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History and Prospects of Natural Gas Pricing in Continental Europe in Conditions of Instability of World Oil Prices

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Abstract:

The article substantiates the need to assess changes in world prices for natural gas in conditions of volatility in world oil prices. The study is aimed at making forecasts of changes in world prices for natural gas in Continental Europe based on historical trend analysis.

The main method of the study is the method of correlation-regression analysis, with the help of which the strength of the correlation of world prices for natural gas from world oil prices was revealed. Also, methods of historical trend and mathematical analysis were used to determine the main forecast scenarios for natural gas price levels. The study is a new approach to analyzing the pricing of world prices for natural gas based on the revealed dependence on world oil prices.

The article examines the natural gas market of Continental Europe in dynamics and analyzes its evolution, as well as a link to the world oil market to make forecasts of the cost of natural gas.

Keywords: *natural gas, oil, Continental Europe, the natural gas market.*

JEL Classification*: F14, F17, F47*

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1. Introduction

Today, natural gas is the most important part of the world gas market, which in the past combines disparate regional natural gas markets. Natural gas plays a dominant role in the world energy balance; it is an important strategic natural resource of many states and has a huge influence on the oil and gas revenues of the federal budgets.

Given the volatility of world oil prices, a historical analysis of the pricing of natural gas in the European market is needed to compose the forecasted levels of world gas prices. In our opinion, the results of this study will make it possible to more effectively predict the effect of export gas prices on domestic prices in European countries, including allowing a more accurate forecast of oil and gas revenues of federal budgets.

The world and European gas market was considered in many papers. The paper of the Institute for Energy Studies of the Russian Academy of Sciences, written by Jonathan Stern, A.A. Konoplyannik and I.D. Elyakova, was used and considered. These authors considered the development of the gas market, its evolution, as well as energy markets in general, including the development of oil markets. The study of the oil market was necessary because of the binding of prices for natural gas to oil quotes. The article uses statistical materials U.S. Energy Information Administration, Gazprom PJSC and Energy Studies of the Russian Academy of Sciences.

2. Method

During the study, the correlation-regression analysis method was used to identify the relationships between variables through point and interval estimation of pair (private) correlations, calculation and verification of the significance of multiple correlation and determination coefficients; selection of the factors that have the most significant effect on the outcome, based on measuring the degree of communication between them.

Using the paired correlation coefficients, the density and strength of the relationship between the main factors influencing the change in oil prices for each period of development of the world oil market are established.

Pair correlation coefficients served as a basis for determining the priority factors that most strongly influence the change in oil prices. The method of least squares determined the quantitative level of priority of the influence of factors on the level of oil prices, which made it possible to assess the tightness of the relationship between the variable variables and to assess the effect of the factor on the outcome. Priority of the influence of factors is represented by the regression model

(Mandelbrot, 1963; Thalassinos and Pociovalisteanu, 2007; Pociovalisteanu *et al.*, 2010; Thalassinos *et al.*, 2009; Pociovalisteanu and Thalassinos, 2008).

To calculate the forecast values of production and consumption, a model is used to calculate future values based on historical data based on exponential smoothing with the definition of confidence intervals (the ETS AAA algorithm). Thus, the forecast values are based on existing data and continue the timeline. For calculations, the additive model of the triple exponential smoothing of Holt-Winters is used. The time series is denoted by Y_t:

$$\begin{aligned} \hat{y}_{t+d} &= a_t (r_t)^d \varpi_{t+(d \bmod s)-s}, \\ a_t &= \alpha_1 \cdot \frac{y_t}{\varpi_{t-s}} + (1-\alpha_1) a_{t-1} r_{t-1}, \\ r_t &= \alpha_3 \cdot \frac{a_t}{a_{t-1}} + (1-\alpha_3) r_{t-1}, \\ \varpi_t &= \alpha_2 \cdot \frac{y_t}{a_t} + (1-\alpha_2) \varpi_{t-s}, \end{aligned}$$

Where *s* is the period of seasonality, *s-1* is the seasonal profile, r_t is the trend parameter, and a_t is the forecast parameter, cleared of the influence of trend and seasonality (Goodwin, 2010; Winters, 1960; Thalassinos and Politis, 2012).

3. Results and Discussion

To compile a historical analysis of the natural gas market in Continental Europe, the dynamics of the gas market development and the basic theories of gas pricing were considered.

The European gas market, one of the largest energy markets in the world, is the main importer of Russian gas (Rakhimova, 2014). Five countries in Western Europe (Britain, Germany, Italy, Netherlands, and France) account for 70% of gas consumption in the European Union (EU). Since the 1930s, the development of gas markets in the EU countries began and until the 1960s they were mainly of a national, domestic nature (Yanchuk, 2013). In Italy and France, gas occurrences were discovered in the 1930's and in Germany and the Netherlands in the 1950s. The United Kingdom began to purchase liquefied natural gas (LNG) in the 1950s, and local gas production began only in the 1960s.

In the Netherlands, after the discovery of the Groningen reservoir in 1959, gas exports began on a large scale. This period is characterized by the creation of a huge transport network built in Europe for gas trading at the international level (IGU, 2014; Thalassinos *et al.*, 2013).

In 2000-2015, the value of world gas trade increased by approximately 31%. In 2015, natural gas was exported by 15 major countries, among which Russia is the

largest exporter. Russia exported about 196 billion cubic meters. Natural gas or 20% of the world trade value in natural gas. A total of 1033 billion cubic meters of natural gas were exported by countries in the form of liquefied gas and using pipelines.

To compile a historical analysis of pricing, the main problems in the construction of pricing theories were identified. So, the well-known gas expert Jonathan Stern believes that the theory of energy pricing in practice does not apply to the natural gas industry, nor did he find any other commodity at which prices would be set and indexed considering the prices of other commodities. He also revealed that the current pricing principles do not relate to depletion of resources and in most countries gas prices are regulated by the state (Stern, 2012; 2013).

A well-known Russian expert A.A. Konoplyannik believes that in most theories the idea of setting gas prices below the level of economic costs for its extraction or below the cost of its extraction and transportation to the final consumer is completely excluded, although in practice this happens in many countries in the form of state subsidies to the local population (Konoplyannik, 2013; 2014).

Table 1. *History of the methods of pricing natural gas used in Continental Europe from 1930 to the present*

Period of use	Pricing method	Pricing mechanism
1930-1960	“Cost Plus” (Ricardo's rent)	It is based on the cost price and the required profitability of production
1960 - Nowadays.	“Netback” (Ricardo's rent + Hoteling’s rent)	The price is set based on the replacement cost of the resource by the consumer and the cost of transportation
1970 - Nowadays.	The Groningen concept	Long-term contracts between the supplier and the consumer, formed under the “take or pay” scheme with a regular price adjustment based on “Netback” pricing methodology
1980 - Nowadays.	Exchange Price	Market pricing mechanisms

Natural gas is a relatively “young” fuel, requiring large investments and infrastructure costs. This circumstance explains the fact that a significant part of international trade in natural gas is carried out based on long-term contracts. As can be seen in Table 1, in the European gas market, according to the pricing history, various models were used:

- In the period from 1930 to 1960, in Continental Europe, gas prices were set by the "Cost-plus" method (Ricardo's rent), which was based on the cost price and the required profitability of production. Gas prices were fixed in fixed form or with the possibility of their indexation in case of inflation or cost growth (Putting a Price on Energy, 2007).
- Since 1960, the gas pricing mechanism in Europe is based on the "take and pay" principle, or on the so-called Groningen pricing principle. He got his name from the giant Groningen gas reservoir, discovered in the Netherlands in 1959. Its development was too expensive, and to get paid off, public funds were raised. To ensure the stability of payment and supplies, the same principle of "take and pay" was applied in the gas market, and the price of gas was "tied" to the oil price. Now Europeans sell and buy gas through this system. It provides for long-term contracts that fix the annual volumes of gas choice. If the buyer does not purchase the entire contracted amount, then he pays fines. The price of gas (usually per thousand cubic meters) is reviewed quarterly. At the same time, it depends on the cost of alternative energy sources.
- After 2000, gas prices began to be formed by the "net-back" method based on the prices of alternative energy carriers, considering the principle of replacement of the value of assets. For example, prices for gas oil (diesel fuel) reflect competition with gas in the housing and communal sector, fuel oil in the sphere of industrial heat and electric power industry (Putting a Price on Energy, 2007; Mironova, 2015; Mitrova and Galkina, 2013).
- In Europe, as in the US, there is a spot gas market, (a deal with immediate settlement): its price does not depend on the prices of possible substitutes. In this market short-term contracts are valid for a maximum of 2 years. Part of the volume of Russian gas, mainly LNG, is also sold on the spot gas market on the trading floors of the UK, Belgium, the Netherlands and France. But at present the European gas market is not ready to switch to the competition "gas-gas" as the main pricing mechanism (IGU, 2014). The bulk of Russian natural gas is sold to Continental Europe through long-term contracts (Konoplyannik, 2013, 2014).

Further, the analysis of the natural gas market for 1950-2015 was carried out. The world market of gas trade developed very rapidly in 1980-2010. Table 2 shows the volume of world trade in gas for 1950-2015. As can be seen in the table, the share of natural gas transported by gas pipelines is about 67.5%, respectively, the volumes are equal to 704.1 billion cubic meters of gas. The data show that the main volume in the world trade in natural gas is piped gas, since the costs of its transportation are much lower than when using its liquefaction technology for transportation.

Table 2. *Volumes of world gas trade for 1950-2015*

Period	Pipeline gas, billion m^3	Specific weight, %	Liquefied natural gas, billion m^3	Specific weight, %	Total, billions m^3
1950	0.8	100	-	0	0.8
1960	5.3	100	-	0	5.3
1970	43	94.1	2.7	5.9	45.7

1980	169.6	84.4	31.3	15.6	200.9
1990	235.3	76.6	72.1	23.4	307.4
2000	492.8	78.2	137.7	21.8	630.5
2010	718.9	70.8	296.3	29.2	1015.1
2015	704.1	67.5	338.3	32.5	1042.4

Source: *Compiled by the authors based on US Energy Information Administration data – access via https://www.eia.gov.*

In Continental Europe, the development of the natural gas market depends largely on the volume of its production and consumption. Five countries of Europe were selected for analysis, which significantly affect the natural gas market in Continental Europe - Russia, Germany, Norway, the Netherlands and France. Russia, Norway and the Netherlands are the main natural gas producers in Europe, and France and Germany are the main consumers of natural gas in Europe, which cannot provide themselves with their own reserves.

Table 3 shows the volumes of natural gas production, and Table 4 shows the volumes of natural gas consumption by the above countries. Tables are generated based on US Energy Information Administration data (EIA), which were translated into million cubic meters.

Table 3. *Production of natural gas, million cubic meters*

	1993	1995	2000	2005	2010	2014
Russia	627 104	605 102	557 614	629 341	609 746	617 221
France	3 426	3 341	1 869	1 784	1 359	17
Germany	19 595	21 691	23 673	20 898	16 112	10 392
Netherlands	88 292	84 611	72 604	78 579	88 688	70 339
Norway	41 569	47 204	90 274	130 795	148 748	n/a

Source: *US Energy Information Administration – access via https://www.eia.gov.*

Table 4. *Consumption of natural gas, million cubic meters*

	1993	1995	2000	2005	2010	2014
Russia	458 307	410 792	369 789	405 780	438 004	431 293
France	32 791	33 499	39 728	49 271	47 997	36 727
Germany	80 137	89 821	87 725	90 699	94 606	79 202
Netherlands	48 535	48 167	48 846	49 300	54 850	40 266
Norway	2 549	2 860	3 964	5 295	5 493	5 862

Source: *US Energy Information Administration – access via https://www.eia.gov.*

As can be seen from the data in Tables 3 and 4, France, the Netherlands and Germany have recently reduced the consumption of natural gas, but nevertheless they retain the position of the largest consumers of natural gas in Europe. The decline in consumption occurred despite the transition to gas-fired CHPP plants from coal-fired power plants. This is largely due to the development and use of new energy-saving and energy-efficient technologies in the energy sector. At the same time, it should be noted that despite the decline in natural gas consumption by the above-mentioned countries, Russia and Norway are increasing their natural gas production volumes.

Figure 1 shows the world gas imports by region for 1970-2010. It shows how the world's gas imports are growing in all regions: in Europe, Asia, North America and the CIS - from 43.9 billion cubic meters in 1970 to 945.7 billion cubic meters in 2010.

Figure 1. *World gas imports by regions for 1970-2010, billion m^3*

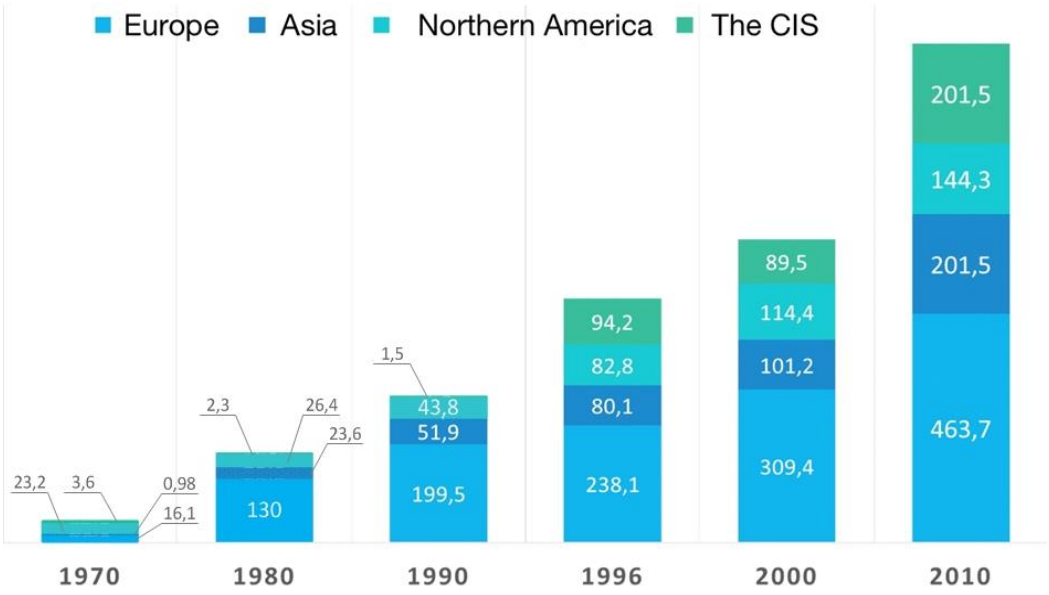


Table 5 presents data on the import of natural gas by European countries. Russia, despite being one of the largest gas producing countries, imports a significant amount of natural gas. Imports arise because of the vast territory of the country and the heterogeneity of the domestic gas market. The bulk of imported gas comes from Central Asia. France and Germany reduced gas imports in 2014 due to a reduction in gas consumption - they import gas volumes under a long-term contract, considering quarterly adjustments to the planned volumes of gas supplies. Germany imports most of the gas under a contract with PJSC Gazprom, which provides for revisions to the volume of gas supplies and prices only once a quarter. High volumes of

natural gas imports from Norway to Germany, Belgium, and Great Britain with gas transit through the Netherlands are due to existing schemes for the location of main gas pipelines and gas storage facilities (Correljé *et al.*, 2003). Norway does not import gas, since it fully provides its own internal needs with own gas.

Table 5. *Import of natural gas, million cubic meters*

	1993	1995	2000	2005	2010	2014
Russia	20 190	8 212	8 891	27 411	38 001	24 154
France	29 648	32 451	0	49 016	48 762	45 137
Germany	67 932	77 192	41 031	94 153	94 040	89 906
Netherlands	3 681	3 851	17 415	22 937	25 740	29 110
Norway	0	0	0	0	0	0

Source: *US Energy Information Administration – access via https://www.eia.gov.*

Figure 2 shows the world gas imports by region for 1970-2010. It should be noted the growth in the volume of world gas exports across all regions: in Europe, Asia, North America and the CIS - from 44.8 billion cubic meters in 1970 to 1015 billion cubic meters in 2010.

Figure 2. *World gas exports by regions for 1970-2010, billion* m^3

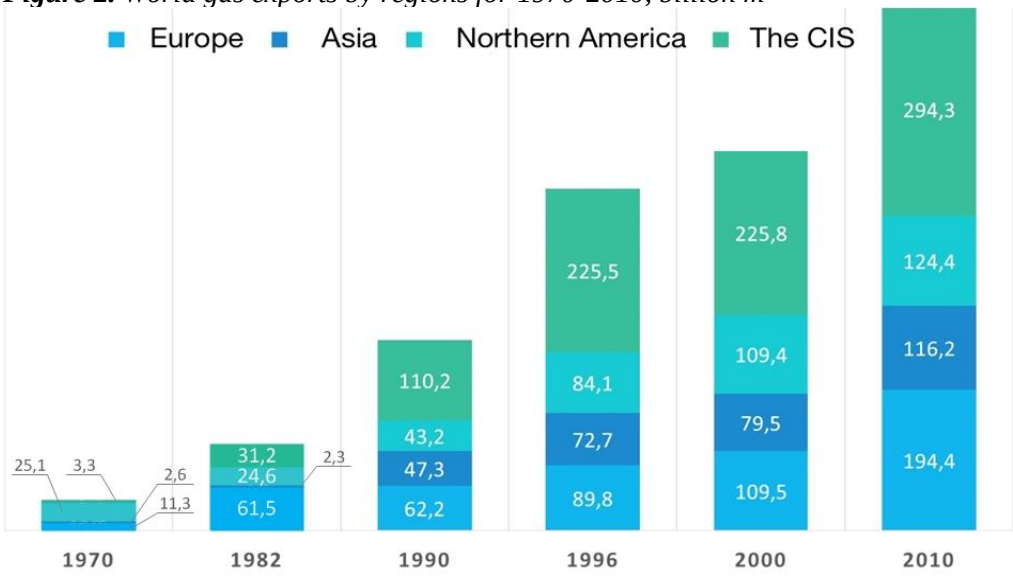


Table 6 presents data on the export of natural gas by European countries. Russia, the Netherlands and Norway are the main exporters of natural gas, while Germany and France are usually transit routes, which fact is reflected in the statistics. The bulk of the Netherlands' gas exports, as the main of the main transportation hubs for the

transportation and storage of natural gas, go to northern Germany and Belgium, to the UK. France is connected by gas pipelines with Germany and the Netherlands. The export of natural gas by Germany is since the country has become a transit route for natural gas coming from Russia via the Nord Stream main gas pipeline.

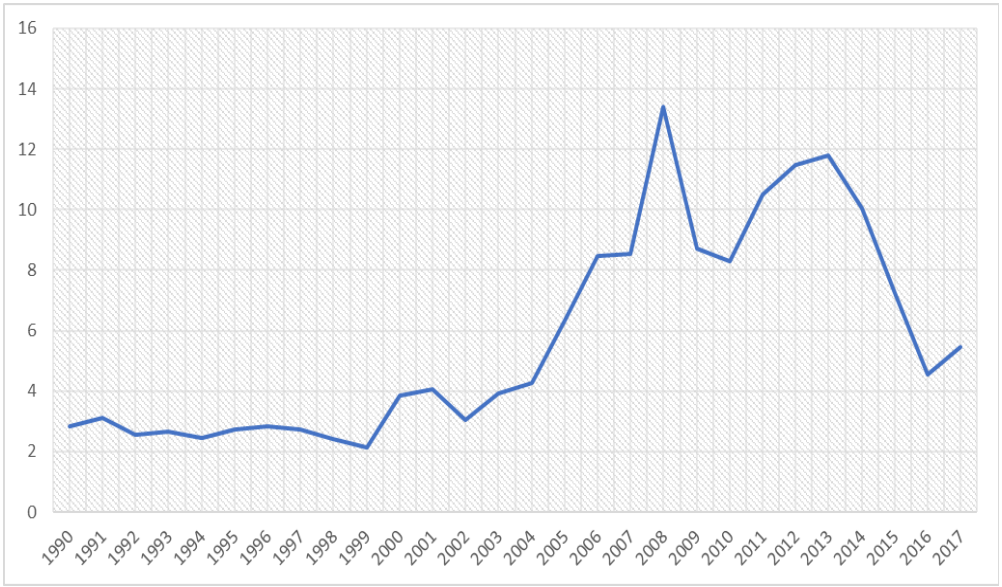
Table 6. *Export of natural gas, million m3*

	1993	1995	2000	2005	2010	2014
Russia	179 613	192 214	186 608	222 598	210 394	193 913
France	566	708	765	906	1 529	7 079
Germany	1 841	3 370	5 380	20 247	20 473	22 285
Netherlands	43 948	40 663	41 427	52 160	59 522	58 757
Norway	24 834	27 609	48 903	81 694	100 864	102 960

Source: *US Energy Information Administration – access via https://www.eia.gov.*

Figure 3 shows the dynamics of world prices for natural gas from 1990 to 2017, USD/1MMBTU - millions of British thermal units or units of measurement of thermal energy. Average natural gas prices were set at 3-5 USD, a sharp increase in gas prices of 13.4 USD observed in 2008, which is associated with an increase in world oil prices.

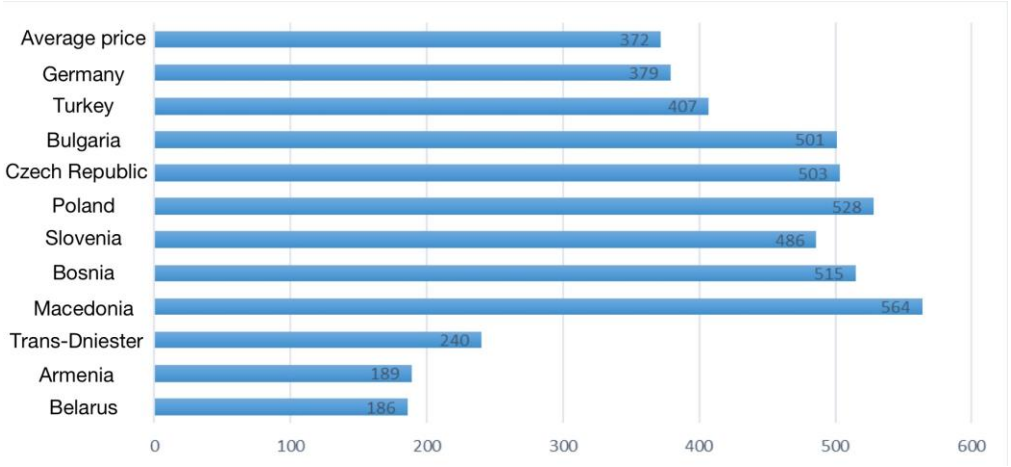
Figure 3. *Dynamics of world prices for natural gas from 1990 to 2017, USD/1MMBTU*



The cost of natural gas is affected not only by the costs of its extraction and transportation, but also by a number of factors, such as geophysical, chemical, economic and even political factors. The formula, by which the cost of Russian gas

for foreign consumers is determined by analysts, is jokingly called the "formula of love". The export prices of PJSC Gazprom are shown in Figure 4.

Figure 4. *Export prices for natural gas of PJSC Gazprom in 2014, USD / 1 thousand cubic meters*



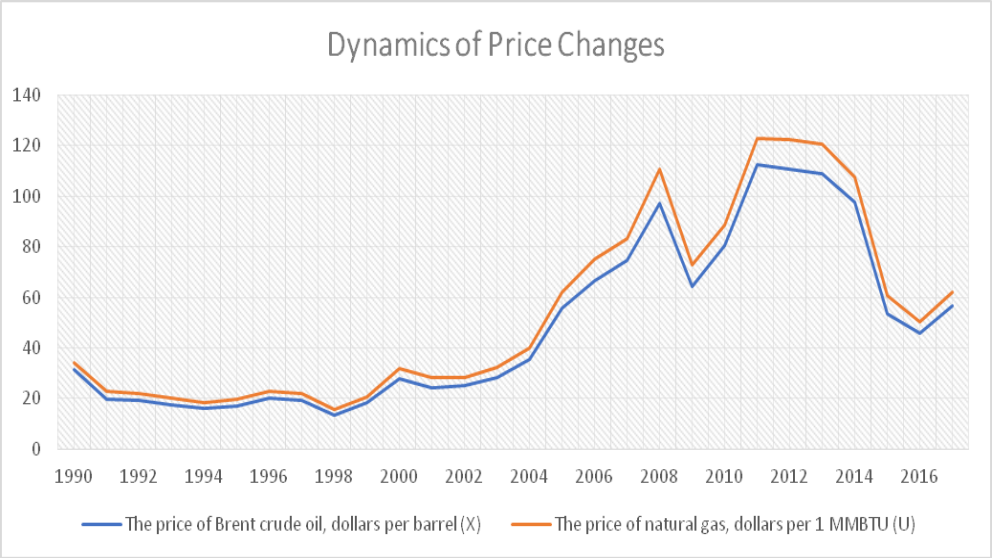
In 2015, the average price of gas supplies to Western Europe was 372 USD per thousand cubic meters. The average price for the CIS countries was 272 USD, incl. for Belarus -186 USD, for Armenia -189 USD. Most pay the countries of Yugoslavia: Macedonia - 564 USD, Bosnich - 515 USD, Slovenia - 486 USD, in the same group, the traditionally cool Poland - 528 USD, the Czech Republic - 503 USD, as well as Bulgaria - 501 USD that joined NATO. On the other hand, the price of gas for Turkey-407 USD and Germany-379 USD, they received significant discounts mainly for the promotion of Gazprom strategic projects - the construction of the Northern and Southern streams.

As stated on the website of PJSC Gazprom, "long-term contracts with oil products and the" take-or-pay "condition are the basis for the stability and security of gas supplies". At the same time, the cost of long-term contracts considers not only the cost of oil, but also many other factors, among which are the following:

- The price formula, which takes into account the change in prices for petroleum products in the previous 6-9 months;
- Conditions that prevent unilateral termination of contracts, except in cases of prolonged major force circumstances;
- The "take or pay" conditions that apply to a significant contractual volume, which provide that the buyer pays for non-selected volumes for a year and subsequently can select them with an appropriate surcharge after the delivery of the minimum annual volumes stipulated by contracts in the corresponding year (Gazprom).

During the study, a correlation-regression analysis of European natural gas prices and oil prices was carried out. As a result, it was revealed that the correlation coefficient is equal to r = 0.97, which indicates a direct relationship between gas prices and oil prices. Considering the coefficient of determination, which is equal to r^2 = 0.94, it can be argued that natural gas prices are 94% dependent on world oil prices. Comparison of the dynamics of changes in prices for natural gas and oil is shown in Figure 5.

Figure 5. *Dynamics of changes in prices for natural gas and Brent crude oil for 1990-2017*



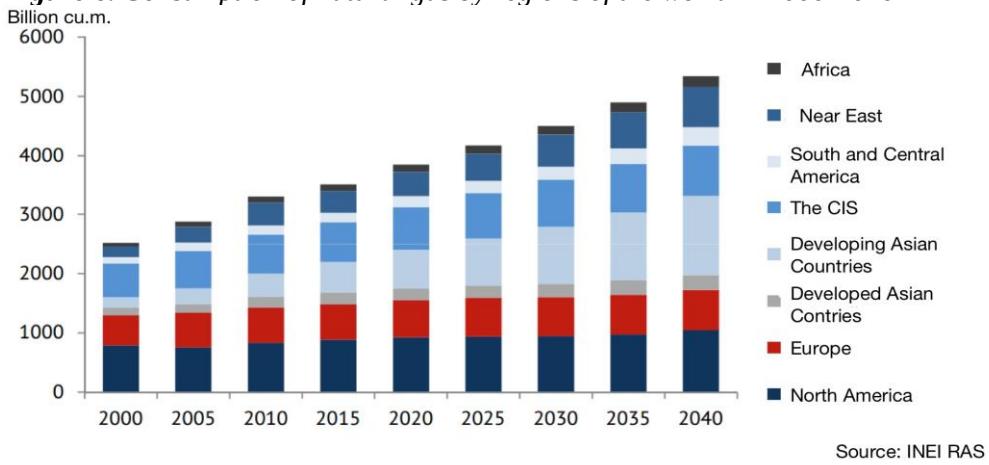
According to the forecast of natural gas consumption by regions of the world (Figure 6) compiled by Institute for Energy Studies of the Russian Academy of Sciences, by 2040 the world gas consumption is projected to increase to 5.3 trillion cubic meters, which is more than 60% higher than in 2010 (Forecast of the development of the energy sector in the world and Russia before 2040, 2013).

The main increase in gas demand (up to 81%) will be provided by developing countries, where the gas generation of the electric power industry will develop at a rapid pace and the gas consumption in industry will grow, and the ecological benefits of gas should be considered that will contribute to the preservation of interest in it and cause its consumption growth.

According to the International Energy Agency, countries such as China, India and Brazil will have the highest growth rates of gas consumption. On demand for natural gas Europe leads the world. In Russia, the growth rate of gas consumption will not be high, since at present the share of natural gas in the energy balance is already high.

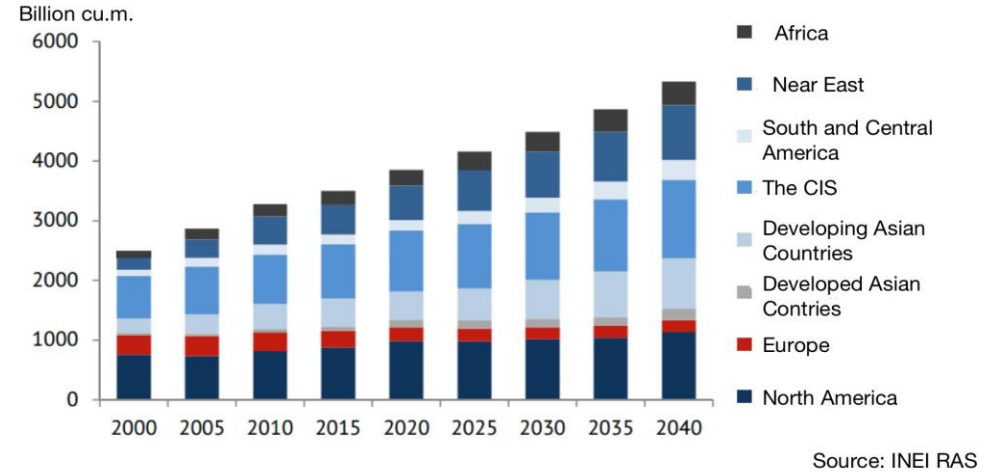
The forecast of natural gas production, shown in Figure 7, shows that all regions of the world, except Europe, will significantly increase gas production. Leaders of its growth will be, in addition to traditional suppliers (the CIS and the Middle East), as well as the developing countries of Asia, as well as the United States.

Figure 6. *Consumption of natural gas by regions of the world in 2000-2040*



Source: *Institute for Energy Studies of the Russian Academy of Sciences.*

Figure 7. *Production of natural gas by region of the world in 2000-2040*

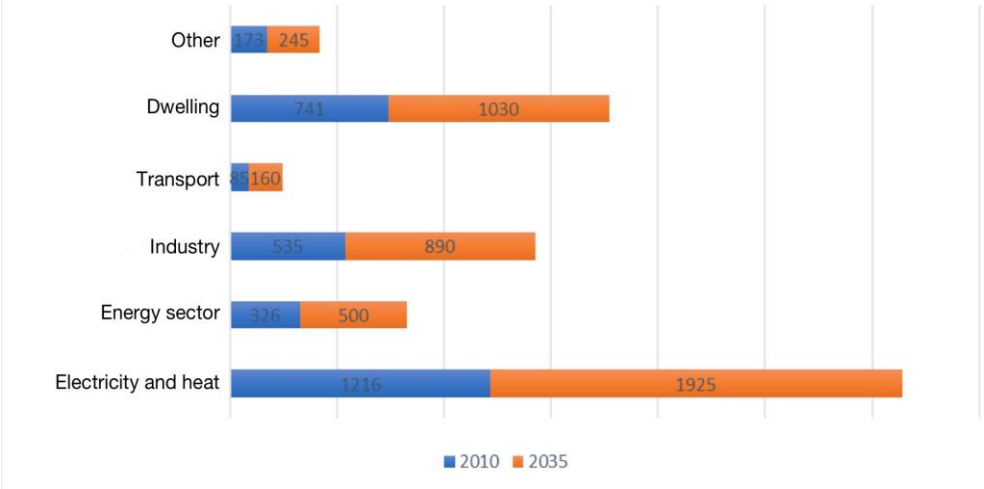


Source: *Institute for Energy Studies of the Russian Academy of Sciences.*

Figure 8 shows the forecast of natural gas consumption in the sectors of the economy, according to which natural gas in the fuel and energy balance will take 24%. This is facilitated by the trade in carbon credits and high fees for carbon emissions into the atmosphere. A large volume of gas will consume the industrial

sector, where gas will be used to produce hot water and steam, create high temperatures for technological processes, and as a base raw material to produce synthetic organic materials. The main consumers of gas will be the industries that produce metals and building materials (cement, bricks, and glass).

Figure 8. *Forecast of natural gas consumption in the economic sectors*



Forecasting the volume of production and consumption in Europe was carried out by triple exponential smoothing of data from 1993 to 2014. The results of production and consumption forecasting are presented in Tables 7 and 8, respectively.

Table 7. *Forecast volumes of natural gas production by European countries from 2015 to 2020, million cubic meters*

	2015	2016	2017	2018	2019	2020
Russia	625 808	629 054	632 299	635 544	638 790	642 035
France	0	0	0	0	0	0
Germany	9 552	7 674	5 796	3 918	2 041	163
Netherlands	76 645	76 372	76 100	75 828	75 555	75 283
Norway	186 697	193 299	199 902	206 504	213 107	219 709

Table 8. *Forecast volumes of natural gas consumption by European countries from 2015 to 2020, million cubic meters*

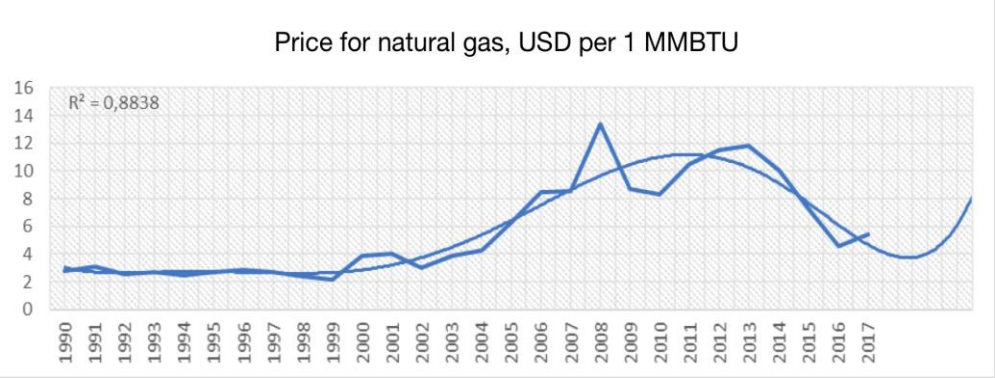
	2015	2016	2017	2018	2019	2020
Russia	434 906	437 200	439 494	441 788	444 082	446 376
France	48 093	48 701	49 309	49 918	50 526	51 134
Germany	83 477	81 889	80 300	78 712	77 123	75 535

Netherlands	40 117	39 967	39 817	39 667	39 517	39 367
Norway	5 803	5 925	6 047	6 169	6 290	6 412

The results of the forecast model of natural gas production and consumption from 2015 to 2020, developed by the authors, show that Russia and Norway will increase the volumes of natural gas production, while Germany and the Netherlands will reduce. France will stop its own gas production, but will continue to actively consume it. The consumption of natural gas by Russia, France, Germany and Norway will only grow. The results of mathematical modeling suggest a decrease in the volume of natural gas consumption in the Netherlands. Thus, due to an increase in consumption with a decline in natural gas production by Germany, we can expect significant changes in the natural gas market in Continental Europe.

To obtain a forecast of world gas prices, a historical trend analysis was performed using the polynomial trend line of the 6th degree. The value of the reliability of the approximation is 88%, which is a relatively high index. According to the forecast, natural gas prices will exceed 8 USD/1 MMBTU in 2020 (Figure 9).

Figure 9. *The forecast of prices for natural gas in Europe until 2020*



Based on historical trend analysis, forecast scenarios of world prices for natural gas were compiled. Scenarios were developed in accordance with the forecast values for oil quotations. As indicated above, the current Groningen concept involves linking natural gas prices to major commodity substitutes, namely, oil and petroleum products. Studies conducted in 2016 by the authors to compile forecast scenarios based on the dynamics of oil price changes confirmed the correctness of the basic option and setting the price level for a barrel of oil in the range of 50-55 USD in 2017 (Elyakova *et al.*, 2016; Elyakov, 2017).

- The first scenario is optimistic: prices will continue to rise and exceed 8.5 USD/MMBTU before 2020 - this is justified by the growing demand for gas in the world market, including through the active transition of China from coal to natural

gas. In the future, by 2025, it is planned to fix prices at the level of 9.5-10 USD/MMBTU.

- The second scenario is pessimistic: prices in 2017 will remain at the current level with a smooth fall to the level of 3.5 USD/MMBTU by 2020. This is probably due to the growth in gas sales proposals associated with an increase in the number of natural gas producers, as well as the improvement of its associated output (coalbed methane, shale gas during hydraulic fracturing, and associated gas during oil production).
- The third scenario is moderate: prices will rise, but at a relatively slow pace and reach a level of 7.5-8 USD/MMBTU by 2020.

4. Conclusion

Thus, because of the analysis of the pricing history of natural gas in Continental Europe, as the most significant market for the trade in Russian export gas, the evolution of pricing methods has been revealed.

Based on the correlation-regression analysis, a close relationship between oil and gas prices was revealed. Based on the trend analysis, forecasts of gas price levels have been compiled that can be useful for forming the price policy of the state and its oil and gas companies in foreign and domestic markets.

The obtained results of the study will make it possible to draw up more precise strategic plans for the development of gas companies and export supplies to Europe, which will lead to an increase in the profitability of sales and, as a result, effective planning of tax revenues to the budget and improvement of the state welfare and its trade balance.

References:

Correljé, A., van der Linde, C., Westerwoudt, T. 2003. Natural Gas in the Netherlands: From Cooperation to Competition? Amsterdam: Oranje-Nassau Groep, 1-240 C.

Elyakov, A.L. 2017. History and Prospects of Natural Gas Pricing in Continental Europe in Conditions of Instability in World Oil Prices. Materials of the International Youth Scientific Forum "LOMONOSOV-2017". ISBN 978-5-317-05504-2

Elyakova, I.D., Pakhomov, A.A., Darbasov, V.R., Khristoforov, A.A., Elyakov, A.L. 2016. Assessment of Changes in International Prices for Crude Oil Amid the Global Instability of its Production and Consumption. Indian Journal of Science and Technology, 9(36), 328-339. DOI: 10.17485/ijst/2016/v9i36/102010.

Energy Information Administration (EIA). https://www.eia.gov

Forecast of the Development of the Energy Sector in the World and Russia before 2040. 2013. Moscow: Institute for Energy Studies of the Russian Academy of Sciences - AC under the Government of the Russian Federation.

Gazprom. http://www.gazprom.ru/

Goodwin, P. 2010. The Holt-Winters Approach to Exponential Smoothing: 50 Years Old and Going Strong. Foresight: The International Journal of Applied Forecasting, 19, 30-33.

IGU. 2014. Wholesale Gas Price Survey - 2014 Edition: A Global Review of Price Formation Mechanisms 2005-2013. Fornebu: International Gas Union, 32 C.

Konoplyannik, A. 2013. Evolution of oil and gas markets: regularities of movement from physical markets to paper energy markets. Chapter book in, VII Melentiev Readings, 163-178. Moscow: Institute for Energy Studies of the Russian Academy of Sciences.

Konoplyannik, A.A. 2014. The American Shale Revolution: the consequences are irreversible. ECO, 5, 111-126. http://www.konoplyanik.ru/ru/publications/111Konoplyanik2014_05.pdf

Mandelbrot, B. 1963. New Methods in Statistical Economics. Journal of Political Economy, 71, 421-440.

Mironova, I.Yu. 2015. Gas pricing mechanisms in the world: a review of the regions, the problems of globalization and conclusions for Russia. St. Petersburg: European University at St. Petersburg.

Mitrova, T.A., Galkina, A.A. 2013. Interfuel competition. Economic Journal of the Higher School of Economics, 17(3), 372-389.

Pociovalisteanu, M.D., Thalassinos, I.E., Tirca, A. and Filho, L.W. 2010. Trends and challenges in the energy sector of Romania in the post-accession to the European Union. International Journal of Environmental Technology and Management, 12(1), 3-15, DOI: 10.1504/IJETM.2010.029957.

Pociovalisteanu, M.D., Thalassinos, I.E. 2008. The beginning and some national particularities of liberalism. Metalurgia International, 13(2), Special Issue, 172-177.

Putting a Price on Energy. 2007. International mechanisms for the formation of oil and gas prices. Brussels: Energy Charter Secretariat.

Rakhimova, G.M. 2014. Structural elements of the sources of potential of regional economy. Contemporary Economic Issues, 1, http://economic-journal.net/index.php/CEI/article/view/95/82. DOI: 10.24194/11406.

Stern, J. 2012. The Pricing of Internationally Traded Gas. Oxford: OIES/Oxford University Press.

Stern, J. 2013. Setting prices for natural gas: past, present and future. Economic Journal of the Higher School of Economics, 17(3), 430-455.

Thalassinos, I.E., Pociovalisteanu, D.M. 2007. A Time Series Model for the Romanian Stock Market. European Research Studies Journal, 10(3-4), 57-72.

Thalassinos, I.E., Hanias, P.M., Curtis, G.P. and Thalassinos, E.J. 2009. Chaos theory: Forecasting the freight rate of an oil tanker. International Journal of Computational Economics and Econometrics, 1(1), 76-88.

Thalassinos, I.E. and Politis, D.E. 2012. The evaluation of the USD currency and the oil prices: A VAR Analysis. European Research Studies Journal, 15(2), 137-146.

Thalassinos, I.E., Hanias, P.M., Curtis, G.P. and Thalassinos, E.J. 2013. Forecasting financial indices: The Baltic Dry Indices. Marine Navigation and Safety of Sea Transportation: STCW, Maritime Education and Training (MET), Human Resources and Crew Manning, Maritime Policy, Logistics and Economic Matters; Code 97318, 283-290, ISBN: 978-113800104-6.

Winters, P.R. 1960. Forecasting Sales by Exponentially Weighted Moving Averages. Management Science, 6(3), 324-342.

Yanchuk, M.B. 2013. Application of theory of spiral dynamics in management of integrative development of economic systems. Contemporary Economic Issues, 3, http://economic-journal.net/index.php/CEI/article/view/72/59. DOI: 10.24194/31308.