconomic policy and related scientific research works.

Contents

1	Theoretical–Methodological Principles of the Problem	1
1.1	Necessity of the Problem, Study Level, and Methodological Aspects	1
1.2	Classification and Analysis of Factors Influencing Oil Prices	2
1.2.1	Theoretical Aspects of the Influence of Solar Activity on Oil Prices	5
1.3	Forecasting Through Econometric Models	8
1.3.1	Short-Term and Long-Term Econometric Models for Oil Price Forecasting	9
1.3.2	Trend Models and Forecasting	11
1.3.3	Time Series and Nonstationary Problems	13
1.3.4	Checking the Stationarity of Time Series: The Dickey–Fuller Test	16
1.3.5	ARIMA Models	20
2	Creating Econometric Models: Evaluation and Analysis	21
2.1	Data Collection and Processing	21
2.2	Econometric Modeling of the Impact of Solar Activity on Oil Prices	27
2.3	Building and Testing of the Trend Model of Daily Oil Prices	36
2.4	Conclusions	39
3	Forecasting of the World Market Price of Oil	41
3.1	Building of an Autoregressive Integrated Moving Average Model to Forecast Oil Prices	41
3.2	Building of a Trend Model to Forecast Oil Prices	47
3.3	Long-Term Forecasting of World Oil Market Prices	52
3.3.1	Forecasting of World Market Prices of Azeri Light Oil	58
3.4	Conclusions	59

Appendix A: Dynamics of a Number of Indicators Affecting Oil Prices	61
Appendix B: Prices of Crude WTI Oil	65
Appendix C: Maximum, Minimum, and Simple Average Oil Prices, 1986–2017	127
Appendix D: Daily Oil Price—Statistical Characteristics of the Trend Autoregression Model and Proper Tests	129
Appendix E: Statistical Characteristics of the Oil Price Trend Model and Tests	135
Appendix F: Oil Prices in the World Market (Months)	139
Appendix G: Statistical Characteristics of ARIMA (1.1.26) Model (3.1) and Tests	157
Appendix H: Statistical Characteristics of Logarithmic Linear Trend Model	161
Appendix I: Time Series of Oil Prices (Years)	165
Appendix J: Statistical Characteristics of the ARIMA Model and Forecast	167
Appendix K: Statistical Characteristics of the Forecast Model of Average Prices of Brent and WTI Oils—Tests and Forecast	173
Appendix L: Statistical Characteristics of the Forecast Model of Prices of Azeri Light Oil in the World Market—Tests and Forecast	179
References	183

Scientific Editors

Rawi Abdelal Herbert F. Johnson Professor of International Management, Harvard Business School/Director of the Davis Center for Russian and Eurasian Studies.

Ziyad Samadzadeh Azerbaijani academician, Chairman of Economic Policy, Industry and Entrepreneurship Committee of the Parliament (Milli Mejlis) in the Republic of Azerbaijan, Doctor of Science in Economics, Professor.

Reviewers

Khoshbakht Yusifzadeh Azerbaijani academician and the First Vice-President of the State Oil Company of Azerbaijan Republic (SOCAR), Doctor of Science in Geology and Mineralogy, Professor.

Gorkhmaz Imanov Corresponding Member of the ANAS, Azerbaijan, Institute of Control Systems of ANAS, a member of Royal Academy of Finance, Spain, Doctor of Science in Economics, Professor.

About the Authors



Adalat Muradov studied at the School of Economy at Kiev State University (which is named after Taras Shevchenko) in Kiev, Ukraine, between 1985 and 1990 and graduated from that school with honors. He was awarded second place at the USSR Olympiad on Organization of the Economy and Production, held among students in 1989. He received a doctorate of philosophy in economics in 1993 and a doctorate of sciences in economics in 1998 at Kiev State University. He is an author of three textbooks, three monographs, three education programs, and more than 70 scientific articles. He has participated as a guest speaker at more than 100 international and local conferences. He worked as a professor at the Academy of Public Administration under the President of the Republic of Azerbaijan during the 1999–2004 period and at the Ministry of Economic Development (now called the Ministry of Economy) of the Republic of Azerbaijan between 2002 and 2014. He headed the Department of Macroeconomic Analysis and Forecasting during 2002–2007, the Department of Foreign Trade Policy and World Trade Organization between 2007 and 2009, and the Department of Economic Policy, Analysis and Forecasting between 2009 and 2014. He has been the rector of the Azerbaijan State University of Economics (UNEC) since 2014 by a decree from the President of the Republic of Azerbaijan and is the head of the Department of Economics and Business Administration at the UNEC Business School. He is the editor-in-chief of the *Journal of Economic Sciences: Theory and Practice* (in English) and scientific reviews at

UNEC. He is an editorial board member for the *Journal of Global Economy Review* (Kozani, Greece). The major fields of his current research interests include macroeconomic policy, macroeconomic forecasting, the World Trade Organization (WTO), and oil and gas price forecasting.



Yadulla Hasanli graduated from the School of Applied Mathematics at Azerbaijan State University (now called Baku State University) in 1981. He received a doctorate of philosophy in economics in 1989 and a doctorate of sciences in economics in 2007, and he has been a full professor since 2012. He was a postgraduate student at the Institute of Cybernetics at the Azerbaijan National Academy of Sciences between 1983 and 1987. He has been a participant and a winner at the national Olympiad in Mathematics in different years. Since 1981 he has worked at the Institute of Control Systems at the Azerbaijan National Academy of Sciences. He is the head of the Laboratory of Modeling of Social and Economic Processes at the Institute of Control Systems (part time). Between 1994 and 2005 he served as an assistant professor and head of department at the Higher Diplomacy College (now called the University of Eurasia). Between 1998 and 1999 he worked as an associate professor at the Institute of Political Science and Administration (now called the State Academy of Administration) under the President of the Republic of Azerbaijan. Between 2002 and 2005 he was a scientific advisor to the National Bank of Azerbaijan. In 1994 he has served as an assistant professor and a professor at the Department of Optimization and Administration at Baku State University. He became a local expert for the World Bank in Azerbaijan in 2000 and the Asian Development Bank in 2001. Between 2002 and 2005 he served as a scientific advisor to the Monetary Policy Department at the Azerbaijan Republic Central Bank. Since 2016 he has been a director of the Scientific Research Institute of Economic Studies, and since 2017 he has been a Professor at the Economics and Management department at the Azerbaijan State University of Economics (UNEC). He is an author of nine books (including four monographs) and about 167 scientific

works, 32 of which have been published abroad. He has attended about 20 international symposiums and conferences. He is an editorial board member for the *Journal of Economic Sciences: Theory and Practice* (in English) and the editor of scientific reviews at UNEC. The major fields of his current research interest are socioeconomic modeling, macroeconomic policy, macroeconomic forecasting, and oil and gas price forecasting.



Nazim Hajiyeu studied at the Baku branch of the Leningrad Financial Economics Institute (now called the Azerbaijan State University of Economics (UNEC)) between 1986 and 1990. He received a doctorate of philosophy in economics in 2000 and became an associate professor in 2014 with a decision from the Higher Attestation Commission under the President of the Republic of Azerbaijan. He was a winner at the national Olympiad in Mathematics in 1980. He has published one monograph and is an author of two textbooks for higher education, more than 90 scientific articles (including 25 in foreign countries), and the draft "Competition Code" of the Republic of Azerbaijan. He is responsible for executing 12 research works and more than 10 international and local grant projects (as a coordinator and expert). He has participated as a guest speaker at more than 20 international and local conferences. His research has been supported by the German Academic Exchange Service (DAAD), the US Agency for International Development (USAID), the United Nations Development Program (UNDP), the East-West Management Institute (EWMI) in New York (NY, USA), and the Science Fund of Azerbaijan Republic. He was a postgraduate student at the Center of Economic Reforms (now called the Institute for Scientific Research on Economic Reforms) between 1993 and 1996 and worked at the Ministry of Education between 1990 and 1992. He has been a researcher, a leading researcher, and a head of department at the Center of Economic Reforms under the Ministry of Economic Development (now called the Ministry of Economy). He worked at the Department of Antimonopoly Policy (State Service for Antimonopoly Policy and Consumer Rights Protection) under the

Ministry of Economy between 1996 and 2003. Since 2015 he has delivered lectures on “The Economics of Oil and Gas Resources” and “Project Management of Oil and Gas” in Greece and lectures on economics, managerial economics, and international management in the framework of UNEC and the University of Business and International Studies (UBIS; Geneva, Switzerland) Dual Degree Graduate Program. He is the managing editor of the *Journal of Economic Sciences: Theory and Practice* and scientific reviews at UNEC, and he also serves as an editorial board member for the *Journal of Global Economy Review* (Kozani, Greece). Since 2014 he has been the director of the UNEC Business School, and he has been an associate professor at the Department of Economics and Business Administration since 2017. He was a visiting scholar at the Davis Center for Russian and Eurasian Studies at Harvard University (Cambridge, MA, USA) during the 15th of October 2017–31st August 2018 period. His last project was “Hydrocarbon Resources (Oil and Gas) in the Global Market and their Perspectives.” The major fields of his current research interests are applied economic issues, competition policy, socioeconomic modeling, macroeconomic policy, macroeconomic forecasting, and oil and gas price forecasting.