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## Assessment and modelling the dynamics of building materials prices in the current conditions

Construction, which is the driver of economic development in the current crisis conditions, needs to determine the correct cost and sufficiency of material resources, as well as systematic forecasting of price dynamics in order to plan the implementation of investment projects. High material capacity of construction products, along with the specificity of its pricing, leads to the necessity of not only keeping sufficient accuracy of quantitative and cost calculations regarding basic construction materials but also predicting the dynamics of cost in order to determine the volume of capital costs and accounting for the cost of work. The unstable dynamics of the cost of construction materials in 2022, caused by foreign policy pressure, requires the systematization of the factor space in order to predict trends more reliably. The factor space of the price dynamics of construction materials has undergone fundamental changes, starting with the impact of the coronavirus pandemic, and further due to changes in the geopolitical situation, sanctions pressure from unfriendly countries and corresponding changes in the economic principles of globalization, the transformation of the global and domestic logistics system, as well as the actions of local country and industry scale predictors. The authors have proposed a system of factors affecting the cost of building materials, structures and products in modern conditions, on the basis of the factor analysis the prices of basic building materials (armature and concrete) have been corrected by the expert method, a scenario forecast of price dynamics has been made. The authors substantiate the necessity for calculation-expert forecasting in conditions of high uncertainty and variability of forecasting results. In general, in the short term, a moderate upward trend in the cost of basic building materials with a rather high value coefficient of variation, explained by the strong influence of non-economic factors on the price.

**Keywords:** construction, forecast, factors, prices, building materials

The current conditions of economic turbulence [1], resulting from a rather sudden alteration in the foreign policy situation, characterized by a change in the Central Bank key rate, the presence of sanctions pressure and foreign trade restrictions, changes in logistics conditions [2], fluctuations in exchange rates and other related and derived factors<sup>1</sup>, have led to a rather sharp rise in the cost of construction and finishing materials.

The unstable dynamics of the cost of building materials, including some declines in market prices for a number of items, are largely due to government intervention and decreasing demand, along with the need to provide a certain volume of products for manufacturers. Various studies postulate an increase in the cost of building materials from 10 to 50 %<sup>2, 3, 4</sup>, and the production of some building materials is import-dependent. Under these conditions, the necessity of systematization, estimation and modelling of the factors determining the dynamics of building materials prices is revealed in order to predict them in future.

In current conditions, the geopolitical situation and the related sanctions policy affecting the construction and building materials market both directly (need for import substitution of a range of materials, structures and products) and indirectly (need for

changes in logistics chains, import substitution of technological equipment), as well as market factors of demand dynamics and influence mediation activities, possible price cartel agreements and logistics costs [3, 4].

The main factors affecting the cost of building materials, structures and products have been systematized by us in the form of a diagram (Fig. 1).

Taking into account all these factors, prices for building materials are not expected to decrease in 2022: in the most optimistic scenario, their growth will slow down to a proportionate projected inflation of 7–9 %. However, in the baseline scenario, we predict a more significant rise — by 12–15 % in total.

Manufacturers and suppliers of raw materials and goods are not yet able to fully meet the increased demand, and transport and logistics companies are unable to cope with the increased buyer activity. At the same time, the prices of oil, gas, many metals and other raw materials, which take up a significant share of the cost of production of many goods, including construction materials, are rising. These factors negatively impact both global inflation and inflation rates in the Russian Federation. In addition, due to the increase in the key rate, the need for which is caused by the influence of geopolitical

Uvarova S. S.  
Belyaeva S. V.  
Bolgov V. A.



**Uvarova Svetlana Sergeevna,**

Doctor of Economic Sciences, Professor of Department of Economics and Management in Construction; Moscow State University of Civil Engineering (National Research University) (MGSU); 26 Yaroslavlskoe shosse, Moscow, 129337, Russian Federation; SPIN-code: 3282-8871, Scopus: 57192670466, ResearcherID: W-4990-2018, ORCID: 0000-0002-9385-8182; uvarova\_s.s@mail.ru



**Belyaeva Svetlana Viktorovna,**

Candidate of Economic Sciences, Associate Professor, Associate Professor of the Department of Digital and Sectoral Economics; Voronezh State Technical University (VSTU); 84 20-letiya Oktyabrya st., Voronezh, 394006, Russian Federation; SPIN-code: 8541-4739, Scopus: 56437610100, ResearcherID: W-1655-2018, ORCID: 0000-0002-0771-5661; Belyaeva-sv@mail.ru



**Bolgov Vladimir Aleksandrovich,**

Candidate of Economic Sciences, Associate Professor, Department of Digital and Sectoral Economics; Voronezh State Technical University (VSTU); 84 20-letiya Oktyabrya st., Voronezh, 394006, Russian Federation; SPIN-code: 2814-7129, Scopus: 571944440216, ResearcherID: AAD-3421-2022, ORCID: 0000-0002-6563-9783; v\_bolgov@mail.ru

1 World Bank (2022). Annual report 2022: Helping countries adapt to a changing world. Washington, DC.

2 How will import substitution affect the timing of construction and the cost of housing. URL: <https://realty.rbc.ru/news/627ca82a9a7947e7150513b6>

3 Forecasts of socio-economic development. URL: [https://www.economy.gov.ru/material/directions/makroec/prognozy\\_socialno\\_ekonomicheskogo\\_razvitiya](https://www.economy.gov.ru/material/directions/makroec/prognozy_socialno_ekonomicheskogo_razvitiya)

4 Threat No. 1: Why are building materials becoming more expensive and how prices will be restrained. URL: <https://realty.rbc.ru/news/622b60829a7947f7030079c3>

► factors and increased inflation, the cost of borrowed capital is also increasing<sup>2</sup>.

One of the key materials used in construction is steel reinforcement. Its share in the cost structure of building materials averages 28 %, and prices directly depend on world steel prices. In the third quarter of 2020, after the cancellation of some of the restrictive measures caused by the pandemic, steel prices began to rise and jumped by 160 % from October 2020 to October 2021, while rebar prices in the domestic market rose by 52 % over the same period<sup>5</sup>.

In 2021, despite the seasonal decline in demand for metal products and the export restrictions imposed, rental prices at the end of the year made a new high [5]. The unstable situation on the world stage, complicated by sanctions, Russia's progressive economic isolation and, as a consequence, currency fluctuations, led to an increase in prices for metal products in the domestic

market during the first quarter of this year by 10–25 %, depending on the nomenclature<sup>6</sup>.

The cost of rebar is directly related to the situation in steel production: higher prices for alloying elements, iron ore, transport and electricity leads to a jump in quotations. The Russian government has imposed a restriction on the margin for metal traders in the domestic market (7–12 %), banned the export of alloyed scrap to unfriendly countries and increased the export duty for the rest of the scrap<sup>7</sup>. On the one hand, the steel industry has faced a number of export restrictions due to the sanctions regime, affecting about 5 million tons of products, except raw materials, cast iron and steel semi-finished products, which is 15 % of the annual exports of the industry. Under these conditions, metal producers are reorienting export routes and increasing shipments to the domestic market, with direct long-term supply contracts. Accordingly, we believe that in the near future, it is difficult to expect

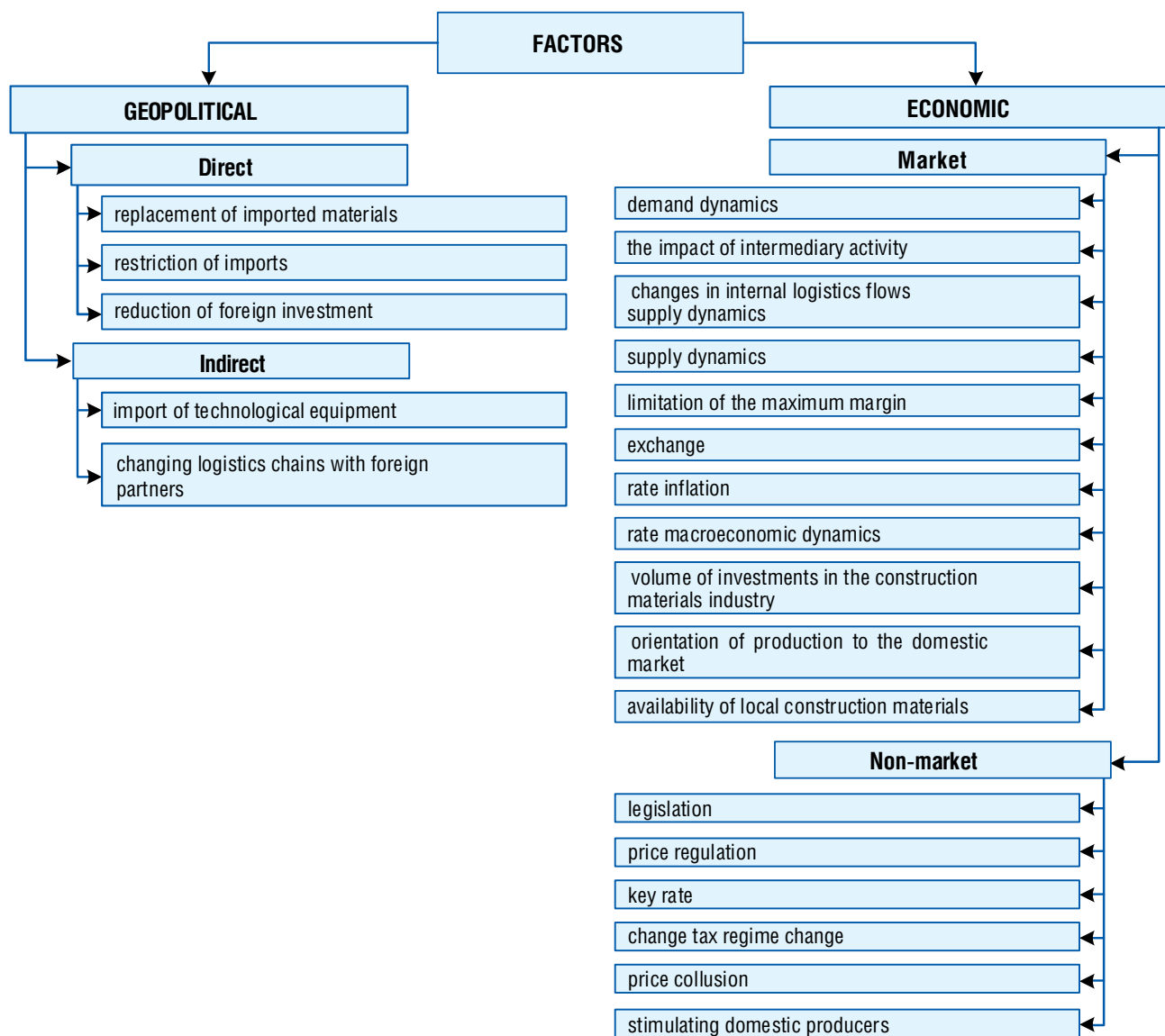


Fig. 1. System of factors affecting the cost of building materials, structures and products in the current conditions

5 METALSERVICE: official website. URL: tats/stats

6 GOSTMETALL: official website. URL: https://gostmetal.ru/dinamika

7 The Ministry of Industry and Trade against further restrictive measures for metallurgy. URL: https://mc.ru/news/nw/news\_id/13687

a significant price decrease for rebar, but strong price rises are not expected either. It is not possible to accurately predict the position of rebar prices in 2022. However, there are factors contributing to the growth and decrease in the cost of steel products.

Among the price growth should be an increase in rail tariffs, increasing transport costs to bring raw materials to steel mills, which will increase the cost of production and the final cost to consumers.

The second quarter of 2022 adds increased demand due to the seasonality of construction in the central Federal District, which may also affect rebar prices.

However, the cumulative drop in domestic demand for metal products by the end of 2022 may reach 30 % (about 13 million tons)<sup>7</sup> due to the suspension of the automotive industry. On the other hand, under the conditions of sanctions restrictions, there is a reorientation of metallurgy towards the domestic market, which is likely to lead to lower prices. The increase in the export duty of scrap metal is intended to restrain the growth of the value of rolled metal products.

Regarding the influence of factors on the price of non-metallic building materials, including concrete and concrete mixtures, the driver of price growth is the growth of export quotations and changes in prices for raw materials. Moreover, the reasons for the price increase are market uncertainty and increased demand, the transport component, rising costs and access issues, foreign equipment and components for it.

Concrete prices have not increased as much as rebar prices. The share of concrete, products made from it, as well as cement in the structure of the cost of building materials in total is 28 %. The share of cement in the volume of work by type of activity "Construction" decreased from 4 % in 2014 to 2.5 % in 2021<sup>4</sup>. The main reasons for the increase in cement and concrete prices are the activation of the construction industry, the rise in the cost of raw materials used for concrete and the increase in the cost of freight transportation, as well as geopolitical factors.

The impact of the need to replace foreign technological equipment and materials used in the total volume of construction and installation works of Russian projects does not exceed 10 %. The "PIK" Group estimated the share of imports in housing construction to be even lower, at 5 %. However, in the high-budget segment, this figure can reach 50 %<sup>8</sup>. In March, Russian Deputy Prime Minister Marat Khusnullin said that the Russian construction industry is ready for import substitution, since the share of imports in road construction is 5 %, and in residential construction does not exceed 8–10 %<sup>9</sup>. Thus, import substitution is not a key price-forming factor for non-metallic building materials.

At the same time, many enterprises require investments in the modernization of technological equipment, which, along with geopolitical factors, may affect concrete and cement prices in the medium and long term.

Experts estimate that the sanctions will require 66 % more funds will be required for repairs and maintenance of equipment than a year earlier. Coal went up in price by 76–86 %, goods and

materials — by 55 %, diesel fuel — by 30 %, oils and lubricants — by 83 %, transport and logistics costs increased by 14–24 %<sup>4</sup>.

The Ministry of Construction and other relevant departments plan to reduce the mineral extraction tax (MET) for producers of inert building materials. These measures are designed to reduce the price of non-metallic building materials and concrete, among others.

In addition to a large number of intermediaries, the increase in final prices for building materials is affected by rising logistics costs, so, in the cost of crushed stone and sand, up to 90 % of the cost of transportation<sup>10</sup>. At the same time, suppliers of building materials are able to enter into long-term contracts with railway carriers and are forced to work on the spot market. The increase in transportation tariffs leads to an increase in prices for the main components of the concrete mixture. However, the Russian Government is working on a number of measures to reduce the cost of transporting construction goods, including fixing railway tariffs for manufacturers of building materials, as well as booking a certain percentage of wagons for their needs<sup>11</sup>.

A number of publications note that the Russian government has simplified the procedure for confirming the suitability of building materials and structures in order to bring goods to market more quickly. In particular, the validation period for domestic building materials has been reduced from 90 to 10 working days<sup>12</sup>.

Production volumes in the cement industry always fall sharply in the times of crisis and the decline continues for several years. The crisis of 2022 is one of the most serious challenges for Russia since the 1990s, according to the Bank of Russia's monetary policy report. The drop in GDP in 2022, the report says, will be from 8 to 10 %<sup>3</sup>. "The measures taken by the Russian government and the Bank of Russia will support the structural transformation of the economy, the transition to new equilibrium trends", the report notes.

Based on the analysis and systematization of factors, the assessment of the dynamics of prices for building materials, the study of expert opinions on this issue, it was decided that it is expedient to calculate the expert assessment of the forecast dynamics of prices for building materials. Expert correction is necessary in conditions of a high degree of uncertainty and risk, which complicates the practical application of economic, mathematical and econometric models. In this situation, an expert assessment of trends and the main price change scenarios is possible.

As a result of the expert survey, the following estimates of possible price developments for rebar and concrete mixtures were obtained, and the corresponding estimated price adjustments were made (Table).

Based on the results of the expert assessment, it can be concluded that in 2022, prices for building materials (reinforcement and concrete) are not expected to decrease: in the most optimistic scenario, their growth will slow down to 7–8 %. However, in the baseline scenario, prices are projected to rise by a combined

8 The state and prospects of development of the industry of production of building materials and related industries // Investment portal of the Moscow Region. URL: <https://investmoscow.ru/media/>

9 RBC: official website. URL: <https://chr.rbc.ru>

10 SOYUZCEMENT: The cost of the basic building material lags behind the prices of other goods and services. URL: [oyuztsement-stoimost\\_-bazovogo-stroimateriala-otstaet-ot-tsen-na-drugie-tovari-i-uslugi.html](https://soyuzcement.ru/oyuztsement-stoimost_-bazovogo-stroimateriala-otstaet-ot-tsen-na-drugie-tovari-i-uslugi.html)

11 Mass media: to reduce the final prices for building materials, railway tariffs may be fixed. URL: [troitel\\_nie\\_materiali/smi-dlya-snizheniya-konechnih-tsen-na-stroimaterialov-mogut-zafiksirovat-zhd-tarifi.html](https://troitel_nie_materiali/smi-dlya-snizheniya-konechnih-tsen-na-stroimaterialov-mogut-zafiksirovat-zhd-tarifi.html)

12 Ministry of Construction, Housing and Utilities of Russia: Official website. URL: <https://www.minstroyrf.gov.ru>

Results of expert assessment of price variants for rebar and concrete mixtures

Expert	Increase in the cost of fittings, %	Increasing the cost of concrete, %	Forecast of the average cost of fittings in the Russian Federation, rub.	Forecast of the average cost of concrete in the Russian Federation, rub.
1	7	16	55,640	4,872
2	12	10	58,240	4,620
3	25	15	65,000	4,830
4	30	10	67,600	4,620
5	4	14	54,080	4,788
6	10	9	57,200	4,578
7	15	8	59,800	4,536
Average value	15	12	59,651	4,692
Consistency of experts	0.65	0.73	0.92	0.97

12–15 %. The pessimistic scenario provides for an even greater increase in prices by 16–25 %.

In 2022, concrete prices are expected to increase, and with a wide range of possible increases from 10 to 50 % due to the multiplicative accumulation of factor effects and the lack of practical methods of regulating prices for local building materials.

Along with the above scenarios, it is necessary to take into account the influence of all the identified factors, the results of an expert assessment of price trends, as well as measures taken by the Russian government to support the economy of the construction industry.

The impact of the factors mentioned above is taken into account and the forecasts obtained on the basis of the ARIMA

model are adjusted to the value of the confidence interval, taking into account scenario analysis and variants of the influence of the factors identified in the study (Fig. 2).

The corresponding adjustments and consideration of the price range of concrete mix in the Moscow region, taking into account the scenario analysis, are shown in the figure below (Fig. 3).

Note that the range of forecast prices in each specific period of the time interval includes a variant of an optimistic scenario (minimum price), a realistic scenario (forecast price), and a pessimistic scenario (maximum price). The resulting trend does not take into account the direct force majeure influence of geopolitical factors, however, the scenarios were formed taking into account the influence of a set of factors systematized in this study.

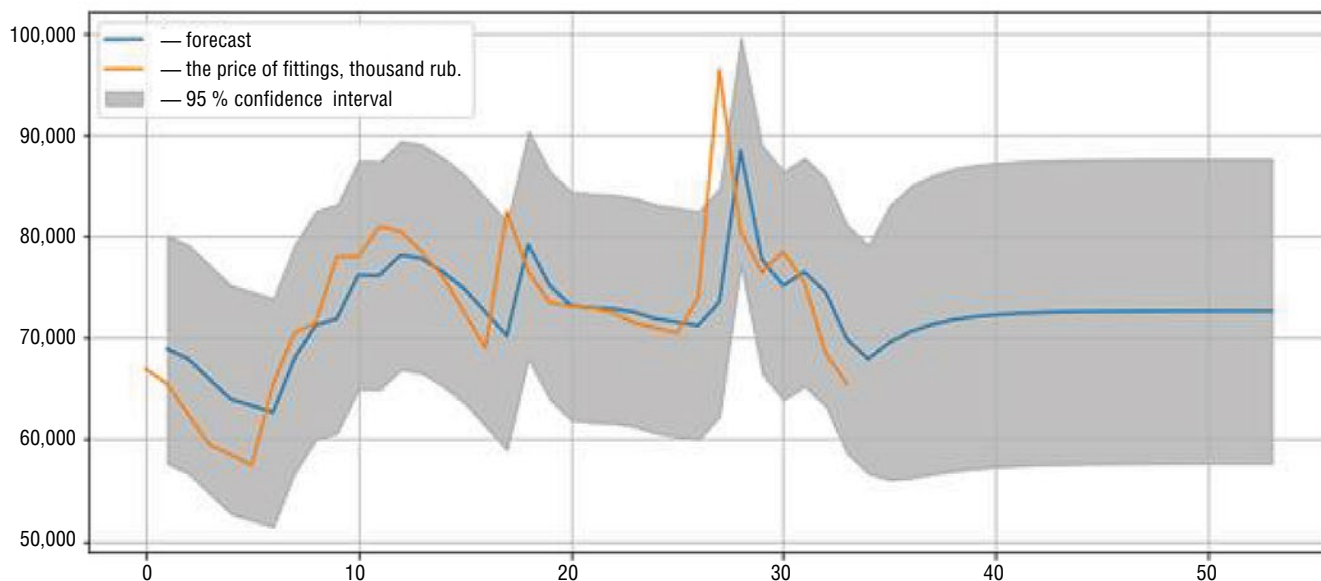


Fig. 2. Projected price graph of f12 A500C rebar in the Moscow region with 95 % confidence interval

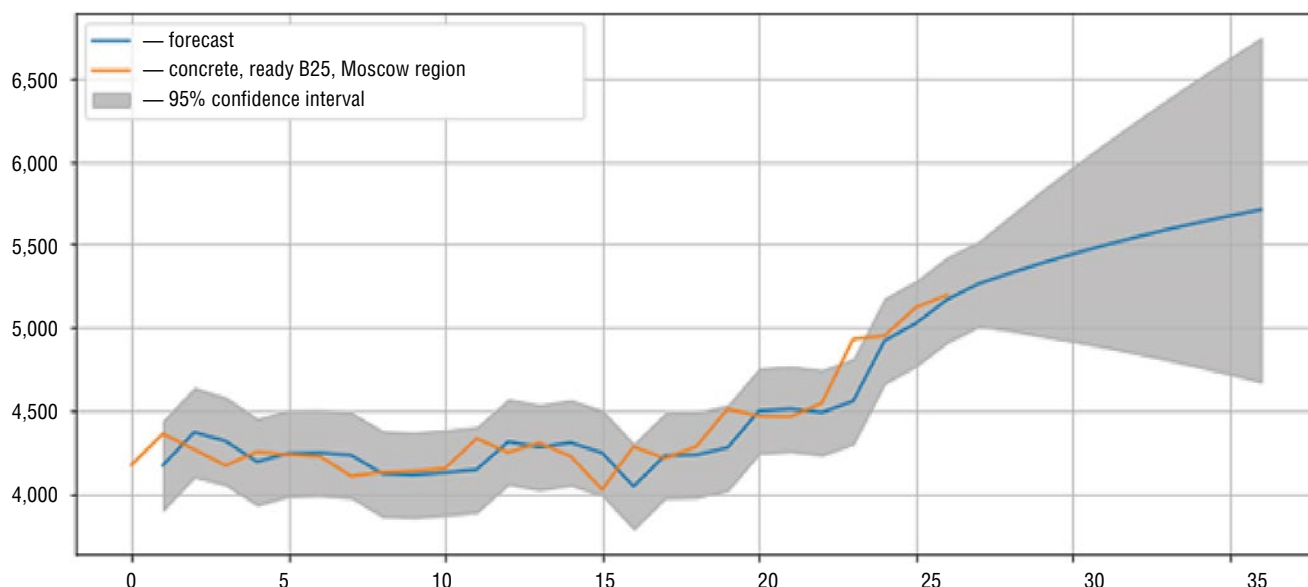


Fig. 3. Projected graph of concrete prices in the Moscow region with a confidence interval of 95%

#### REFERENCES

1. Efremyan B.L., Kankhva V.S. Redistribution of risk management priorities in the housing construction sector under the conditions of external shocks. *Vestnik MGSU [Monthly Journal on Construction and Architecture]*. 2022; 17(6):756-768. DOI: 10.22227/1997-0935.2022.6.756-768 (rus.).
2. Uvarova S.S., Belyaeva S.V., Sudakova A.A., Galeev K.F. Regional differentiation of price dynamics in construction: resource aspect. *Economy and Entrepreneurship*. 2022; 7(144): 300-305. DOI: 10.34925/EIP.2022.144.7.055 (rus.).
3. Abdulina A.A., Filippova E.V. Assessment of artificial price increase for building materials and influence on the final value of real estate. *Science and Innovation: Research and Achievements: collection of articles of the III International Scientific and Practical*

*Conference (Penza, April 1-2, 2021)*. Penza, 2021; 107-109. URL: <https://elibrary.ru/item.asp?id=45799121> (rus.).

4. Farkhutdinov A.M. Analysis of the cost of building materials purchased by construction organizations. *Innovations and High-Tech Technologies in Education and Economics: Materials of the X International Scientific-Practical and Methodological Conference*. Ufa, 2022; 50-58. (rus.).

5. Sturova V.A., Simakov A.G. Study of the dynamics of the cost of building materials for 2022 in Russia on the example of reinforced concrete structures, concrete, gypsum. *Modern problems of materials science: Collection of Scientific Papers of the III All-Russian (National) Scientific and Practical Conference Dedicated to the Memory of Doctor of Technical Sciences, Professor, Academician of the Russian Academy of Architecture and Construction Sciences E.M. Chernyshov*. Lipetsk, 2022; 244-249. (rus.).

### Оценка и моделирование факторов динамики цен строительных материалов в современных условиях

Строительство, являющееся драйвером развития экономики в современных кризисных условиях, нуждается в определении корректной стоимости и достаточности материальных ресурсов, а также в системном прогнозировании динамики цен в целях планирования реализации инвестиционных проектов. Высокая материалоемкость строительной продукции наряду со спецификой ее ценообразования приводят к необходимости не только соблюдения достаточной точности количественных и стоимостных расчетов относительно основных строительных материалов, но и прогнозирования динамики стоимости с целью определения объемов капитальных затрат и учета себестоимости работ. Неустойчивая динамика стоимости строительных материалов в 2022 г., вызванная внешнеполитическим давлением, требует систематизации факторного пространства с целью более достоверного прогнозирования тенденций. Факторное пространство ценовой динамики строительных материалов претерпело коренные изменения, начиная с влияния пандемии коронавируса, и в дальнейшем в связи с изменением геополитической ситуации, санкционным давлением недружественных стран и соответствующими изменениями экономических принципов глобализации, трансформацией мировой и внутрироссийской логистической системы, а также с действиями локальных предикторов странового и отраслевого масштаба.

Авторами предложена система факторов, влияющих на стоимость строительных материалов, конструкций и изделий в современных условиях, на основе факторного анализа экспертным методом скорректирован прогноз цен основных строительных материалов (арматуры и бетона), построен сценарный прогноз динамики цен. Авторами обоснована необходимость расчетно-экспертного прогнозирования в условиях высокой неопределенности и вариабельность результатов прогнозирования. В целом в краткосрочном периоде ожидается умеренная повышательная динамика стоимости основных строительных материалов с достаточно высоким значением коэффициента вариации, объясняемым сильным влиянием на цену неэкономических факторов.

**Ключевые слова:** строительство, прогноз, факторы, цены, строительные материалы

#### СПИСОК ИСТОЧНИКОВ

1. Ефремян Б.Л., Канхва В.С. Перераспределение приоритетов в управлении рисками в жилищном строительстве в условиях последствий внешних шоков // *Вестник МГСУ*. 2022. Т. 17. Вып. 6. С. 756–768. DOI: 10.22227/1997-0935.2022.6.756-768
2. Уварова С.С., Беляева С.В., Судакова А.А., Галеев К.Ф. Региональная дифференциация ценовой динамики в строительстве: ресурсный аспект // *Экономика и предпринимательство*. 2022. № 7 (144). С. 300–305. DOI: 10.34925/EIP.2022.144.7.055

3. Абдулина А.А., Филиппова Е.В. Оценка искусственного завышения цен на строительные материалы и влияния на конечную стоимость недвижимости // Наука и инновации: исследование и достижения : сб. ст. III Междунар. науч.-практ. конф. (г. Пенза, 1–2 апреля 2021 г.). Пенза, 2021. С. 107–109. URL: <https://elibrary.ru/item.asp?id=45799121>

4. Фархутдинов А.М. Анализ стоимости строительных материалов, приобретенных строительными организациями // Инновации и наукоемкие технологии в образовании и экономике : мат. X Междунар. науч.-практ. и мет. конф. (Уфа, 26–27 мая 2022 г.). Уфа, 2022. С. 50–58.

5. Стурова В.А., Симаков А.Г. Исследование динамики стоимости строительных материалов на 2022 год в России на примере железобетонных конструкций, бетона, гипса // Современные проблемы материаловедения : сб. науч. тр. III Всеросс. (национальной) науч.-практ. конф., посвящ. памяти д-ра техн. наук, профессора, академика Российской академии архитектуры и строительных наук Е.М. Чернышова. Липецк, 2022. С. 244–249.

Об авторах: **Уварова Светлана Сергеевна** — доктор экономических наук, профессор кафедры экономики и управления строительством; **Национальный исследовательский Московский государственный строительный университет (НИУ МГСУ)**; 129337, г. Москва, Ярославское шоссе, д. 26; SPIN-код: 3282-8871, Scopus: 57192670466,

ResearcherID: W-4990-2018, ORCID: 0000-0002-9385-8182; uvarova\_s.s@mail.ru;

**Беляева Светлана Викторовна** — кандидат экономических наук, доцент, доцент кафедры цифровой и отраслевой экономики; **Воронежский государственный технический университет (ВГТУ)**; 394006, г. Воронеж, ул. 20-летия Октября, д. 84; SPIN-код: 8541-4739, Scopus: 56437610100, ResearcherID: W-1655-2018, ORCID: 0000-0002-0771-5661; Belyaeva-sv@mail.ru.

**Болгов Владимир Александрович** — кандидат экономических наук, доцент кафедры цифровой и отраслевой экономики; **Воронежский государственный технический университет (ВГТУ)**; 394006, г. Воронеж, ул. 20-летия Октября, д. 84; SPIN-код: 2814-7129, Scopus: 571944440216, ResearcherID: AAD-3421-2022, ORCID: 0000-0002-6563-9783; v\_bolgov@mail.ru.

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