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Translated Article[†]**REINTRODUCTION OF GOLD INTO THE FINANCIAL SYSTEM: TRENDS AND DRIVERS****Vitalii T. BORISOVICH**Russian State Geological Prospecting University (MGPI-RSGPU), Moscow, Russian Federation
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Available online 24 December 2018**JEL classification:** E40, E44**Keywords:** gold, investment, gold exchange reserve**Abstract****Subject** The research is intended to examine the growing importance of gold during the economic instability in the financial markets.**Objectives** The research is to study whether gold can be reintroduced into the financial system. We analyze trends and drivers in the domestic and global gold markets.**Methods** The methodological underpinning comprises objective principles of a systems approach, economic analysis, logic and comprehensive approach to evaluating economic phenomena and processes.**Results** Gold was found to become more popular not only from investment perspectives. Gold evidently regains the reputation of a monetary metal. Central banks sold gold from their exchange reserves until 2009. However, in 2019 they formed the demand, buying gold. The instability of the global financial system makes countries holding gold reserves abroad repatriate them.**Conclusions and Relevance** Resting on the hegemony of the U.S. dollar, the global financial system perishes, paving the way to coming changes. It includes various options of the monetary circulation involving gold.

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*The editor-in-charge of this article was Irina M. Vechkanova**Authorized translation by Irina M. Vechkanova***Introduction**

The Russian and foreign scholars conduct a growing number of researches into the current and future competitiveness of financial markets, positive and negative aspects of investing in gold, possibility of a return to a gold standard¹ [1–5].

[†]For the source article, please refer to: Борисович В.Т., Заернюк В.М. О возвращении золота в финансовую систему: тенденции и движущие силы. *Финансовая аналитика: проблемы и решения*. 2018. Т. 11. № 3. С. 342–353. URL: <https://doi.org/10.24891/fa.11.3.342>

¹ Ishkhanov A.V., Linkevich E.F. [On options for returning to a gold standard]. *Novaya nauka: Sovremennoe sostoyanie i puti razvitiya = New Science: Current Situation and Development Paths*, 2015, no. 3, pp. 110–113. (In Russ.); Kumanova L.R., Yavarova I.D. [Positive and negative aspects of investment in gold]. *Ekonomika i sotsium*, 2015, no. 2-2, pp. 1365–1369. (In Russ.) URL: [http://iupr.ru/domains_data/files/sborniki_jurnal/Zhurnal%20_2\(15\)%202.pdf](http://iupr.ru/domains_data/files/sborniki_jurnal/Zhurnal%20_2(15)%202.pdf); Sibirskaya A.V. [Status and prospects for competitiveness of the EAEU financial markets]. *Finansy i kredit = Finance and Credit*, 2017, vol. 23, no. 4, pp. 201–216. URL: <https://cyberleninka.ru/article/v/sostoyanie-i-perspektivy-konkurentosposobnosti-finansovyh-rynkov-stran-eaes> (In Russ.); Sukharev A.N. [The gold reserves of the Bank of Russia: Trends and current status]. *Finansy i kredit = Finance and Credit*, 2017, vol. 23, no. 9, pp. 490–500. URL: <https://cyberleninka.ru/article/v/zoloty-e-rezervy>

Notwithstanding the official demonetization, gold continues to be a commodity and a means of payment and saving. It is noteworthy that the simultaneous performance of several functions and different insensitivity are evidence of a gold multifunctionality both in markets of commodities and financial instruments [4].

Unique qualities once made gold a means of payment and exchange. Now the same qualities shape its investment potential. What mainly positioned gold as an item for investment is the ability to protect monetary funds from impairment, and generate profit even in the time of the global market instability.

Gold becomes more lucrative for investors during global crises and economic turmoil and in financial markets, in particular. Business entities and individuals treat gold as a highly marketable financial asset. Therefore, gold is used in investment transactions as its main function nowadays².

Investment in gold is made directly through by purchasing metals (bars or coins) or indirectly by acquiring derivatives, shares, certificates, accounts, warrants [6].

Many experts report that gold is not only perceived from perspectives of investment. Another important trend is observed as gold gradually regains its status of monetary metal [6–8]. Gold is no longer considered as ordinary commodity, turning into money, that is a common equivalent and means of exchange and payment. This signifies the turning point in the global economy and policy.

Central banks implement programs for increasing gold reserves mainly to diversify the gold exchange reserves of a respective country so as to edge out the U.S. dollar and euro and expand the use of gold.

The amount of the gold exchange reserve is indicative of the nation's financial position and considered as an important aspect for the stability of national currencies³. An increase in the gold exchange reserve

boosts up investment opportunities of any country. It mitigates the default risk associated with the external debt in case of unfavorable changes in the world and decreases the probability of drastic fluctuation of the national currency [7, 8].

It is globally acknowledged at the governmental level that the U.S. dollar concedes its leadership positions in the global financial system. Anticipating the coming developments, national governments elaborate different money circulation options for their countries with regard to gold. In the gold-standard-based economy, every monetary unit issued may be exchanged for gold upon request.

In 1939, the global gold reserves (except for the USSR) were 24,300 tonnes, worth 15,650 tonnes held by the USA. The USA adopted a gold standard in 1934 and exchange rate of USD 35 (the price hereinafter is given in USD per try ounce).

After World War II, the USA possessed 22,000 tonnes of gold, which also included the Soviet metal under the lend-lease policy. Having accumulated about 70 percent of national gold reserve, the USA launched the campaign for the U.S. dollar to become the world leading currency. They managed to establish the monetary system, which almost equated the U.S. dollar and gold.

The 1944 Bretton Woods Agreement envisaged a gold exchange standard pegged to gold and two reserve currencies (USD and GBP). It also affirmed gold to constitute the national reserve. Gold became the national and ultimate reserve asset.

However, as the U.S. gold reserve shrank rapidly, the system collapsed in the 1970s. In 1971, the USA devalued the U.S. dollar and declared the U.S. dollar would not longer be exchanged for gold, trying to squeeze gold out of the international monetary circulation. In 1976, members of the International Monetary Fund (IMF) articulated principles of a new currency system, which are still effective.

The U.S. dollar was accepted as a financial equivalent worldwide. The gold exchange standard was abolished concurrently with the approval of the gold demonetization, thus signifying that gold was no longer considered as money.

After the U.S. dollar was unpegged from gold, USD issue became almost unlimited. The world supply of the U.S. dollar is 25 times as much as the value of goods

banka-rossii-dinamika-i-sovremennoe-sostoyanie (In Russ.)

² Kumanova L.R., Yavarova I.D. [Positive and negative aspects of investment in gold]. *Ekonomika i sotsium*, 2015, no. 2-2, pp. 1365–1369. (In Russ.) URL: [http://iupr.ru/domains_data/files/sborniki_jurnal/Zhurnal%20_2\(15\)%202.pdf](http://iupr.ru/domains_data/files/sborniki_jurnal/Zhurnal%20_2(15)%202.pdf).

³ *Predstavitel' WGC. MVF stoit rassmotret' vozmozhnost' vklyucheniya zolota i valyut razvivayushchikhsya stran v korzinu* [World Gold Committee official: IMF should consider including gold and currencies of emerging economies into the portfolio of Special Drawing Rights]. URL: <http://www.cbonds.info/em/eng/news/index.phtml/params/id/475088> (In Russ.)

produced. Over 80 percent of the USD supply float outside the USA. Whereas the currency is no longer pegged to gold, financial authorities can make relatively arbitrary money issues. Sometimes this generates an excess of money circulating in the economy, triggers a growth in prices and fuels inflation. Gold appreciated from USD 35 to USD 1,900 from 1967 to 2017, i.e. a 50-fold increase.

The U.S. dollars turned into liabilities of the U.S. Federal Reserve System. It is the Federal Reserve System that is empowered to control the volume of money issue.

The Federal Reserve System is exclusively mandated to produce the currency. Thus, the U.S. dollars gradually and inconspicuously morphed into the so called unsecured representative currency, i.e. a promissory note of the Federal Reserve System. According to analysts' estimates, the U.S. dollar lost 98 percent of its value last year⁴.

Therefore, each entity holding a USD banknote virtually acts as a creditor of the Federal Reserve System. As a result of the financial policy of the Federal Reserve System, the national debt increased 5,000 times.

Is the bankruptcy scenario applicable to the Federal Reserve System? Yes, it is, like it may happen with any business entity. In the case of the Federal Reserve System and the U.S. dollar as the global reserve, the bankruptcy may have shattering effects on global powers as a whole, rather than one single country.

If the Federal Reserve System goes bankrupt, the value of the Federal Reserve Notes, which are often erroneously understood as the U.S. dollars, may slump down to their real value worth 7 to 10 percent per USD, thereby impairing the financial position of entities holding them.

Many countries voice their concerns about the currency system as is currently observed. Here is a question to be answered. Is the strongest economy trustworthy? Its national debt currently amounts to USD 20.16 trillion, exceeding GDP of USD 19.3 trillion by 100 percent⁵.

The Chairman of the Federal Reserve Alan Greenspan announced the USA intends to reintroduce a gold standard, referring to recommendations of the U.S.

⁴ Lezhava A. *Ob odnom yubilee* [On an anniversary].

URL: <http://trueinform.ru/modules.php?name=News&sid=22889> (In Russ.)

⁵ *Gosdolg SShA prevysil 20 trln doll* [The U.S. national debt exceeds USD 20 trillion]. URL: <https://topwar.ru/124735-gosdolg-ssh-a-prevysil-20-trln-doll.html> (In Russ.)

Gold Commission set up in 1981 and considering the probable USD devaluation of 40 percent [10].

As the analysis shows, gold constantly regains its status of a monetary metal⁶. As noted by S.M. Borisov in 2005, the world sees gold crawling back into the monetary system [10].

Purchase of Gold for Reserves

Central banks have been selling gold from their gold exchange reserves for the recent two decades. Over 5,000 tonnes of metal have been disposed of for this period of time. However, in 2010, central banks started to create the demand and buy gold. They revised their attitude to gold reserves, which currently serve for stabilizing the exchange rates of national currencies.

Central banks have been busy incrementing their gold reserves for seven years. The trend is expected to survive in 2018 as well, especially in the Asian countries. According to official data, the People's Bank of China holds less than two percent of gold (*Table 1*).

As many experts note, the People's Bank of China continues to diversify its substantial gold exchange reserves and convert them into gold to protect them from the weakening U.S. dollar. To confer the status of global reserve currency on the yuan, China shall ensure that gold accounts for 10–15 percent of the gold exchange reserves.

According to estimates⁷, the People's Bank of China should buy another 1,900 tonnes of gold so that it would account for 5 percent of its holdings, i.e. being equal to the volume of gold produced for a nine month time worldwide or the gold production output in China for a 66 month time.

In the mean time, even if gold accounts for five percent of the national gold exchange reserve, it is still too little. As analysts believe, the People's Bank of China will continue buying gold in the nearest future, through remaining dependent on its import, notwithstanding an increase in gold production. This is because the Asian countries will also accumulate their gold reserves, trying to catch up with the European countries holding about 60 percent, and replenishing their gold

⁶ Katasonov V. *Zoloto: vozvrashchenie v mir deneg* [Gold: A return to the world of money].

URL: <http://www.faito.ru/news/1364816557> (In Russ.)

⁷ *Dragotsennyye metally: Aziya podtolknet kotirovki zolota vverkh* [Precious metals: Asia will create an upward trend in gold]. URL: <https://www.rbc.ru/economics/17/10/2011/5703ed829a79477633d38eb7> (In Russ.)

exchange reserves by 10–15 percent within the coming 10 to 12 years. Consequently, the market will need about 18–20 tonnes of new gold so as to maintain the demand and price for gold. Thus, central banks of the Asian countries will assume control over the gold market.

Being another large emerging economy, Brazil intends to increase the gold production output up to 180 tonnes within 2014–2022, which is three times as high as the current production output.

The peculiar situation in the gold market is observed in India, which produces about three tonnes of gold annually. However, India remains one of the major gold importers holding the most affluent deposits of processed gold, which are estimated to contain about 10 thousand tonnes. India's gold bullion stock is assessed to account for 50 percent of the national GDP⁸. Moreover, India's Ministry of Mines set out to extract up to 45 tonnes of gold per year.

Russia is among top gold buying countries, thus being on the Top 5 list of the largest gold holders. It possesses 1,680 tonnes in gold reserves, i.e. 16 percent of the global reserves.

The Central Bank of Russia purchased 201 tonnes of the precious metal in gold reserves in 2017. In fact, this has been the record high purchase since the collapse of the USSR. The Central Bank of Russia buys gold from the Russian gold extracting companies so as to become less dependent on the U.S. dollar and diversify its reserves.

Many countries acquire more gold. India increased its gold reserves by 56 percent, up to 557 tonnes. Brazil, Iraq, Turkey, Kazakhstan, Azerbaijan, Belarus and some other countries are the main trend setters. *Table 1* presents the key global holders of gold reserves [11].

Supply and Demand in the Global Gold Market

The gold market has faced challenging trends for the recent months. Diverse factors made it difficult to understand the future market scenarios. Investors are guessing whether gold prices will be *bullish* or *bearish*.

Unstable sentiment about the U.S. monetary policy and its impact on the USD exchange rate turned to be

⁸ *Gornodobyvayushchaya promyshlennost' i zolotodobycha v Indii* [Gold extraction industry and gold production in India]. URL: <https://zolotodb.ru/articles/foreign/10657> (In Russ.)

the most influential factor. We agree with analysts stating that the overall macroeconomic environment remains favorable for gold⁹. We draw this conclusion with reference to the meeting of the Federal Open Market Committee (FOMC)¹⁰ in March 2017 where participants doubted that the U.S. monetary policy would hardly be restricted more rapidly.

In our opinion, some macroeconomic and geopolitical risks may make gold even more lucrative for investors. Considering that speculative positions are relatively low at the beginning of 2018, there is a strong likelihood of an increasing flow of investment in gold within the coming months.

In 2016, on-ground stocks of gold amounted to 186,200 tonnes (*Fig. 1*). *Table 2* shows the global supply and demand for a seven-year period. The extraction volume of 3,255 tonnes is the seventh annual record, being three times as high as was ten years ago. We believe that the overall macroeconomic environment is benevolent for gold.

As observed in the market of physical metal, the respective demand in the segment is unlikely to spur a growth in gold prices. Obviously, there will not be a slight decrease in the extraction volume as expected.

The gold extraction volume is likely to remain the same in 2018 and in the mid-term. Prices for gold denominated in foreign currencies are still high. Even if translated into USD, they are much higher than the historical average. Thus, in the foreseeable future, gold production will be profitable for most gold producing enterprises.

As for positive factors, some key markets will see that absolutely favorable conditions of the previous year will gradually subside, with the supply of scrap gold dropping.

The supply exceeding the demand in the market of gold in 2016 matched the amount of purchases made by the Western institutional investors. 532 tonnes in the net flow of the metal added to the exchange-traded mutual funds, which invest in physical gold, and a growth of 329 tonnes in investors' futures on the Comex marketplace almost equal an excess of 862 tonnes. The data correspond with the trading statistics

⁹ *American Appraisal. Zoloto 2017* [American Appraisal Research. Gold Focus 2017]. URL: http://gold2017.american-appraisal.ru/img/gold_2017_preview.pdf (In Russ.)

¹⁰ Federal Open Market Committee within the U.S. Federal Reserve System.

and information about a considerable flow of gold bullion during the previous year in the United Kingdom, where many institutional investors hold gold.

We should emphasize that investment in gold bars and gold coins dropped by 9 percent, amounting to 1,057 tonnes (gold bars by 10 percent, i.e. down to 787 tonnes, and coins by 5 percent, i.e. down to 271 tonnes). In 2017, the demand increased by 25 percent in China, reaching the second record high value in history. Investors seek dealing with gold since the market sentiment improved concurrently with a growing uncertainty of macroeconomic indicators [10].

In 2016, the extraction pace slowed down, reaching 1.1 percent due to a lower impact of new projects. The gold extraction volume of 3,255 tonnes, which was registered the previous year, is approximately one-third as high as was a decade ago.

Gold producing companies make hedging transactions, thus generating the additional supply of 33 tonnes for three consecutive years.

In 2016, the scrap gold reprocessing volume rose by 16 percent, up to 1,296 tonnes worldwide. It has been the first time increase for the previous four years. China reproduces the largest amounts of scrap gold (a 37 percent growth).

Investment in physical gold fell by 2 percent, down to its record low for the decade. This is due to the fact that emerging economies invest less in gold since growing prices for gold denominated in national currencies not only limited their purchasing ability, but sometimes engendered the selling trend in pursuit of profit.

In 2017, the most considerable reduction in investment was observed in Iraq and India, where the demand also fell due to governmental measures against the shadow economy. China again breaks this pattern, seeing the demand increase by 25 percent the previous year up to the second record high value for its entire history.

Investors demonstrate more interest in gold due to better market sentiment and growing uncertainty of macroeconomic indicators. In particular, the renminbi depreciated substantially, while limited capabilities of investing in alternative assets made investors focus on gold.

Governmental institutions buy gold less than ever for the previous six years. However, Russia and China have acquired much gold for the recent years.

China buys less gold as more pressure is put on the People's Bank of China so that it could undertake the renminbi stabilization measures.

Russia demonstrates stability in gold purchases since it can buy it in the local market without using foreign currency reserves.

The public sectors of other countries remained the net buyers of gold to diversify the gold exchange reserve portfolio. However, those purchases were not substantial.

Having analyzed the demand and supply in the market of gold, we opine that some macroeconomic and geopolitical risks can even lure investors into dealing with gold. Considering that speculative positions were insignificant at the beginning of 2017, investors are very likely to put up their funds in gold.

It is noteworthy, there was about 800 tones and 3,255 tonnes in 1950 and 2016 respectively, thus demonstrating a 400-percent increase¹¹. Whereas 3,255 tonnes of gold were extracted in 2017, deposits rose by 2 percent only, being rather mediocre from historical perspectives. This slight increase gives us a hint why many investors believe in the long-standing value of gold, especially in comparison with monetary funds the supply of which usually grows faster.

For example, if the stocks of extracted gold have almost doubled since the late 1960s, the supply of the U.S. dollars in circulation (aggregate M1) demonstrated a 17-fold upturn. It is worth mentioning that the volume of extracted gold increased correspondingly with the world population, which has also doubled. However, it was substantially lower than a seven-fold growth in the global GDP in real terms.

Therefore, while influencing national economies, the market of gold gives grounds to be treated as a target of governmental regulation [12]. That being said, we assume gold is likely to become a means of governmental control in the nearest future, thereby modifying functions of this precious metal. Countries with the largest gold deposits will have the most powerful say in tackling crucial issues¹².

¹¹ Barsegyan A.G. [Prospects for reforming the global currency system]. *Uchenye zapiski Tavricheskogo natsional'nogo universiteta imeni V.I. Vernadskogo = Scientific Notes of the V.I. Vernatsky Crimean Federal University*, 2011, vol. 24, no. 1, p. 26. (In Russ.)

¹² Borisovich V.T., Madzhidov B.S., Garaev E. [Analysis of gold production leads in today's market]. *Razvedka i okhrana nedr = Prospect and Protection of Mineral Resources*, 2016, no. 4, pp. 59–63. (In Russ.)

Demand for gold will generally have a positive effect on the gold extraction industry, motivate entities dealing with gold extraction and geological survey and contribute to the supply of gold in the global market.

Repatriation of Gold Reserves

If national gold reserves are stored abroad, countries try to repatriate them. Germany returned a portion of its gold reserves. According to other data, Germany was denied to check the physical availability of its gold bars.

It seems unacceptable to store 70 percent of the national gold reserves abroad. Germany intends to repatriate a half of its national gold reserves by 2020.

This intention was shared by some other European countries (The Netherlands, Austria, Italy, France, Belgium), whose gold reserves have been stored elsewhere since the 1930s. The European countries totally had 10,786 tonnes in December 2016, thus making euro the most gold-backed currency.

Gold repatriation ideas are mushrooming, turning into a stable and common trend. Such countries as Ecuador, Venezuela, Iran, Libya, Azerbaijan and others have already announced similar intentions.

Why do many countries claim their gold reserves back? Lack of trust is the only reason. According to official data, the USA holds the largest stock of gold reserves, amounting to 8,134 tonnes in early 2017. In the mean time, there are doubts concerning the real existence of this stock because gold reserves have not been revised since 1950.

Mass media reports on some outrageous incidents, mentioning a shipment of 5,700 gold bars originated from the USA in 2009 to China (11 kg each). Upon the decision of the Chinese government, the delivered gold was analyzed and tested. The gold bars were discovered to be bogus, being simply coated with gold.

In March 2011, the bogus gold from the USA was located in Vietnam. In the following case, the USA suspended a shipment of 191 tonnes of gold to the International Monetary Fund. The IMF Managing Director D. Strauss-Kahn received a confirmation of the U.S. gold reserves depletion¹³.

¹³ Voznesenskii S. *SShA ostalis' bez zolotogo zapasa* [The USA left without gold reserves]. URL: <http://topwar.ru/5918-ssha-ostalis-bez-zolotogo-zapasa.html> (In Russ.)

In addition to gold reserves, the USA also stores some or full gold reserves of other thirty countries. The countries totally deposited 6,029 tonnes of gold there. There are no mass media publications on the amount of gold reserves. Custodians avoid the gold being audited, thereby fueling various rumors and speculations. Will the USA be able to return the gold it accepted to store in its gold vault holdings?

As the analysis shows, the USA and some European countries tend to suppress prices for gold as their main policy in this aspect. They are persistent in their efforts to undermine the importance of gold as an international reserve currency. They try to prevent other countries from using their gold reserves instead of the U.S. dollars and euro. Therefore, it is very beneficial for the USA to suppress the price for gold in order to reinforce the U.S. dollar as an international reserve currency.

After the gold standard was abolished in 1971, countries continued to form their gold reserves, indeed. Some central banks of major countries, including Russia, have been actively and persistently replenishing its gold vaults since the 1990s. As experts say, doing so, national governments secure their respective countries against a global financial catastrophe. Experts believe that realistically minded countries elaborate their own projects for backing their currencies with gold. Although there is little likelihood that the above will happen, such projects boost a growth in prices for gold, precluding their drop in the foreseeable future¹⁴.

The national gold reserve is of international significance as an international asset because it is indicative of the monetary and financial position and creditworthiness of a country.

As other countries create and increment their gold holdings, the USA excoriates the practice, trying to preserve the U.S. status of a reserve currency¹⁵.

¹⁴ Kuznetsov A.V. [China's currency policy: A challenge to U.S. Hegemony?]. *Finansy i kredit = Finance and Credit*, 2017, vol. 23, no. 16, pp. 914–926. URL: <https://cyberleninka.ru/article/v/valyutnaya-politika-kitaya-vyzov-gegemonii-ssha> (In Russ.); Ekimov A.V., Gorbunova N.V., Novokreshchenova O.A. [Strategic partnership as a factor of enhancing the competitiveness of financial market actors]. *Finansy i kredit = Finance and Credit*, 2016, no. 35, pp. 15–26. URL: <https://cyberleninka.ru/article/v/strategicheskoe-partnerstvo-kak-faktor-povysheniya-konkurentosposobnosti-subektorov-finansovogo-rynka> (In Russ.)

¹⁵ Shchedrova O. *Rost nakopleniya zolota i mirovaya finansovaya sistema* [A growth in accumulation of gold and global financial system]. URL: <http://rf-smi.ru/analitika/17846-rost-nakopleniya-zolota-i-mirovaya-finansovaya-sistema.html> (In Russ.)

Preference of Regional (Local) Currency

Facing another global economic crisis, some countries (China, Russia, Iran, South Africa, Norway, Switzerland, South Korea, Taiwan, many countries of Latin America and Islamic countries) initiated talks on the use of gold for international settlements and payments¹⁶.

China proceeds to conclude bilateral agreements (with Japan, Russia, other BRICS nations) on the reciprocal use of national currencies. Experts reasonably suggest that the exchange rate of national currencies should be assessed by the gold parity of the currency, rather than the stock exchange as it is done today.

If a country prefers its local (regional) currency, it recurrently expresses the growing discontent with the U.S. policy. Economic sanctions make Turkey pay for Iran's hydrocarbons with gold because the USA prohibited the ordinary payment procedure. Likewise China has to search for roundabouts when paying to Iran for the supply of hydrocarbons. The People's Republic of China may possibly use gold for this transactions too¹⁷.

Certain States resort to the precious metal for international payments, so to say, without preliminary permission. So, gold serves as a means of payment in dubious schemes and even smuggling. For example, about two-thirds of goods imported to Nepal from India are paid for with gold.

However, there are other reasons why some countries were subject to stringent sanctions. Tackling economic sanctions of the Western countries, Iran prohibited payments for import and export transactions, thereby forcing Turkey to pay for natural gas imported from Iran with gold.

¹⁶ Kuznetsov A.V. [China's currency policy: A challenge to U.S. hegemony?]. *Finansy i kredit = Finance and Credit*, 2017, vol. 23, no. 16, pp. 914–926. URL: <https://cyberleninka.ru/article/v/valyutnaya-politika-kitaya-vyzov-gegemonii-ssha> (In Russ.); Ekimov A.V., Gorbunova N.V., Novokreshchenova O.A. [Strategic partnership as a factor of enhancing the competitiveness of financial market actors]. *Finansy i kredit = Finance and Credit*, 2016, no. 35, pp. 15–26. URL: <https://cyberleninka.ru/article/v/strategicheskoe-partnerstvo-kak-faktor-povysheniya-konkurentosposobnosti-subektov-finansovogo-rynka> (In Russ.).

¹⁷ *Ofitsial'naya statistika zolotogo importa Kitaya – verkhnaya chast' aisberga: zachem Podnebesnoi stol'ko dragotsennogo metalla?* [Official statistics of the Chinese import of gold is the iceberg peak. Why does China need so much precious metal?]. URL: <http://www.oilru.com/news/363892> (In Russ.)

Certain Islamic countries, China and Switzerland have been voicing ideas of gold-backed dinar, yuan and franc for several years. Top public officials discuss the return of gold to the domestic monetary circulation in Sweden, Norway, South Africa, South Korea, Iran, Taiwan, and some countries of Latin America.

The U.S. dollar has been unstable and volatile for the recent several years. Hence, there are multiple suggestions in diamond production, oil and gas industries to substitute it with the other currency or asset representing a currency basket.

Anticipating the collapse of the U.S. dollar, global market actors paid their attention to gold. Gold proved to be an unparalleled in financial dealings.

According to the resolution of the Basel Committee on Banking Supervision (Basel III Accord), gold is a real financial asset, which is considered as the most reliable treasuries, cash for equity assessments. Furthermore, some countries adopted the provisions of Basel III Accord, while the U.S. banks and most European countries failed to comply with it.

The 2008 financial crisis ignited new arguments and debates about the reintroduction of a gold standard, which implies that fiat money should be backed with gold held by a State. Under such circumstances, the exporting country gains an additional advantage since it is able to accumulate a lot of gold. This empowers the country to issue more money in circulation and subsequently fund its own economy. In the mean time, major gold producers become macroeconomically influential as they sell the precious metal in the market.

Gold-Based Monetary Systems

The e-gold system was launched in 1996 and supposed to process international transfers. The e-gold system protected parties to international transactions from the foreign exchange risk.

It is interesting to analyze not only the gold and monetary profile of various countries, but also internal circumstances and events. For example, the USA. As reported in the mass media (September 2011), the U.S. President D. Trump required lessee to pay their rent with gold, rather than the U.S. dollars.

Many U.S. states, indeed, vote for gold-backed money. For example, the Utah government adopted and enacted the law on hard money. This law encourages to

use silver and gold coins produced by the U.S. Mint and accepts them as payment for goods and services, with their value corresponding with the weight of the precious metal in them.

In 2014, Arizona passed the bill making precious metals legal tender. Legislature in other U.S. states (Idaho, Washington, Virginia, Georgia, Indiana, Colorado, Minnesota, Missouri, Montana, New Hampshire, Tennessee and South California) consider bills recognizing gold and silver coins legal tender too. It is noteworthy that most of the above U.S. states suggest using not only coins produced in the U.S. Mint, but also those of other countries.

Resonating with the sentiment and needs of businesses and people, some private companies offered the so called gold-backed products.

As the analysis shows, gold has been an equivalent of money for thousands of years (unit of account), being

used as a medium of payment, saving and global money later on. However, nowadays credit money pushed gold out of local and international circulation. The precious metal is no longer exchanged for goods directly. Prices for gold are not set. It caused monetary functions of gold to modify. Gold is not used as a means of payment, however, it is still perceived as international money in case of emergency to secure international loans, and a symbol of wealth.

We agree with those economists and experts who advocate for gold-backed currency to alleviate crisis implications. The fact that many countries increment their protective gold holdings is economically meaningful and important.

It is reasonable for any country to store its gold reserves internally since gold can be a hedge against risks that the existing financial system will collapse. Hence, gold can regain its monetary functions.

Table 1
The major holders of gold reserves

Country	Gold reserves, tonne		Percentage of total gold exchange reserves, 2017
	2007	2017	
USA	8,134	8,134	74
Germany	3,417	3,378	68
Italy	2,452	2,452	67
France	2,622	2,436	62
China	600	1,843	2
Russia	438	1,816	16
Switzerland	1,166	1,040	6
Japan	765	765	2
Netherlands	624	612	63
India	358	558	5

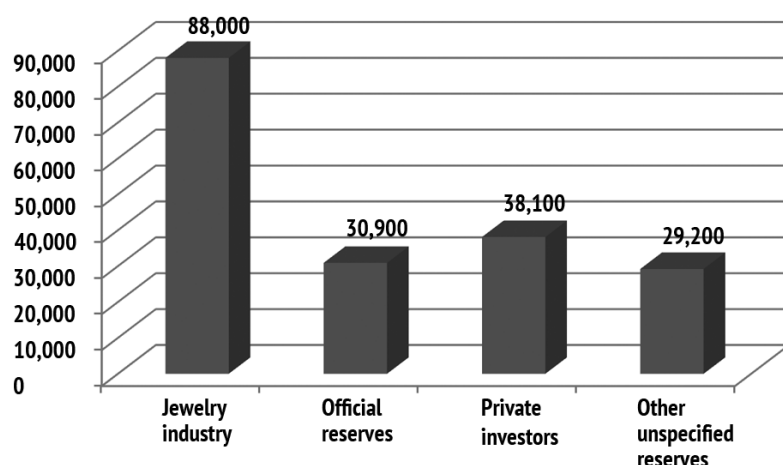
Source: Authoring based on the IMF data

Table 2
Supply and demand in the international gold market in 2010–2016, tonne

Metric	2010	2011	2012	2013	2014	2015	2016
Supply							
Extraction	2,766	2,852	2,933	3,077	3,148	3,220	3,255
Scrap gold reprocessing	1,526	1,675	1,711	1,263	1,189	1,120	1,296
Supply of gold as a hedge	–	32	–	–	105	13	33
Total supply	4,292	4,559	4,645	4,340	4,442	4,353	4,584
Demand							
Consumption of gold in jewelry industry	2,112	2,180	2,198	2,748	2,517	2,448	1,949
Industrial consumption	441	385	363	350	349	332	323
Net investment in physical gold	1,130	1,389	1,287	1,702	1,038	1,048	1,032
Net hedging by producers	118	–	47	25	–	–	–
Net purchase by central banks	104	516	582	646	584	577	377
Total demand	3,876	4,471	4,478	5,471	4,487	4,404	3,722

Source: Authoring based on the Metals Focus data

Figure 1
Above-ground stocks of gold in 2016, tonne



Source: Authoring based on the World Gold Council data

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Translated Article[†]

FACTOR ANALYSIS OF FINANCIAL STANDING OF THE SHANGHAI COOPERATION ORGANISATION MEMBER STATES



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Abstract

Subject The article focuses on the financial position of the Shanghai Cooperation Organisation nations.

Objectives This research represents factor analysis of trends in the financial standing of the Shanghai Cooperation Organisation countries and assesses an increment in a set of interdependencies with subsequent polynomial approximation.

Methods We draw upon fundamental principles of the factor analysis theory and practice, laws of economic and finance, findings of scholarly studies into the equilibrium and non-equilibrium development of global economy and world order by country.

Results We identify countries demonstrating high and low growth rates of interdependencies and high and low instability in terms of absolute peak values.

Conclusions and Relevance Analyzing the 2006–2016 period, we capture high growth rates in Tajikistan (liquid bank reserves to assets ratio), Kyrgyzstan (extensive money supply, inflation, consumer prices), Kazakhstan (foreign exchange rate), Uzbekistan (deflator), Russia (loan interest rate for the private sector), China (national trading companies), and high absolute peak values of instability in Kazakhstan (liquid bank reserves to assets ratio), Tajikistan (extensive money supply), India (foreign exchange rate), Russia (deflator, national trading companies), China (inflation, consumer prices), Kyrgyzstan (loan interest rates for the private sector). The findings would be useful in outlining and adjusting the international policy and foreign trade with the Shanghai Cooperation Organisation countries and improving the implementation mechanisms.

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Introduction

Intensifying competition and rearrangements in the global economic leadership necessitate finding

modern and effective options of international cooperation. An international cooperation organization should continuously and constantly monitor how its capabilities are formed and subsequently exercised as its pursues its interests in the ever changing global environment and fierce competition. Evaluating and subsequently analyzing such capabilities, the international cooperation organization revises

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opportunities it and some of its members have to strengthen their positions in the global economic process and influence the world order.

Factor analysis is quite a popular and frequent technique the Russian researchers resort to in order to evaluate the performance and development of business entities in certain economic systems [1, p. 4], analyze the solvency of borrowers [2, p. 4], build econometric models to review the current tendencies and forecast the future scenarios [3, p. 18], impact of sustainable development factors on the effectiveness of the investment decision making process [4, p. 48]. This technique is also deployed to forge a set of indicators and apply them to evaluate capabilities [5, p. 154], create models for a comprehensive technological and economic evaluation of new and conventional technologies [6, p. 154]. Foreign researchers also opt for factor analysis when studying a choice and implications of types of preferential agreements on economic integration [7, p. 143], polarization of neighboring regions where spatial relationships rest on changes in the demand for manpower [8, p. 115], growth and fall in the shortage of current operations in some of the European and Baltic countries [9, p. 153]. They also use it to analyze the International Monetary Fund's forecasts and Fiscal Stability Treaty of the European Union on a vast sample of countries [10, p. 5], social transfers [11, p. 317; 12, p. 91; 13, p. 119; 14], and evaluate the space of possibilities and ultimate achievements [15, p. 247].

Analysis of financial dynamics in the Shanghai Cooperation Organisation member States (SCO countries) [16, p. 272; 17, p. 214; 18, p. 197; 19, p. 263; 20, p. 185] includes an evaluation of growth rates of financial and economic interdependencies, such as the liquid bank reserves to assets ratio, extensive money supply, foreign exchange rate, deflator, inflation (consumer prices), loan interest rate (private sector), national trading companies.

Analyzing the financial position of the SCO countries (India, Kazakhstan, Kyrgyzstan, China, Pakistan, Russia, Tajikistan, Uzbekistan) in terms of growth rates (*GR*) of financial and economic interdependencies, we use indicators in the related time series with subsequent polynomial approximation, which is best fit to describe frequently changing values for analyzing diverse combinations of unstable factors. Polynomial approximation involves the power of six that cannot

have more than five peaks, being sufficient for the analyzable period of time.

GR Analysis of the Liquid Bank Reserves to Assets Ratio

We show results of polynomial approximation of growth rates of the liquid bank reserves to assets ratio in the descending order of their absolute peak values (*Fig. 1*):

- Kazakhstan: $y = 0.0479x^6 - 1.4179x^5 + 14.844x^4 - 61.763x^3 + 57.02x^2 + 161.47x - 148.74$; $R^2 = 0.8555$; average $GR_{2006-2016} = 26.03$;
- Pakistan: $y = -0.0302x^6 + 1.1056x^5 - 15.614x^4 + 106.43x^3 - 357.18x^2 + 531.74x - 248.8$; $R^2 = 0.7286$; average $GR_{2006-2016} = 1.68$;
- Tajikistan: $y = 0.029x^6 - 0.9856x^5 + 12.781x^4 - 80.542x^3 + 263.22x^2 - 441.88x + 313.88$; $R^2 = 0.8359$; average $GR_{2006-2016} = 9.5$;
- Russia: $y = 0.0208x^6 - 0.7586x^5 + 10.713x^4 - 73.996x^3 + 258.46x^2 - 421.15x + 233.33$; $R^2 = 0.4743$; average $GR_{2006-2016} = -4.09$;
- Kyrgyzstan: $y = -0.0138x^6 + 0.4692x^5 - 5.8065x^4 + 30.431x^3 - 50.104x^2 - 65.488x + 164.36$; $R^2 = 0.8509$; average $GR_{2006-2016} = 8.48$.

These results reveal that Kazakhstan leads in terms of instability of its liquid bank reserves to assets ratio with positive *GR*. Kyrgyzstan outperforms the other SCO countries in terms of peak values, but has worse *GR* than Tajikistan and Kazakhstan.

GR Analysis of Extensive Money Supply

We show results of polynomial approximation of growth rates of extensive money supply in the descending order of their absolute peak values (*Fig. 2*):

- Tajikistan: $y = -0.7518x^6 + 25.756x^5 - 337.7x^4 + 2,130.9x^3 - 6,685.1x^2 + 9,583.7x - 4,628.1$; $R^2 = 0.5464$; average $GR_{2006-2016} = -176.83$;
- Kyrgyzstan: $y = -0.0742x^6 + 3.354x^5 - 57.432x^4 + 472.02x^3 - 1,918.3x^2 + 3,488.7x - 1,970.6$; $R^2 = 0.7014$; average $GR_{2006-2016} = 73.76$;
- Pakistan: $y = 0.0724x^6 - 2.3681x^5 + 29.709x^4 - 180.5x^3 + 552.5x^2 - 796.03x + 411.75$; $R^2 = 0.6339$; average $GR_{2006-2016} = 18.99$;

- Kazakhstan: $y = -0.035x^6 + 1.6248x^5 - 28.678x^4 + 244.88x^3 - 1,047x^2 + 2,031.9x - 1,247.2$; $R^2 = 0.7665$; average $GR_{2006-2016} = 24.8$;
- Russia: $y = -0.0234x^6 + 0.9843x^5 - 16.161x^4 + 130.72x^3 - 539.95x^2 + 1,054.3x - 734.93$; $R^2 = 0.6642$; average $GR_{2006-2016} = -9.1$;
- India: $y = 0.0031x^6 - 0.0928x^5 + 0.9781x^4 - 3.7499x^3 - 2.7833x^2 + 47.386x - 76.292$; $R^2 = 0.5036$; average $GR_{2006-2016} = -4.61$;
- China: $y = 0.002x^6 - 0.0697x^5 + 0.8341x^4 - 3.6193x^3 - 0.1221x^2 + 27.014x - 21.596$; $R^2 = 0.0727$; average $GR_{2006-2016} = -0.31$.

Tajikistan is seen to have the most unstable extensive money supply and very high negative GR in comparison with the other SCO countries. China has more preferable peak values but its GR follows those of Kazakhstan, Pakistan and Kyrgyzstan.

GR Analysis of Foreign Exchange Rate

We show results of polynomial approximation of growth rates of foreign exchange rate in the descending order of their absolute peak values (Fig. 3):

- India: $y = 0.0092x^6 - 0.3292x^5 + 4.5981x^4 - 31.354x^3 + 106.99x^2 - 165.72x + 91.51$; $R^2 = 0.4649$; average $GR_{2006-2016} = 4.11$;
- Kazakhstan: $y = 0.0088x^6 - 0.3064x^5 + 4.0959x^4 - 26.917x^3 + 93.114x^2 - 172.19x + 156.21$; $R^2 = 0.9107665$; average $GR_{2006-2016} = 10.17$;
- Pakistan: $y = 0.0087x^6 - 0.3149x^5 + 4.3771x^4 - 29.575x^3 + 100.13x^2 - 154.75x + 82.868$; $R^2 = 0.704$; average $GR_{2006-2016} = 5.43$;
- Russia: $y = -0.0057x^6 + 0.2735x^5 - 5.0495x^4 + 45.099x^3 - 199.88x^2 + 393.27x - 222.46$; $R^2 = 0.8087$; average $GR_{2006-2016} = 9.55$;
- Tajikistan: $y = -0.0029x^6 + 0.1297x^5 - 2.1956x^4 + 17.604x^3 - 67.081x^2 + 102.53x - 23.491$; $R^2 = 0.797$; average $GR_{2006-2016} = 9.14$;
- Kyrgyzstan: $y = 0.0027x^6 - 0.0618x^5 + 0.269x^4 + 2.9284x^3 - 28.44x^2 + 73.279x - 39.38$; $R^2 = 0.8698$; average $GR_{2006-2016} = 5.27$;
- China: $y = 0.0003x^6 - 0.0061x^5 + 0.0482x^4 - 0.2338x^3 + 1.6334x^2 - 8.6081x + 13,745$; $R^2 = 0.8278$; average $GR_{2006-2016} = -1.82$.

India demonstrates the most unstable foreign exchange rate and positive GR . China has not only the most preferable peak values among the other SCO countries but also negative GR .

GR Analysis of the Deflator Index

We show results of polynomial approximation of growth rates of the deflator index in the descending order of their absolute peak values (Fig. 4):

- Russia: $y = -0.0081x^6 + 0.2914x^5 - 4.0412x^4 + 27.152x^3 - 90.883x^2 + 140.57x - 69.646$; $R^2 = 0.5128$; average $GR_{2006-2016} = 10.96$;
- Kyrgyzstan: $y = -0.0055x^6 + 0.1904x^5 - 2.527x^4 + 16.187x^3 - 51.425x^2 + 76.208x - 36.391$; $R^2 = 0.4828$; average $GR_{2006-2016} = 9.93$;
- China: $y = -0.0034x^6 + 0.1158x^5 - 1.5181x^4 + 9.4915x^3 - 28.796x^2 + 39.069x - 17.281$; $R^2 = 0.6496$; average $GR_{2006-2016} = 3.75$;
- Pakistan: $y = 0.0029x^6 - 0.0868x^5 + 0.9656x^4 - 4.8818x^3 + 11.067x^2 - 6.9834x + 0.4065$; $R^2 = 0.7788$; average $GR_{2006-2016} = 10.52$;
- Uzbekistan: $y = 0.0018x^6 - 0.0697x^5 + 1.0218x^4 - 7.231x^3 + 25.264x^2 - 37.768x + 26.559$; $R^2 = 0.9068$; average $GR_{2006-2016} = 16.36$;
- Tajikistan: $y = -0.0014x^6 + 0.0336x^5 - 0.2153x^4 - 0.4482x^3 + 9.0458x^2 - 26.267x + 23.084$; $R^2 = 0.9237$; average $GR_{2006-2016} = 12.87$;
- Kazakhstan: $y = -0.0011x^6 + 0.0338x^5 - 0.3395x^4 + 0.8119x^3 + 5.556x^2 - 27.858x + 35.058$; $R^2 = 0.5478$; average $GR_{2006-2016} = 12.57$;
- India: $y = 0.0002x^6 - 0.01x^5 + 0.1993x^4 - 1.9717x^3 + 9.7215x^2 - 20.206x + 15.939$; $R^2 = 0.8866$; average $GR_{2006-2016} = 6.09$.

Russia demonstrates the most unstable deflator index and moderate GR (it is higher in Tajikistan, Uzbekistan and Kazakhstan). India has more preferable peak values but its GR lags behind that of China.

GR Analysis of Inflation (Consumer Prices)

We show results of polynomial approximation of growth rates of inflation (consumer prices) in the descending order of their absolute peak values (Fig. 5):

- China: $y = -0.0675x^6 + 1.7446x^5 - 14.259x^4 + 28.303x^3 + 121.07x^2 - 495.81x + 404.98$; $R^2 = 0.5821$; average $GR_{2006-2016} = -41.44$;
- Pakistan: $y = 0.0599x^6 - 2.2664x^5 + 33.255x^4 - 238.69x^3 + 868.65x^2 - 1,481.8x + 869.58$; $R^2 = 0.5251$; average $GR_{2006-2016} = 3.85$;
- India: $y = 0.0335x^6 - 1.2131x^5 + 17.13x^4 - 119.05x^3 + 421.56x^2 - 696.81x + 381.8$; $R^2 = 0.7521$; average $GR_{2006-2016} = 4.69$;
- Tajikistan: $y = -0.0354x^6 + 1.2489x^5 - 16.989x^4 + 111.98x^3 - 367.37x^2 + 548.09x - 275.45$; $R^2 = 0.1839$; average $GR_{2006-2016} = 9.66$;
- Kazakhstan: $y = -0.0056x^6 + 0.1569x^5 - 1.6382x^4 + 8.5937x^3 - 27.746x^2 + 56.488x - 45,074$; $R^2 = 0.2818$; average $GR_{2006-2016} = 3.32$;
- Russia: $y = -0.023x^6 + 0.9048x^5 - 14.331x^4 + 115.58x^3 - 487.99x^2 + 972.32x - 636.97$; $R^2 = 0.6038$; average $GR_{2006-2016} = 3.97$;
- Kyrgyzstan: $y = -0.005x^6 + 0.0499x^5 + 0.9846x^4 - 14.987x^3 + 53.893x^2 + 3.257x - 136.7$; $R^2 = 0.3728$; average $GR_{2006-2016} = 24.67$.

China demonstrates a more unstable inflation (consumer prices) and high negative GR . Kyrgyzstan has attractive peak values but its GR significantly lags behind the other SCO countries.

GR Analysis of Loan Interest Rate (Private Sector)

We show results of polynomial approximation of growth rates of loan interest rates (private sector) in the descending order of their absolute peak values (Fig. 6):

- Kyrgyzstan: $y = -0.013x^6 + 0.4668x^5 - 6.57x^4 + 45.794x^3 - 163.33x^2 + 272.89x - 157.81$; $R^2 = 0.6419$; average $GR_{2006-2016} = -1.26$;
- India: $y = -0.0128x^6 + 0.4209x^5 - 5.224x^4 + 30.777x^3 - 88.842x^2 + 117.92x - 58.19$; $R^2 = 0.454$; average $GR_{2006-2016} = -0.01$;
- China: $y = -0.0114x^6 + 0.3891x^5 - 4.9576x^4 + 29.124x^3 - 77.831x^2 + 80.761x - 29.437$; $R^2 = 0.461$; average $GR_{2006-2016} = -1.13$;

- Russia: $y = 0.0099x^6 - 0.3147x^5 + 3.4913x^4 - 14.309x^3 + 0.7993x^2 + 102.24x - 109.36$; $R^2 = 0.6692$; average $GR_{2006-2016} = 3.66$;
- Tajikistan: $y = 0.0056x^6 - 0.1961x^5 + 2.6116x^4 - 16.503x^3 + 49.496x^2 - 60.887x + 22.642$; $R^2 = 0.366$; average $GR_{2006-2016} = 0.82$;
- Pakistan: $y = 0.0056x^6 - 0.1892x^5 + 2.4485x^4 - 15,179x^3 + 46,287x^2 - 61,284x + 13,824$; $R^2 = 0.8915$; average $GR_{2006-2016} = 0.26$.

Kyrgyzstan demonstrates more unstable loan interest rates (private sector) and negative GR . Pakistan has more preferable peak values but its GR lags behind those of Kyrgyzstan, India and China.

GR Analysis of National Trading Companies

We show results of polynomial approximation of growth rates of national trading companies in the descending order of their absolute peak values (Fig. 7):

- Russia: $y = -0.0149x^6 + 0.5883x^5 - 9.0089x^4 + 66.891x^3 - 245.8x^2 + 403.24x - 222$; $R^2 = 0.3155$; average $GR_{2006-2016} = -0.13$;
- China: $y = -0.008x^6 + 0.2988x^5 - 4.3281x^4 + 30.288x^3 - 104.36x^2 + 160.44x - 74.884$; $R^2 = 0.7486$; average $GR_{2006-2016} = 7.63$;
- Kazakhstan: $y = -0.0054x^6 + 0.1874x^5 - 2.4936x^4 + 15.926x^3 - 49.819x^2 + 67.21x - 20.451$; $R^2 = 0.2231$; average $GR_{2006-2016} = 3.29$;
- India: $y = -0.0015x^6 + 0.0586x^5 - 0.8905x^4 + 6.7992x^3 - 27.041x^2 + 51.088x - 30.33$; $R^2 = 0.9773$; average $GR_{2006-2016} = 1.85$;
- Pakistan: $y = 0.0009x^6 - 0.0246x^5 + 0.2199x^4 - 0.3779x^3 - 3.391x^2 + 12.589x - 9.7197$; $R^2 = 0.4206$; average $GR_{2006-2016} = -1.21$.

Russia's trading companies are more unstable and demonstrate negative GR . Pakistan has more preferable peak values but its GR lags behind those of India, Kazakhstan, China and Russia.

Summary Analysis of Trends in the Financial Position of the Shanghai Cooperation Organisation Member States

Having performed the summary analysis of growth rates of the liquid bank reserves to assets ratio, extensive money supply, foreign exchange rate, deflator index, inflation (consumer prices), national trading

companies with subsequent polynomial approximation, we revealed the following trends in the financial position of the SCO countries (Fig. 1–7):

1) high $GR_{2006-2016}$:

- Tajikistan: the liquid bank reserves to assets ratio $GR_{2006-2016} = 26.03$;
- Kyrgyzstan: extensive money supply $GR_{2006-2016} = 73.76$, inflation (consumer prices) $GR_{2006-2016} = 24.67$;
- Kazakhstan: foreign exchange rate $GR_{2006-2016} = 10.17$;
- Uzbekistan: deflator index $GR_{2006-2016} = 16.36$;
- Russia: loan interest rate (private sector) $GR_{2006-2016} = 3.66$;
- China: national trading companies $GR_{2006-2016} = 7.63$;

2) low $GR_{2006-2016}$:

- Russia: the liquid bank reserves to assets ratio $GR_{2006-2016}$, extensive money supply $GR_{2006-2016} = -9.1$;
- China: foreign exchange rate $GR_{2006-2016} = -1.82$, deflator index $GR_{2006-2016} = 3.75$, inflation (consumer prices) $GR_{2006-2016} = -41.44$;
- Kyrgyzstan: loan interest rate (private sector) $GR_{2006-2016} = -1.26$;
- Pakistan: national trading companies $GR_{2006-2016} = -1.21$;

3) high absolute peak values of instability:

- Kazakhstan: the liquid bank reserves to assets ratio: $y = 0.0479x^6 - 1.4179x^5 + 14.844x^4 - 61.763x^3 + 57.02x^2 + 161.47x - 148.74$; $R^2 = 0.8555$;
- Tajikistan: extensive money supply: $y = -0.7518x^6 + 25.756x^5 - 337.7x^4 + 2,130.9x^3 - 6,685.1x^2 + 9,583.7x - 4,628.1$; $R^2 = 0.5464$;
- India: foreign exchange rate: $y = 0.0092x^6 - 0.3292x^5 + 4.5981x^4 - 31.354x^3 + 106.99x^2 - 165.72x + 91.51$; $R^2 = 0.4649$;
- Russia: deflator index: $y = -0.0081x^6 + 0.2914x^5 - 4.0412x^4 + 27.152x^3 - 90.883x^2 + 140.57x - 69.646$; $R^2 = 0.5128$; national trading companies $y = -0.0149x^6 + 0.5883x^5 - 9.0089x^4 + 66.891x^3 - 245.8x^2 + 403.24x - 222$; $R^2 = 0.3155$;
- China: inflation (consumer prices): $y = -0.0675x^6 + 1.7446x^5 - 14.259x^4 + 28.303x^3 + 121.07x^2 - 495.81x + 404.98$; $R^2 = 0.5821$;

- Kyrgyzstan: loan interest rate (private sector): $y = -0.013x^6 + 0.4668x^5 - 6.57x^4 + 45.794x^3 - 163.33x^2 + 272.89x - 157.81$; $R^2 = 0.6419$;

4) low absolute peak values of instability:

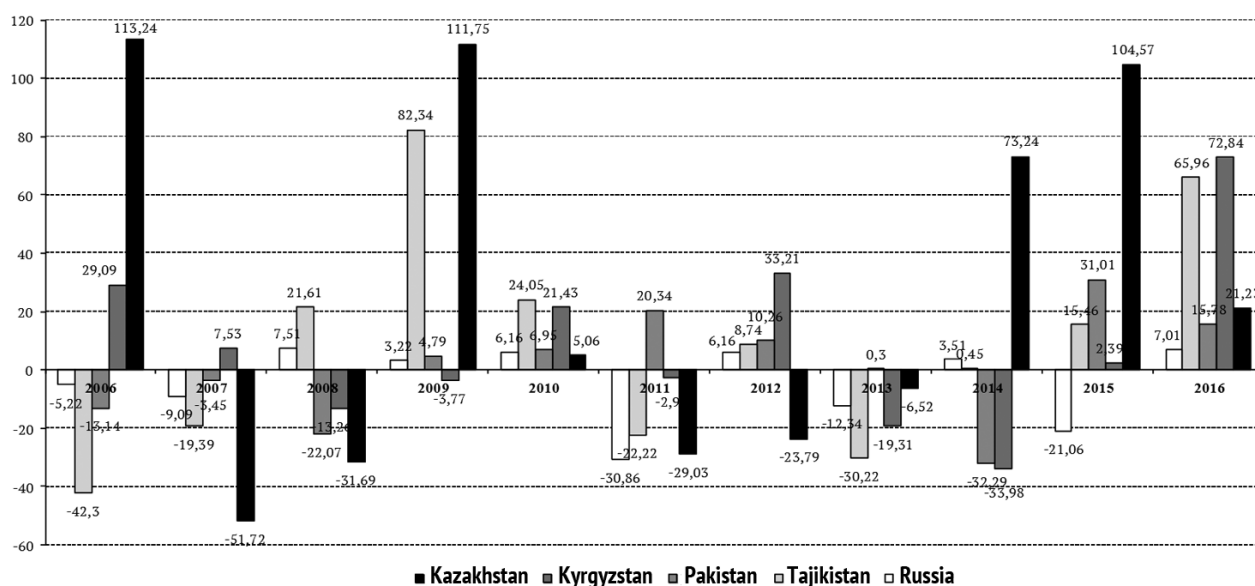
- Kyrgyzstan: the liquid bank reserves to assets ratio: $y = -0.0138x^6 + 0.4692x^5 - 5.8065x^4 + 30.431x^3 - 50.104x^2 - 65.488x + 164.36$; $R^2 = 0.8509$; inflation (consumer prices) $y = -0.005x^6 + 0.0499x^5 + 0.9846x^4 - 14.987x^3 + 53.893x^2 + 3.257x - 136.7$; $R^2 = 0.3728$;
- China: extensive money supply: $y = 0.002x^6 - 0.0697x^5 + 0.8341x^4 - 3.6193x^3 - 0.1221x^2 + 27.014x - 21.596$; $R^2 = 0.0727$; foreign exchange rate: $y = 0.0003x^6 - 0.0061x^5 + 0.0482x^4 - 0.2338x^3 + 1.6334x^2 - 8.6081x + 13.745$; $R^2 = 0.8278$;
- India: deflator index: $y = 0.0002x^6 - 0.01x^5 + 0.1993x^4 - 1.9717x^3 + 9.7215x^2 - 20.206x + 15.939$; $R^2 = 0.8866$; average $GR_{2006-2016} = 6.09$;
- Pakistan: loan interest rates (private sector): $y = 0.0056x^6 - 0.1892x^5 + 2.4485x^4 - 15.179x^3 + 46.287x^2 - 61.284x + 13.824$; $R^2 = 0.8915$; national trading companies: $y = 0.0009x^6 - 0.0246x^5 + 0.2199x^4 - 0.3779x^3 - 3.391x^2 + 12.589x - 9.7197$; $R^2 = 0.4206$.

Conclusions

Having analyzed trends in the financial position of the SCO countries and used polynomial approximation of GR of a set of financial and economic interdependencies, we found high $GR_{2006-2016}$ in Tajikistan (the liquid bank reserves to assets ratio), Kyrgyzstan (extensive money supply, inflation (consumer prices)), Kazakhstan (foreign exchange rate), Uzbekistan (deflator index), Russia (loan interest rate (private sector)), China (national trading companies) and high absolute peak values of instability in Kazakhstan (the liquid bank reserves to assets ratio), Tajikistan (extensive money supply), India (foreign exchange rate), Russia (deflator index, national trading companies), China (inflation (consumer prices)), Kyrgyzstan (loan interest rate (private sector)).

Having focused on the financial position of the SCO countries and evaluated GR with subsequent polynomial approximation, we recorded high $GR_{2006-2016}$ in Kyrgyzstan, and low $GR_{2006-2016}$ in China, Russia. High instability is also captured in Russia, with a lower level being in China, Kyrgyzstan and Pakistan.

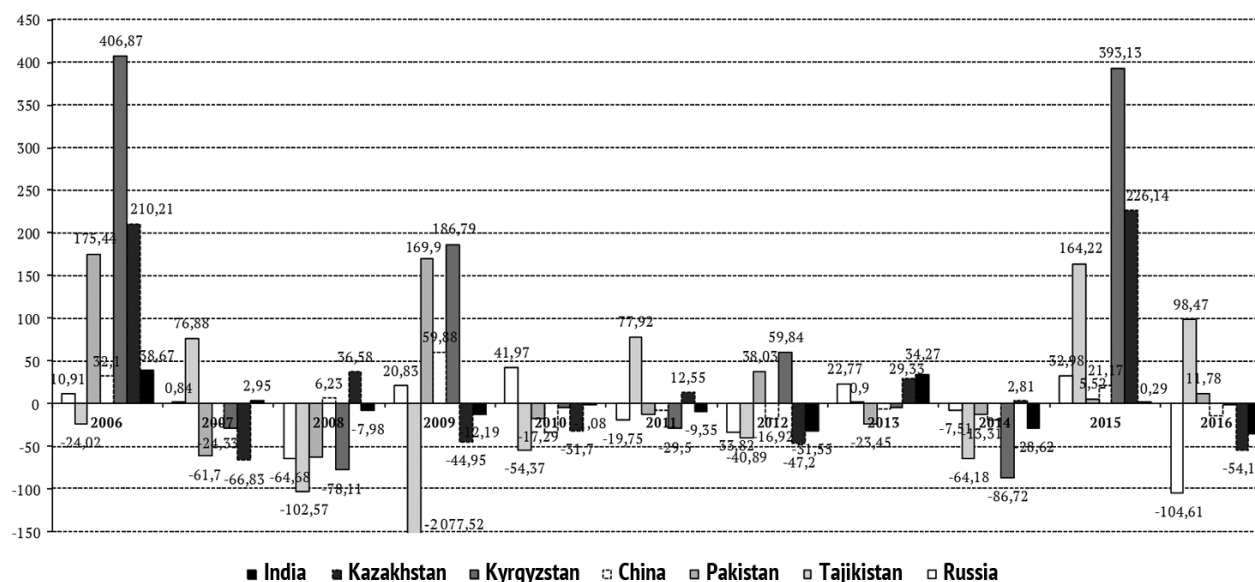
Figure 1
GR of liquid bank reserves to assets ratio (2006–2016)



Source: Authoring based on the World Bank data.

URL: http://data.trendeconomy.ru/dataviewer/wb/wbd/wdi?kf=WDI&time_period=2005,2006,2007,2008,2009,2010,2011,2012,2013,2014,2015,2016&ref_area=CHN,IND,KAZ,KGZ,PAK,RUS,TJK,UZB&series=FD_RES_LIQU_AS_ZS

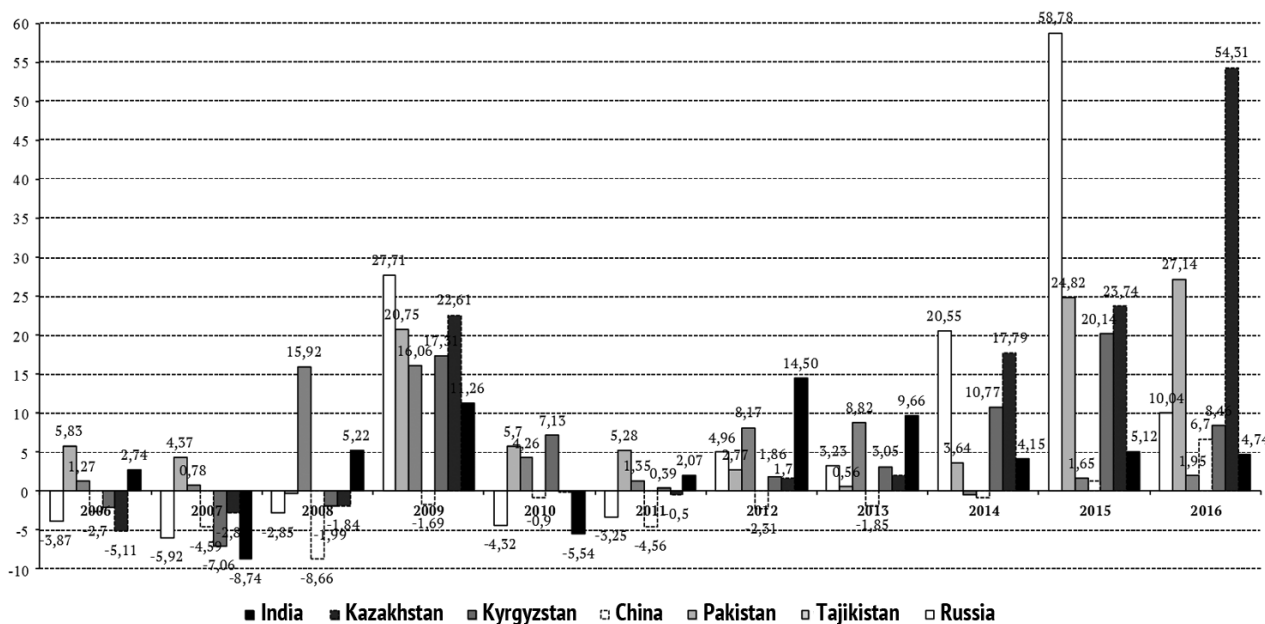
Figure 2
GR of extensive money supply (2006–2016)



Source: Authoring, based on the World Bank data.

URL: http://data.trendeconomy.ru/dataviewer/wb/wbd/wdi?kf=WDI&time_period=2005,2006,2007,2008,2009,2010,2011,2012,2013,2014,2015,2016&ref_area=CHN,IND,KAZ,KGZ,PAK,RUS,TJK,UZB&series=FM_LBL_BMNY_ZG

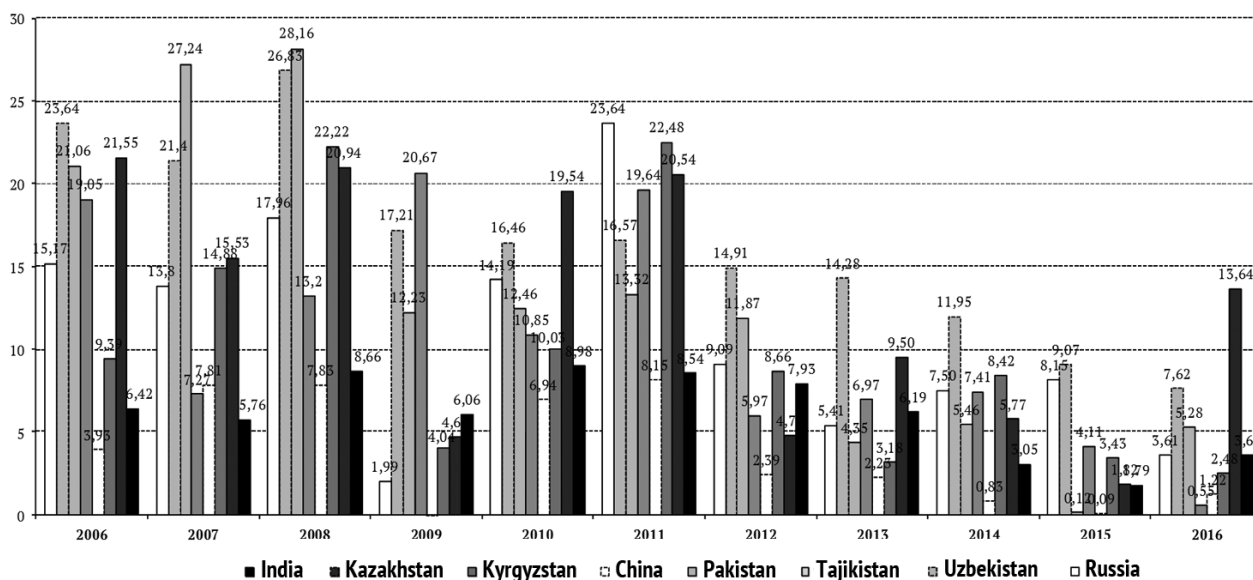
Figure 3
GR of exchange rate (2006–2016)



Source: Authoring based on the World Bank data.

URL: http://data.trendeconomy.ru/dataviewer/wb/wbd/wdi?kf=WDI&time_period=2005,2006,2007,2008,2009,2010,2011,2012,2013,2014,2015,2016&ref_area=CHN,IND,KAZ,KGZ,PAK,RUS,TJK,UZB&series=PA_NUS_FCRF

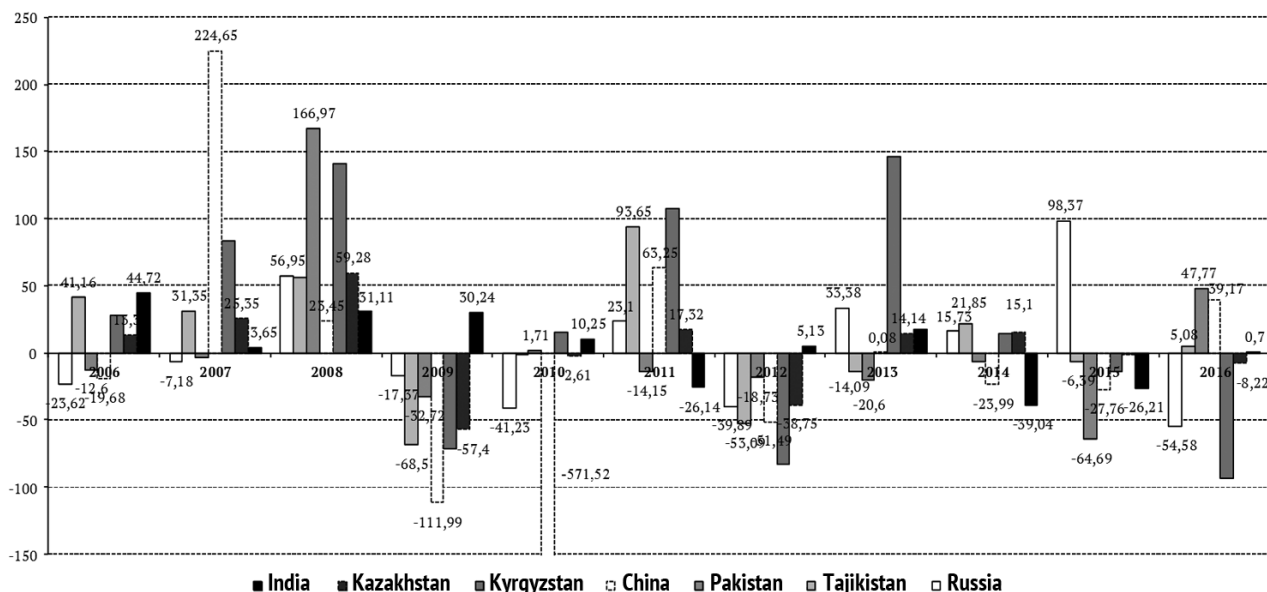
Figure 4
GR of deflator index (2006–2016)



Source: Authoring based on the World Bank data.

URL: http://data.trendeconomy.ru/dataviewer/wb/wbd/wdi?kf=WDI&time_period=2005,2006,2007,2008,2009,2010,2011,2012,2013,2014,2015,2016&ref_area=CHN,IND,KAZ,KGZ,PAK,RUS,TJK,UZB&series=NY_GDP_DEFL_Z

Figure 5
GR of inflation (consumer prices) (2006–2016)

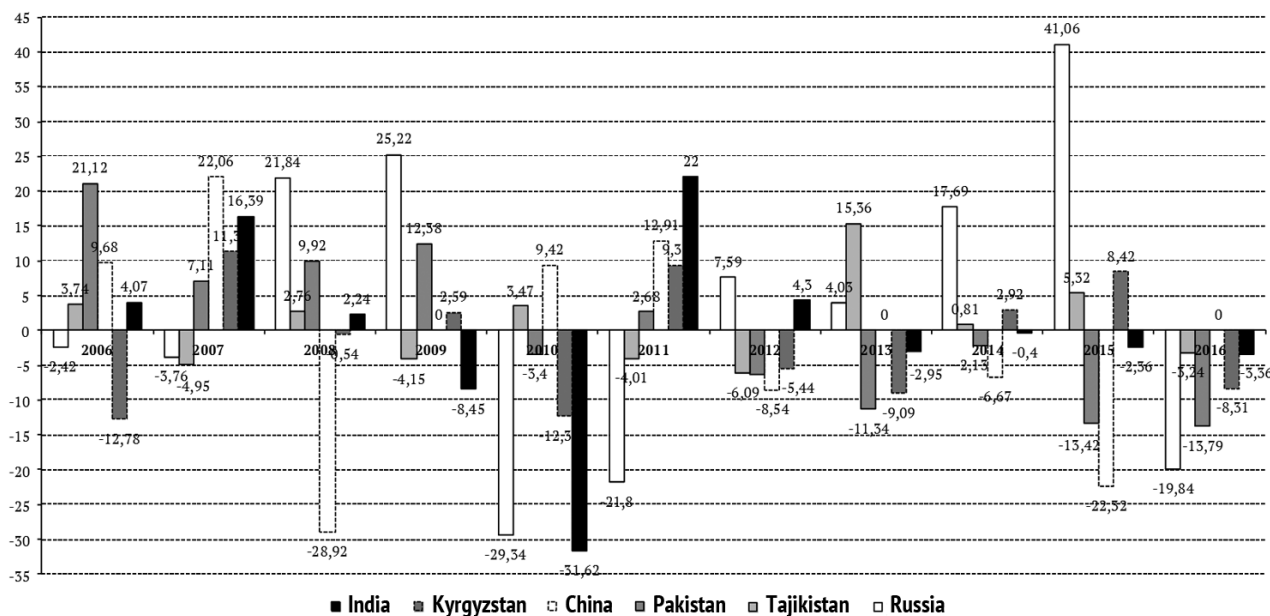


Source: Authoring based on the World Bank data.

URL: http://data.trendeconomy.ru/dataviewer/wb/wbd/wdi?kf=WDI&time_period=

2005,2006,2007,2008,2009,2010,2011,2012,2013,2014,2015,2016&ref_area=CHN,IND,KAZ,KGZ,PAK,RUS,TJK,UZB&series=FP_CPI_TOTL_ZG

Figure 6
GR of interest rate on loans (private sector) (2006–2016)

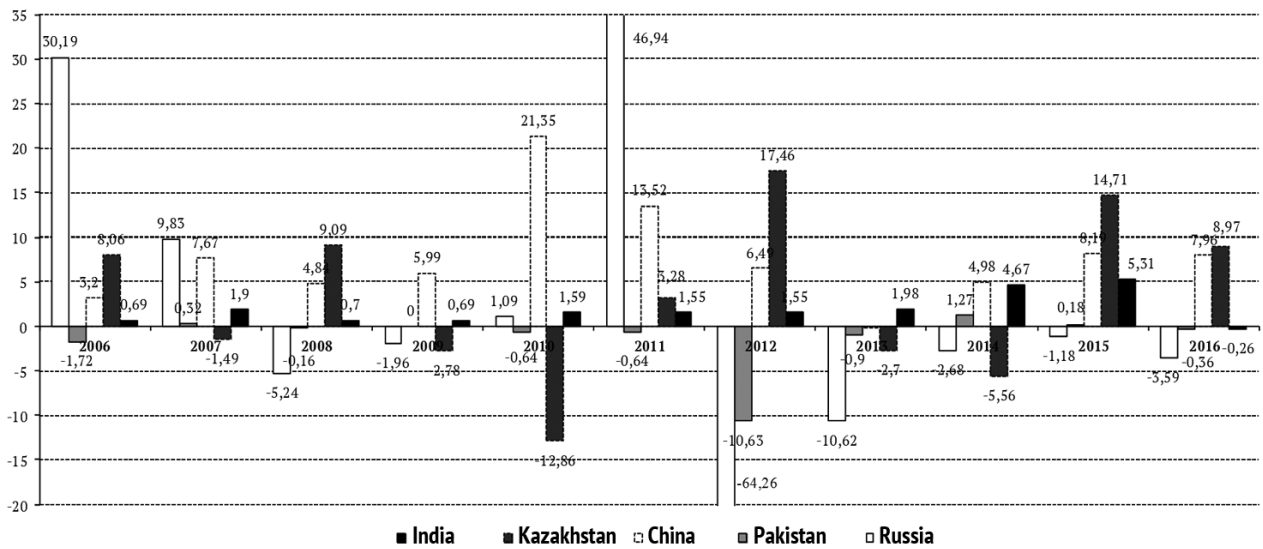


Source: Authoring based on the World Bank data.

URL: http://data.trendeconomy.ru/dataviewer/wb/wbd/wdi?kf=WDI&time_period=

2005,2006,2007,2008,2009,2010,2011,2012,2013,2014,2015,2016&ref_area=CHN,IND,KAZ,KGZ,PAK,RUS,TJK,UZB&series=FR_INR_LEND

Figure 7
GR of listed domestic companies (2006–2016)



Source: Authoring based on the World Bank data.

URL: http://data.trendeconomy.ru/dataviewer/wb/wbd/wdi?kf=WDI&time_period=

2005,2006,2007,2008,2009,2010,2011,2012,2013,2014,2015,2016&ref_area=CHN,IND,KAZ,KGZ,PAK,RUS,TJK,UZB&series=CM_MKT_LDOM_NO

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Conflict-of-interest notification

We, the authors of this article, bindingly and explicitly declare of the partial and total lack of actual or potential conflict of interest with any other third party whatsoever, which may arise as a result of the publication of this article. This statement relates to the study, data collection and interpretation, writing and preparation of the article, and the decision to submit the manuscript for publication.

Translated Article[†]

THE FINANCING MODEL OF THE REGIONAL HEALTH SYSTEM



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Abstract

Subject The research devises the healthcare spending model in line with types and scope of medical aid, assesses indicators of the current and future planned periods.

Objectives The research is an attempt to optimize healthcare spending by improving the way it is earmarked in line with the region's demand for certain types of medical aid and reallocating financial resources.

Methods We use the conceptual modeling and Python 3.

Results We devised the model to optimize expenditures in order to increment resources available for health care purposes by reallocating them in accordance with the analysis of the financial situation, classes of patients. Our model builds on the type of total medical expenditures on patients with certain diseases and adjustment of healthcare spending against the current year's plans.

Keywords: medical treatment, health care, resources, economic efficiency, cognitive modeling

Conclusions and Relevance Expenditures could be optimized through their reallocation in line with the type of total spending, financial effectiveness class and adequacy of their planning for promising and effective medical interventions.

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Introduction

Many countries model certain aspects of their healthcare systems [1–4]. They strive to make their national health systems more effective in light of the existing social needs and goals¹.

However, despite the highly elaborate approach to this issue as seen in the scholarly literature, there are still no versatile models allowing to plan and allocate healthcare resources as the region and/or country would really need. As a result, it is difficult to substantially upgrade the health system by lowering the public morbidity rates, curb a growth in medical spending [5–9]. The above effects are indispensable and unattainable without optimizing the mechanism for planning and allocating healthcare resources in line with the region's local distinctions. To ensure further development of the regional healthcare management theory and practices, resource planning and allocation processes should be modeled. In this respect, the appropriate methodological tools should be selected.

Looking through bibliographic sources, we found out that researchers from many countries had attempted to model some healthcare processes for the recent years. In particular, some of them suggested forming interdisciplinary teams and practicing systems approaches to chronic disease treatment [1, 2, 10, 11], analyzing the incidence of chronic non-infectious diseases and risks of their occurrence [12–14]; front-end medical assistance [15] and vertical equality [16], optimization of planning, designing and financing of health systems in accordance with the number of

population. These models accommodate for socio-political circumstances and determinants of the health system [2, 17–21]; healthcare finance through the public-private partnership mechanism [22], spatial and time development of the health system [23–25]. The above studies involved correlation and regression analysis [13, 17, 19], Poisson lognormal mixed model in the Bayesian framework fitted to the INLA efficient estimation procedure [23], cost effectiveness estimation method [14], decision tree, Markov chain, micromodels, discrete and dynamic event modeling [24, 26], descriptive statistics, forecasting and simulation [19–21, 24, 25], market research [10].

Russia's health system is restructured to increase the cost effectiveness of medical aid to the public. The analysis reveals that optimization of resource planning, allocation and use is still pending in this sector [27–31]. Currently, human rights for health protection and medical aid are widely pronounced and specified. To exercise the declared rights, the State needs to form, effectively allocate and use as much financial resources as needed to perform specific tasks and attain healthcare goals. Accessible medical aid and its quality require to integrate various types of medical assistance. The health system shall be organized on the basis of a comprehensive approach to managing all its constituents [32].

Medical aid in case of a certain disease implies a combination of healthcare services varying by disease or a group of diseases. Available resources and financial resources, in particular, become a cornerstone of the quality and effectiveness of such medical care.

Nowadays healthcare services are financed in accordance with the State guarantee program for public healthcare and special-purpose programs for priority healthcare aspects. However, such finance is considered to be insufficient and unbalanced since funds are mainly spent on the priority needs.

The situation determines the purpose of this research. We devise and test an algorithm to build a healthcare spending model and optimize it by

[†]For the source article, please refer to: Куликова О.М., Усачева Е.В., Шамис В.А., Нелидова А.В., Боуш Г.Д. Модель финансового обеспечения регионального здравоохранения. *Региональная экономика: теория и практика*. 2018. Т. 16. № 10. С. 1823–1840. URL: <https://doi.org/10.24891/re.16.10.1823>

¹ Dahabreh I.J., Chan J.A., Earley A. et al. Modeling and Simulation in the Context of Health Technology Assessment: Review of Existing Guidance, Future Research Needs, and Validity Assessment. Rockville, Agency for Healthcare Research and Quality (US), 2017. URL: <https://www.ncbi.nlm.nih.gov/books/NBK424024/>

- classifying types of medical care by level of financing;
- classifying patients by type and scope of medical care they need;
- estimation of indicators for the current and planned periods in accordance with the morbidity trend in the Russian regions, and analysis of observed scenarios.

Methodology

The research employs methods of logic and statistical analysis. We devised a special algorithm to optimize healthcare spending in the Russian regions. The regional healthcare spending algorithm is based on the assumption that the optimal structure of expenditures is the principal driver of healthcare effectiveness and high quality. In the Russian regions, the structure of healthcare funds is expressed with the set $CR = \{C_1, C_2, \dots, C_m\}$, which encompasses financial expenditures C_1, C_2, \dots, C_m on various types of medical care. When planning and allocating financial resources of the national health system, authorities consider the delivery of primary health and sanitary care (outpatient clinics), specialized healthcare (inpatient and high-tech healthcare facilities), emergency and palliative care. Financial spending on the delivery of i -type of medical care is expressed with the formula:

$$C_i = c_i n_i ,$$

where c_i is the unit cost of i -type of medical care, thousand RUB; n_i is the number of patients awaiting i -type of medical care in the region, people.

The following condition determines whether healthcare spending in the national health system is optimal or not: CR is optimal only if $C_i = C_i^{nd}$, where C_i^{nd} is healthcare institutions' needs for financial resources to deliver i -type of medical care. The needs are expressed with the following formula:

$$C_i^{nd} = c_i n_i^{nd} ,$$

where n_i^{nd} is the number of patients who need i -type of medical care in the region.

As part of the model for optimizing healthcare spending in the Russian regions, healthcare financing is viewed from perspectives of public needs. Funds may be sufficient or scarce. Financial funds for healthcare can be classified into the following types by scarcity/insufficiency:

- 1) excessively funded (contributing constituents), where $C_i > C_i^{nd}$;
- 2) optimally funded (normal constituents), where $C_i = C_i^{nd}$;
- 3) insufficiently funded (recipient constituents), where $C_i < C_i^{nd}$.

Therefore, expenditures can be classified as follows depending on the structure of financial resources earmarked for medical care:

- *Sponsor set*: all respective constituents are excessively funded and can be viewed as potential sponsors of other types of total expenditures;
- *Optimum set*: the structure is optimal, i.e. all respective constituents are optimally funded and cannot be viewed as sponsors of other types, and recipients;
- *Chimera set*: there are both excessively and insufficiently funded items;
- *Recipient set*: all respective constituents are insufficiently funded.

The financing of the national health system is optimized by reallocating financial resources among types of medical care and hereby transforming ineffective spending schemes into effective ones. If it is impossible to generate the Optimum set, the financial priority is assigned to those types of medical care which are in the highest demand in terms of the risk and emergency theory.

In pursuit of optimization and more effective finance of medical care in the regional health system, patients can be classified by disease, severity and stability of their disease.

As part of a certain disease or a group of diseases, the model of healthcare spending and its optimization is built in the following coordinates:

- *X-axis* denotes *The ratio of finance needed to finance planned in the current year, percent*, determining to what extent the current expenditures correspond with the available (earmarked) funds;
- *Y-axis* denotes *The type of a set of medical care expenditures for a group of patients*.

The ratio of finance needed to finance planned in the current year, percent» (D_g) is assessed with the formula:

$$D_g = \frac{\sum_{i=1}^m C_i^{nd}}{\sum_{i=1}^m C_i^{pl}} \cdot 100 \quad ,$$

where C_i^{pl} stands for funds earmarked for the delivery of i -type of medical care. Expenditures are expressed with the formula:

$$C_i^{pl} = c_i n_i^{pl} \quad ,$$

where n_i^{pl} indicates the number of patients who are eligible for i -type of medical care to be funded as part of the State guarantee program in the region.

When estimates concern those classes of patients who pertain to the same set in accordance with the analysis of the State guarantee program, n_i^{nd} is substituted with n_{gi} showing how many g -class patients need i -type of medical care in the region. The indicator is expressed with the following formula:

$$n_{gi} = k_{gi} \sum_{i=1}^m l_{gi} N_{gnos} \quad ,$$

where k_{gi} is the share of i -type of medical care within the overall medical care services, which are sought after by the analyzable class of patients; l_{gi} denotes the relative share of i -type of medical care services envisaged in the State guarantee program in the region; N_{gnos} is the number of patients in the analyzable set who have the analyzable disease or a group of diseases.

Moreover, when estimates accord classes of patients and State guarantee program, n_i^{pl} is substituted with n_{gi}^{pl} indicating the number of g -class patients who are eligible to i -type of medical care funded under the State guarantee program in the region. The indicator is expressed with the formula:

$$n_{gi}^{pl} = N_{gnos} l_{si} \quad .$$

If D_g is less than 100 percent, financial needs are below the planned amount; if D_g equals or approximates 100 percent, financial needs correspond with the planned finance; if D_g is higher than 100 percent, financial needs exceed the planned finance.

The metric, *Type of Medical Care Expenditures for a Group of Patients*, is inscribed into the ordinal scale and has the following values: 1 corresponds to *the Sponsor set*; 2 is for *the Optimum set*; 3 is for *the Chimera set*; 4 is for *the Recipient set*. The scale reflects the complexity of managerial decision on the optimization of healthcare spending.

The model can be configured *As-Is/To-Be*² with or without regard to classes of patients and the State guarantee program. Let us observe how the models are set. As part of the *As-Is* model, healthcare expenditures on each class of patients are indicated in the given coordinate system as a pie chart. In the case of the *As-Is* model, a table can be made to define what rules and results the optimization process shall produce. They shall be determined on combinatorial principles and optimization aspects. The table may provide for changes in the scope of healthcare services. Thus, patients may be reclassified. The *To-Be* model can take two forms:

- without overlapping with the *As-Is* model to reveal only optimized aspects of healthcare expenditures per each class of patients;
- overlapping with the *As-Is* model to show pre-optimization structures in addition to those ones which were optimized.

The healthcare spending optimization model in the Russian regions is built in accordance with the algorithm below.

1. Predetermining input parameters for modeling a disease class as per the International Classification of Diseases 10 (ICD-10) (one or several diseases); form of the model (*As-Is*, *To-Be* with or without overlapping).
2. Setting up the *As-Is* model.
 - 2.1. Predetermining input parameters for setting the *As-Is* model.
 - 2.2. Assessing values for the *As-Is* model.
 - 2.3. Setting up the *As-Is* model.
 - 2.4. Analysis of results from the model. If the healthcare spending structure is optimal, paragraph 2.6 is relevant. If the structure is not optimal, paragraph 2.5 shall be referred to.

² Modern Business Management Technologies.

The *As-Is* Model. URL: <http://piter-soft.ru/automation/more/glossary/process/as-is-model/> (In Russ.)

2.5. Determining aspects of healthcare spending structure to be optimized with respect to classes of patients.

2.6. Visualization of estimates through the graphical presentation of the model.

2.7. Conclusions on the modeling results.

If the healthcare spending structure is optimal with respect to classes of patients, paragraph 4 becomes relevant. If the structure is not optimal and the *As-Is* model is chosen only, paragraph 4 shall be referred to again. If the structure is not optimal and the *To-Be* model is chosen, paragraph 3 shall be referred to.

3. Setting up the *To-Be* model.

3.1. Setting the table of optimization opportunities (the table can be embedded into the algorithm and run by default).

3.2. Apply limits to modeling.

3.3. Optimization of the healthcare spending structure with respect to classes of patients through the exhaustive search method.

3.4. Setting up the *To-Be* model, with or without overlapping.

4. Cognitive visualization of results.

The algorithm is implemented via Python 3.

The model was tested while healthcare expenditures were structured and optimized with respect to patients with ischemic heart disease. The unit cost of a certain type and statutory scope of medical care is assessed per person holding a compulsory medical insurance policy by type and form of health care in accordance with the State guarantee program for free medical aid³ as earmarked for 135 thousand patients with ischemic heart disease.

Results

The regional healthcare spending optimization model treats the finance of healthcare services in terms of the public needs. The State guarantee program sets forth statutory rates of healthcare services per person holding a compulsory medical insurance policy. The established rates and norms are used to plan and

substantiate financial resources. If we refer to the statutory scope of healthcare services stipulated in under the Statutory guarantee program as a percentage, the breakdown below of key healthcare services will be the most cost effective per person holding a compulsory medical insurance policy:

- services of outpatient clinics (healthcare services delivered out of hospital due to a disease) – 78%;
- emergency healthcare – 13%;
- specialized healthcare in twenty-four hour hospitals (inpatient care) – 7%;
- high tech healthcare – 2%.

We point out four classes of patients by severity and stability of ischemic heart disease, specifics of their treatment, needs for some type of healthcare services.

Rosebush patients. Treatment is very effective and inexpensive as it results in a protracted remission of a disease so that patients may keep an ordinary lifestyle and continue working. Outpatient care prevails in the *rosebush* class spending. It is cost effective, very accessible and inexpensive.

Camelthorn patients. High-tech medical services are predominant in the *camelthorn* spending structure. The treatment is sustainably effective but it requires expensive medical interventions. Such patients seldom suffer from acute conditions of their chronic disease and continue to work given high-tech healthcare services are delivered to them. High costs of this healthcare type stems from the use of innovation and gradually rising indications.

Quicksand patients. Treatment efficacy is not stable, though being rather costly. The disease is severe, with frequently reoccurring acute conditions making patients unable to work as they used to and become physically limited in everyday life. Emergency care and twenty-hour inpatient care make the substantial part of expenditures on such patients.

Severe winter patients. This class is associated with the highest costs of twenty-four hour inpatient care and ambulance service. Unplanned costs for high-tech medical care are also incurred. The patients are mostly disabled, thus requiring additional payments for temporary or full loss of ability to work.

Table 1 and *2* present input data of the *As-Is* model in the case of patients with ischemic heart disease, which

³ Resolution of the RF Government of November 28, 2014 № 1273, *On The State Guarantee Program for Free Healthcare Services for 2015 and the 2016 and 2017 Planning Period* (with amendments and additions). URL: <http://base.garant.ru/70812574/> (In Russ.)

we obtained as a result of the clinical test research and reassessed the entire population of patients with ischemic heart disease in the region.

Fig. 1 depicts the *As-Is* healthcare spending model, which is based on input data, with respect to classes of patients with ischemic heart disease.

Having analyzed the results, we concluded that the analyzable classes of patients with ischemic heart disease pertain to *the Chimera set* of healthcare expenditures since each class of financial efficiency has the sponsor constituents and recipient constituents, namely:

- expenditures of the *Rosebush* class include ambulatory and outpatient care as the recipient constituent (additional funds of RUB 28.32 million are required) and sponsor constituents (excessive funds of RUB 563.8 million);
- expenditures of the *Camelthorn* class include such sponsor constituents as ambulatory and outpatient care and emergency care with excessive funding of RUB 3.9 and 13.9 million respectively, and two recipient constituents – inpatient care and high-tech medical care, which require additional RUB 53.5 million and RUB 348.4 million respectively;
- expenditures of the *Quicksand* class include the sponsor constituent – ambulatory and inpatient care – with excessive funding of RUB 6.1 million and recipient constituents – ambulance care (additional funding of RUB 1.42 million), inpatient care (additional RUB 74.85 million), high-tech medical care (additional funding of RUB 297.23 million);
- expenditures of the *Severwinter* class include the sponsor constituent – ambulatory and outpatient care (excessive funding of RUB 9.9 million) and recipient constituents – ambulance care (additional funding of RUB 247 million), inpatient care (additional funding of RUB 61.48 million), high-tech medical care (additional funding of RUB 302.38 million).

Therefore, healthcare spending on patients with ischemic heart disease cannot be considered as optimal. Hence, measures should be taken to qualify it as such. *Fig. 2* shows the healthcare spending optimization model without overlapping with respect to patient with ischemic heart disease (*To-Be* model). The utilization of financial resources was optimized by reallocating them among types of healthcare services within a class of patients.

As seen in *Fig. 2*, after financial resources were streamed from the sponsor constituent to recipient constituents within the same class, the *Rosebush* expenditures could be reclassified from *the Chimera set* into *the Optimum set*. The structure of the other classes remained unchanged. As the next step, all the sets of expenditures shall be brought to *the Optimum* type, which is feasible only if additional financial resources of RUB 1.12 billion are allocated annually. Most of the funds (RUB 948 million, i.e. 84,6%) should be earmarked for high-tech medical care. We should note that this regional healthcare development course is in accord with departmental special-purpose programs, *The 2014–2020 Health System Development*.

Discussion

The optimal structure of healthcare spending is modeled to get a more comprehensive and accurate view of resources needed to implement primary goals of healthcare, i.e. substantially reduce the morbidity and mortality rates, cut unplanned healthcare expenditures. Creating the effective mechanism for resource planning, allocation and use in health care, it is necessary to consider the volume and composition of resources needed to deliver healthcare services depending on a disease since the Russian regions have different morbidity trends.

The algorithm we propose allows to consider the morbidity trends in the region and subsequently configure healthcare spending in each region and Russia as a whole. If costs are planned in accordance the financial efficiency classes, there will be sustainable cash flows. Insufficient funding restricts the delivery of healthcare services as needed under the compulsory medical insurance program. In this respect, it is not enough to prioritize expenditures and choose the type, volume of free healthcare services and categories of citizens who are eligible to them. There should be understanding of possible rearrangement of financial flows within the sector. The proposed model has the following advantages.

1. It raises the public awareness about the existing financial situation with respect to every disease.
2. It shows how the financial situation may develop in the future.
3. It clarifies financial challenges and their causes.
4. It paves the way for increased efficiency of the regional health system.

5. It contributes to the regional allocation of healthcare resources.
6. It enhances the way expenditures are controlled.

Referring to these findings, regional authorities may enhance the management of the regional health system, deciding on each class of diseases and choosing those types of healthcare services which definitely reduce morbidity rates.

Conclusion

Regionally and nationally, challenges of the health system include not only lack of funds but also the effective use of available financial resources. Public healthcare, quality and timeliness of healthcare services will lower morbidity rates, prolong the ability to work and raise labor productivity. The above factors will foster a growth in the national income and public wellbeing.

Table 1

Baseline data on the classes and number of patients, and the need for medical care

Class of patients	Demand for outpatient care, %	Demand for ambulance care, %	Demand for inpatient care, %	Demand for high-technology medical care, %	Number of patients within the class
Rosebush	90	7	2.997	0.003	88,152
Camelthorn	75	12	10	3	27,124
Quicksand	65	15	15	5	13,562
Severwinter	50	20	20	10	6,781

Source: Authoring

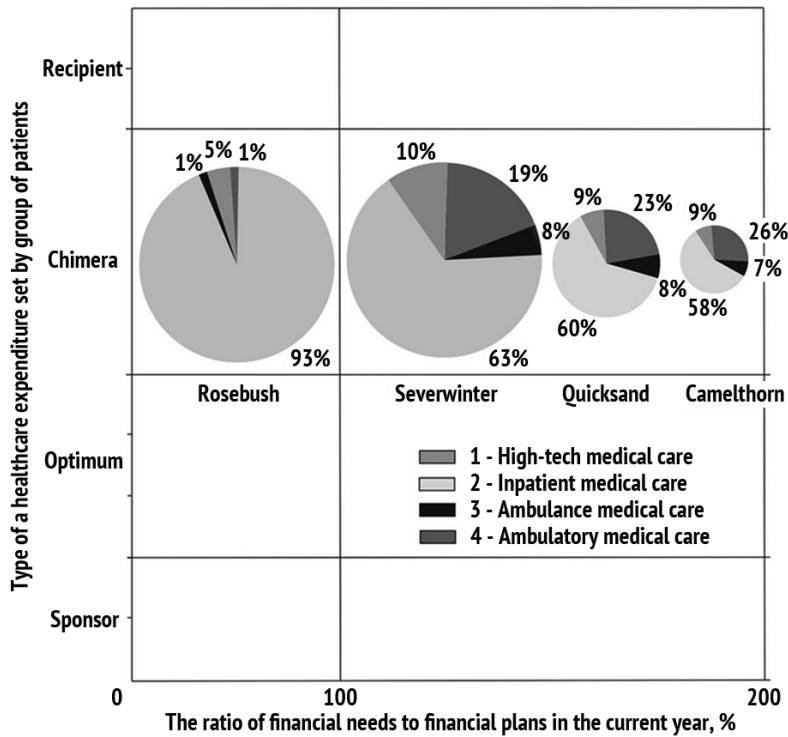
Table 2

Baseline data on the key indicators of healthcare services

Indicators	Outpatient care	Ambulance care	Inpatient care	High-tech medical care
Statutory rate of key healthcare services per one policyholder, %	79.628	12.985	7.22	0.167
Unit cost of a healthcare type, thousand RUB	1.265	2.124	28.968	185.193

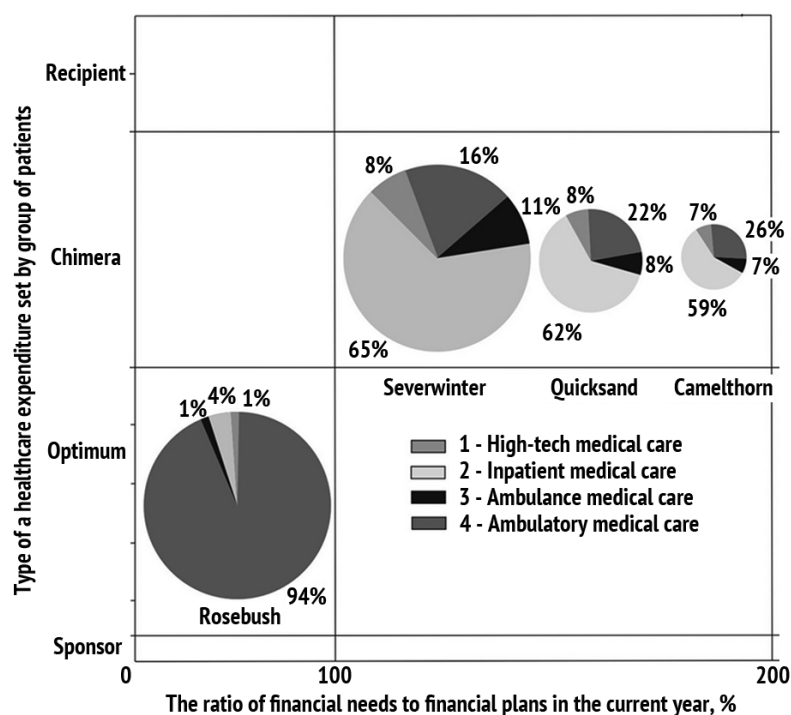
Source: Authoring

Figure 1
The healthcare spending model by class of patients and type of Expenditure set



Source: Authoring

Figure 2

The healthcare spending optimization model with respect to patients with ischemic heart disease, without overlapping (the *To-Be* model)

Source: Authoring

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Translated Article[†]

THE WORKING CAPITAL MANAGEMENT MODEL IN AGRICULTURAL BUSINESS



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Abstract

Subject The article discusses the management of current financial needs agricultural producers have.

Objectives The research evaluates the current financial needs of agricultural producers and devises tools to coordinate the policy for managing the current assets and liabilities in agriculture at the regional level.

Methods The research employs methods of financial management and tools of econometric and statistical analysis, which are used to analyze and model the current financial needs of agricultural entities in the Penza Oblast.

Results We summarized and systematized financial methods for comprehensive operational management of current needs in agriculture. We used the specified financial management tools and grouped agricultural producers of the regions by type of the current assets and liabilities management policy. Doing so, we proved some aspects of the existing comprehensive operational management policy should be transformed and updated. We elaborated an econometric model reflecting the correlation of principal aspects of the policy concerning agricultural businesses. Describing the econometric model, we determine and coordinate strategic decisions on operational management of current financial needs in agriculture at the regional level.

Conclusions and Relevance Referring to the resultant functional relations, we can substantiate focal points to be addressed in improving the agricultural policy and raising additional financial resources for agriculture.

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Authorized translation by Irina M. Vechkanova*

Currently, practices of project and financial management are reaching new horizons in Russia. As the legislative and regulatory framework gets more refined and updated, these practices are implemented by governmental authorities charged with management and regulation of national economic sectors. Agriculture is of special importance in this case so as to observe and pursue the national food security.

The robust legislative mechanism has been developed for the recent decade to move the agricultural business forward. It suffices to mention the priority national project, *The Development of Agro-Industrial Complex*, Federal Law, *On Development of Agriculture*, of 29 December 2006 № 264-ФЗ, Food Security Doctrine, 2013–2020 National Program for Agricultural Development and Regulation of Markets of Agricultural Production, Resources and Food. The documents and other ones are intended to comfort the agricultural business.

The above documents emphasize agricultural production should be technologically and technically upgraded. Relevant activities are conducted to support the construction of new farms, greenhouses, development and improvement of farmlands, renewal of vehicles, equipment and agricultural machinery. Such investment projects and capital expenditures cannot be overestimated. They become a stepping stone for the future income, and reasonable source of discounted cash flows in a five-to-seven year time.

Unfortunately, sound investment policy in agricultural products overlooks the current operations of agricultural producers, which cannot but have certain difficulties. Current expenses are as important for production enterprises as capital expenditures. The production cycle of production enterprises includes the funding of inventories, tangible costs, payroll and social security charges, trade and other payables. As the government neglects the policy for managing the current financial needs in agriculture, the debtload of agricultural businesses grows, thereby preventing them from raising loans or State funds for their innovative development since the main fundraising mechanisms depend on financial and credit institutions.

[†]For the source article, please refer to: Самыгин Д.Ю.,

Имяреков С.М., Степашкина Е.Н. Модель управления рабочим капиталом в аграрном бизнесе. *Экономический анализ: теория и практика*. 2018. Т. 17. № 10. С. 1951–1961.
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As the analysis of agricultural entities in the Penza Oblast shows, the agricultural entity's debtload exceeds its revenue, its fixed assets will be sufficient to satisfy only 30 percent of its current needs, while the debtload below the revenue raises this indicator up to 50 percent (*Table 1*).

Due to very scarce current assets, meager agricultural businesses have to take out short-term loans in order to construct current assets. That is the reason why their debtload with current liabilities accounts for almost 60 percent, while they are less than 30 percent in more financially sustainable entities. Under such circumstances, over 30 percent of agricultural businesses have a slim chance of securing long-term loans and improving their production capacities respectively.

Major agricultural firms set up their own model for managing net current assets [1]. The other ones lack funds from time to time to purchase materials and resources, pay for fuel and lubricants, create inventories, etc. [2]. This brings business performance results to nothing, intensifies the issue of deficit and shortage of resources and desynchronizes the outgoing and incoming flows of liquid assets. Agricultural producers have to increase their debts, disinvest and seek various financial aids [3].

In such circumstances, there should be an agricultural strategy in place to manage the current financial needs of agricultural producers. For this purposes, it is necessary to create a certain pool of available funds of agricultural producers in the regions, raise the standards of efficiency of financing and subsidizing sources [4].

Considering that the current financial needs are virtually the difference between current assets and accounts payable, indicating the agricultural producers' lack of credit resources [5], the agricultural policy is called to accelerate the turnover of circulating resources, choose the most appropriate approach to operational management of current assets and liabilities in the region [6] (*Table 2*).

The difference between readily available property and current sources of finance constitutes net working capital, which is measured using the technique depicted in *Fig. 1*.

In 2016, value of circulating resources owned by agricultural entities of the Penza Oblast equaled 25.67 percent of the annual turnover, or over RUB 10 billion.

Only a portion of resources that the region's agricultural businesses possess are spent on current financial needs. The cash balance amounts to over RUB 3 billion.

As the analysis shows, agricultural entities of the region hold a sufficient amount of circulating resources, with 63 percent of them being spent on current operational needs of agricultural producers and other 37 percent forming freely available cash. In 2016, there was a 70 to 30 percent proportion respectively. Such current financial needs and resources give hope that the payment discipline will strengthen, expenses in the nearest future will be covered, minimum reserve stock and short-term financial investment will be formed. This highlights a most adequate balance of needs and financial sources.

Such a balance shall persist and be stable for a number of years so that an agricultural producer could be considered financially sustainable [7].

The ratio of financial sources of mobile assets is a key factor influencing the amount of net working capital of agricultural entities [8]. In this respect, the theory of financial management suggests observing the fundamental principle of operational life of assets matching their financial sources [9]. The principle implies that equity is a reasonable source feeding the constant minimum need in mobile assets. Short-term loans sustain the other additional need in current assets, for example, those of seasonal nature [10]. It is necessary to compare the effectiveness of capital use and financial sustainability risk of agricultural businesses to reasonably choose sources for financing circulating resources of agricultural producers [11]. The factors underlie the policy for comprehensive operational management of financial needs. The policy pursues to maintain a certain level and composition of current assets, on one hand, and volume and effective structure of financial sources, on the other hand (*Table 3*).

Having analyzed the 2015–2016 data (Return on Assets, turnover period of mobile assets, etc.), we found out that many agricultural entities in the Penza Oblast tend to a moderate policy in managing their current assets. In the mean time, having analyzed a percentage of short-term loans in the total liabilities, we can report on an aggressive policy for managing the current liabilities, which immediately raises the effect of financial leverage. Fixed costs also include interests charged for utilizing loan resources, thereby intensifying operating leverage.

As indicated in the matrix for determining a type of current need management strategy (*Fig. 2*), the combination of moderate policy for managing current assets and aggressive policy for managing current liabilities enables us to describe the comprehensive policy of operational management at agricultural entities of the Penza Oblast.

To increase net working capital and financial sustainability, agricultural entities are advised to adopt a moderate policy for managing their current liabilities. This will curb the effect of financial leverage and boost a growth in the Weighted Average Cost of Capital (WACC).

Based on combined financial statements of agricultural entities in the Penza Oblast for 2015 through 2016, we conducted the statistical analysis of the current policy for comprehensive operational management using the grouping technique (*Table 4, 5*).

As the research shows, many business entities in the region tend to an aggressive policy for managing their current assets (almost 63 percent). The current assets out of total assets approximates 75 percent. Profitability of such entities is over 13 percent as compared with less than 1 percent in those entities having a conservative policy, and around 5 percent in entities with a moderate policy for managing current assets. Strengthening the current assets management policy increases the profitability and vice versa.

Over 64 percent of the region's agricultural entities are found to have a conservative policy for managing their current liabilities. Current liabilities account for 22 percent in such entities, while profitability is 8 percent. Entities with an aggressive policy (27.7 percent) have slightly lower profitability of 5.15 percent, but significantly higher turnover of circulating resources (1.71).

To combine the current assets management strategy and current liabilities management strategy as much as effectively, we set up the model reflecting the dependency of current financial needs policy on principal factors (*Table 6*). Profitability is deemed as the efficiency characteristics.

Conducting an econometric study into the current financial needs management strategy in agriculture of the Penza Oblast, we traced the high dependency of profitability both on elements of the current assets management policy and (92 percent) and current liabilities management policy (89 percent). Characteristics of the resultant models are evaluated to be adequate and significant.

Having analyzed the current assets management model for elasticity, we determined that a 1-percent increase in the percentage of current assets raises profitability by 0.24 percent, while one additional turnover round adds 1.13 percent to profitability. Profitability grows only if equity rises. In the mean time, a percentage of current liabilities decreases the analyzable indicator by 0.04 percent.

The optimal combination of strategies for financing current needs is measured if profitability characteristics are given. The resultant values of indicators characterizing the policy for comprehensive operational management can be used to outline the uniform strategy for financial management of agricultural entities' current needs.

Table 1**Grouping of agricultural entities in the Penza Oblast by ratio of revenue and accounts payable**

Groups of entities by ratio of revenue to accounts payable	Percentage of entities in the group	Average ratio of revenue and accounts payable in the group	Percentage of current liabilities	Percentage of fixed assets in total assets	Percentage of equity
Ratio below 1	21	0.5	58.9	28	-42.9
Ratio above 1	79	5.94	29.7	47	-19.5

Source: Authoring

Table 2**Current financial needs in agricultural entities of the Penza Oblast for operations in 2015–2016**

Metrics	2015	2016	Deviation
Average revenue from sale, thousand RUB	73,010.7	107,221.3	34,210.6
Stocks of resources and finished products, thousand RUB	11,794,813	16,437,822	4,643,009
Right to claim receivables, thousand RUB	10,648,877	17,264,582	6,615,705
Trade payables, thousand RUB	16,947,073	26,666,400	9,719,327
Current financial needs, thousand RUB	5,496,617	7,036,004	1,539,387
Current financial needs, days	75.29	65.62	-9.67
Current financial needs, percent	20.91	18.23	-2.68

Source: Authoring

Table 3**Determining types of policy for current assets and current liabilities management in agricultural entities of the Penza Oblast in 2015–2016**

Metric	2015	2016	Deviation
Revenue from sales, thousand RUB	26,283,866	38,599,667	12,315,801
Net profit, thousand RUB	3,612,597	5,427,898	1,815,301
Current assets, thousand RUB	25,723,156	36,714,440	10,991,284
Fixed assets, thousand RUB	37,109,051	41,437,344	4,328,293
Total assets, thousand RUB	62,832,207	78,151,784	15,319,577
Equity, thousand RUB	20,309,499	23,447,656	3,138,157
Short-term loan, thousand RUB	16,947,073	26,666,400	9,719,327
Percentage of current assets in total assets	40.94	46.98	6.04
Return on Assets, percent	5.75	6.95	1.2
Turnover period of circulating resources, round	1.02	1.05	0.03
Current equity, thousand RUB	-16,799,552	-17,989,688	-1,190,136
Percentage of short-term loans in total liabilities	26.97	34.12	7.15
Type of current assets management policy	Moderate	Moderate	-
Type of current liabilities management policy	Aggressive	Aggressive	-

Source: Authoring**Table 4****Grouping of agricultural entities by current assets management policy**

Group of entities	Percentage of the entities in the group	Percentage of current assets in total assets	Profitability, percent	Turnover period of circulating resources, round
Conservative	12.9	21.5	0.75	1.5
Moderate	24.2	37.7	4.9	1.6
Aggressive	62.9	74.6	13.5	0.7

Source: Authoring

Table 5**Grouping of agricultural entities by current liabilities management policy**

Group of entities	Percentage of entities in the group	Percentage of current liabilities in total assets	Current equity, thousand RUB	Profitability, percentage	Turnover period of circulating resources, round
Conservative	64.3	21.9	-10,984,616	7.75	0.86
Moderate	8	42.2	-1,661,924	6	0.9
Aggressive	27.7	64.1	-5,276,282	5.15	1.71

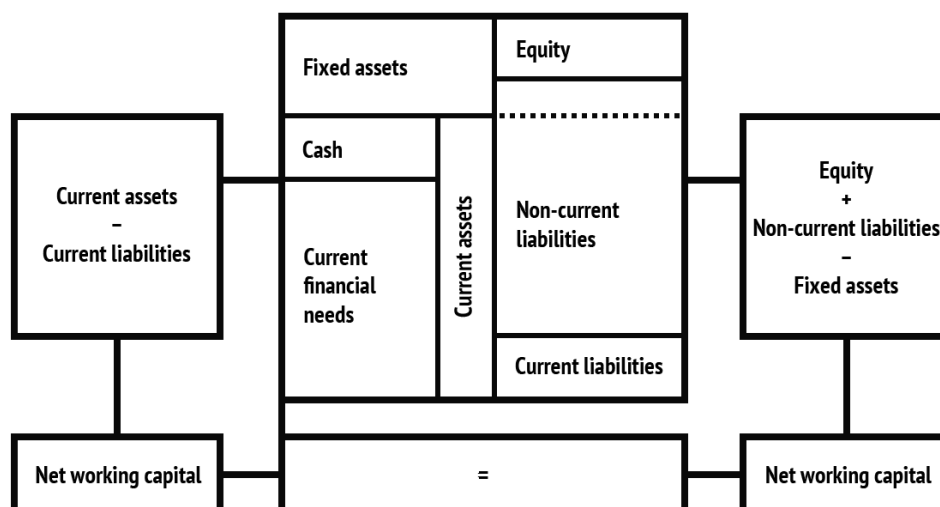
Source: Authoring

Table 6**Functional dependence of profitability of agricultural producers in the Penza Oblast on aspects of the current financial needs management policy**

Efficiency indicator Y	Aspects of current financial needs management policy	Model	Regression coefficient	Fisher's exact test (<i>F-test</i> < 0.05)	Student's t-test X_1 / X_2 (<i>P-value</i> < 0.05)
Profitability	Percentage of current assets X_1 . Turnover period of circulating resources X_2	$0.24 X_1 + 1.13 X_2 - 7.22$	0.92	0.002	0.0008 / 0.002
	Percentage of current liabilities X_1 . Current equity X_2	$10.2 - 0.04 X_1 + 0.0000024 X_2$	0.89	0.003	0.004 / 0.01

Source: Authoring

Figure 1
The working capital measurement technique



Source: Authoring

Figure 2
The matrix for choosing the policy for operational management of current assets and current liabilities

		Current assets management policy		
		Conservative	Moderate	Aggressive
Current assets management policy	Aggressive	Inapplicable	Moderate policy	Aggressive policy
	Moderate	Moderate policy	Moderate policy	Moderate policy
	Conservative	Conservative policy	Moderate policy	Inapplicable

Source: Authoring

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Translated Article[†]

INTERNAL CONTROL: METHODOLOGICAL DISTINCTIONS OF COUNTERPARTY CREDITWORTHINESS CHECKS



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Abstract

Subject This article deals with the issues related to the methodology of client acceptance procedures within the internal control framework.

Objectives The article aims to develop methodological approaches to perform internal control when checking the counterparty creditworthiness.

Methods We used the methods of comparative analysis and systematization.

Results The article proposes a method for internal control when checking counterparties' financial reliability preceding the conclusion of a contract, including working papers of the controller, mitigating the business risk.

Conclusions and Relevance The proposed algorithm for counterparty creditworthiness checks and forms of working documents will help enterprises and entrepreneurs get information about contractors at the stage of contracting, which would reduce the default risk in the future. The findings can be applied in the theory and practice of internal and external control during counterparty creditworthiness checks, as well as in the master's degree educational process in the field of Economics and Economic Expert Analysis.

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Selling its finished products, goods, services, any business entity deals with counterparties (Latin *contrahēns* 'collecting, accomplishing, contracting'). Counterparties are persons or entities *bound by obligations under a common agreement and cooperating in compliance with it*¹. Such relationships result in accounts receivable or payable.

It is important for any business entity to manage its accounts receivable since it is able to plan its cash flows assuming that amounts due will be timely repaid. In the mean time, business entities need to manage their accounts payable as well since acquiring entities expect suppliers to timely deliver property, work and services. If suppliers fail to perform their contractual obligations in a timely manner, the production process will stall, inducing other consequences and affecting the continuity of business operations.

Accounts receivable are managed so as to secure cash flows or other property and settle accounts with counterparties within the timelines stipulated in the contract. Managing its accounts receivable, the business entity should ensure the quality of its accounting and effective analysis. These challenging issues are examined in proceedings by A. Arens and J. Loebbecke², V.B. Ivashkevich [1], L.I. Kulikova [2], G.S. Klychova and Z.Z. Khamidullina [3, 4], S.A. Kemaeva [5, 6], L.B. Sungatullina [7]. Distinctive aspects of accounts receivable management are studied by N.V. Gorshkova and O.V. Khmeleva [8].

Distinctive aspects of accounting, analysis and accounts payable management are investigated by I.V. Artemova [9], E.A. Vedernikova [10], V.A. Grebennikova and A.N. Ponchishkina [11], V.V. Kopeina [12], N.A. Markova [13].

Auditing and internal control screen accounts receivable and payable. Respective studies are performed by N.G. Sapozhnikova and O.Yu. Trunaeva [14], N.N. Kovaleva, L.V. Ermakova and A.E. Mel'guya [15], M.A. Chaplygina, G.A. Pol'skaya and

N.I. Vinogradova [16], N.O. Mikhaleuk and O.V. Shnaider [17].

Business entities may perform preliminary, ongoing and follow-up control of the transaction time. Preliminary control takes place before a transaction, ongoing control coincides in time with a transaction, and follow-up control goes after a transaction.

Scholarly proceedings mainly discuss the audit of financial statements, external and internal control which are usually of ongoing or follow-up nature. We assign the highest importance to preliminary internal control. Contractual policy is studied by B.A. Shakhmanova as an aspect to be audited [18]. In our opinion, business entity should necessarily conduct the preliminary internal control of counterparties in terms of their creditworthiness.

The counterparty creditworthiness check is a crucial step in the contractual process. It gets especially important if the contract is intended to be long-term and entail substantial financial costs. We believe the counterparty creditworthiness check is the responsibility of the internal control department.

Unreliable entities (the so called *fly-by-night* organizations) affect all parties involved. The State collects less tax. Their counterparties have to face controlling authorities' interrogations concerning such organizations. These issues usually turn to be very costly for business entities, entailing additionally charged taxes, penalties, and denied VAT refunds. Counterparty creditworthiness checks may, if needed, help produce evidence of the business entity's prudence in documenting its business relationships with the counterparty.

General information about counterparties is in public sources on the Internet. For this, business entities need to know identification number of a tax payer (in Russian 'INN'). Publicly available sources are presented in *Table 1*.

Referring to the sources, we examine the specifics of checking the counterparties which are debtors of an agricultural entity in the Nizhny Novgorod Oblast and buyers of agricultural products for canteens and bakery production.

The Uniform State Register of Legal Entities (abbreviated in Russian as 'EGRUL') provides information on the incorporation date, size of authorized capital, registered address, CEO's details,

[†]For the source article, please refer to: Шатина Е.Н., Козменкова С.В., Фролова Э.Б. Внутренний контроль: методические особенности проверки контрагентов на благонадежность. *Международный бухгалтерский учет*. 2018. Т. 21. № 8. С. 904–916. URL: <https://doi.org/10.24891/ia.21.8.904>

¹ Raizberg B.A., Lozovskii L.Sh., Starodubtseva E.B. *Sovremennyy ekonomicheskii slovar'* [Contemporary dictionary of economics]. Moscow, INFRA-M Publ., 1997, 496 p.

² Arens A., Loebbecke J. *Audit* [Auditing: An Integrated Approach]. Moscow, Finansy i Statistika Publ., 1995, 560 p.

types of activities, dates of updates to the EGRUL. *Table 2* reflects the proposed form of a working document the internal controller uses.

Having checked commercial court case files, we found out that PAO Machinebuilding Plant as one of the analyzable counterparties is sued in the court. The proposed form of the internal controller's working document, *Commercial Court Case Files Check*, (*Table 3*) shows the findings we made in scrutinizing the debtors.

Therefore, we should analyze financial statements prepared by the Machinebuilding Plant to test whether it meets the going concern principle and is able to repay its debts within the timelines set forth in contracts if the court issues an unfavorable ruling and imposes penalties.

Looking through the register of disqualified persons³, business entities may detect whether the would-be counterparty's executive body consists of any disqualified persons (company check). Checking the source⁴, business entities may run through the list of disqualified persons to possibly locate the counterparty's top managers (citizen verification). We suggest documenting the results of such checks in the proposed form of the internal controller's working document as showed in *Table 4*.

Checking the register of material facts⁵, business entities may learn about net assets, results of audits, pledged property. Findings of internal control are given in the proposed working documents, *Check of Register of Material Facts* (*Table 5*).

Searching through the log of mass business registration addresses (the location is qualified as such if it serves as the registered seat for 10 or more companies)⁶, it is possible to figure out the number of legal entities registered at the address in question. What also matters is to search for information about legal entities having taxes in arrears and/or failing to submit tax

returns for more than one year⁷. Findings are presented in the proposed working file of the internal controller, *Check of Mass Business Registration Addresses Database* (*Table 6*).

Business entities should be especially prudent when assessing the following aspects:

- the company's address serving as the registered seat for numerous business entities;
- substantial amounts of taxes due;
- the same person acting as the chief accountant and CEO;
- a short period of time between the official incorporation date and the conclusion of the contract with the supplier.

These aspects come under close scrutiny of financial functions, which should adhere to the statutory document⁸. The document enlists indicia of *mala fide* entities and rules for practicing the approach. To verify the creditworthiness of an entity, it is necessary to gather a set of documents (copies verified by the authorized person) before the contract is concluded or finished products, goods are shipped or services, work are delivered:

- 1) the Certificate of State Registration of the Legal Entity;
- 2) the Certificate of Tax Registration of the Legal Entity;
- 3) Articles of Association in the effective edition;
- 4) Executive Body Appointment Order (director, general manager);
- 5) Minutes of Executive Body Appointment (director, general manager);
- 6) lease contract for the registered address;
- 7) abstract from the Uniform State Register of Legal Entities as of the current date;
- 8) lease contract for warehouse and (or) production premises/facilities;

³ Federal Tax Service of the Russian Federation. Search through the register of disqualified persons. URL: <https://service.nalog.ru/disqualified.do> (In Russ.)

⁴ Federal Tax Service of the Russian Federation. Addresses indicated by several legal entities for the State registration as their registered seat. URL: <https://service.nalog.ru/addrfind.do> (In Russ.)

⁵ Uniform federal register of legally valid data on performance of legal entities, individual entrepreneurs and other business agents (Fedresurs). URL: <http://www.fedresurs.ru> (In Russ.)

⁶ Federal Tax Service of the Russian Federation. Data on mass business registration addresses. URL: <https://service.nalog.ru/baddr.do> (In Russ.)

⁷ Federal Tax Service of Russia. Data on legal entities having taxes in arrears and/or failing to submit tax returns. URL: <https://service.nalog.ru/zd.do> (In Russ.)

⁸ Resolution of the Plenum of the Supreme Arbitration Court of the Russian Federation № 53 of October 12, 2006, *On Arbitration Courts' Evaluation of Reasonableness of the Taxpayer's Tax Benefits*. URL: http://www.consultant.ru/document/cons_doc_LAW_63894/ (In Russ.)

- 9) information on the existence/non-existence of the official web site;
- 10) Balance Sheet;
- 11) tax returns;
- 12) bank account statement;
- 13) statement of specific tax treatment eligibility;
- 14) licenses (if the entity's activity is subject to licensing);
- 15) tax clearance statement;
- 16) copy of the executive body's passport details (director, general manager);
- 17) documents confirming title to motor vehicles;
- 18) contract for lease of motor vehicles or other documents confirming the physical availability of tangible resources for the declared activity;
- 19) information about the average headcount;
- 20) documents confirming the authorized person's entitlement to act as a signatory; copies of passport details of such persons.

It should be noted that the developing e-commerce made many buyers and sellers use Internet resources to seek and offer goods, work and services. Strengths can be found in every aspect of e-commerce. However, there are still many weaknesses which entail millions of losses for businesses. Sometimes Internet resources

happen to lack reliability and transparency. There more frequently reoccur bogus websites repeating the information of renown companies. Modern technologies and their growth raises the state of alert among the e-commerce market actors. Online services can be used to verify the reliability and creditworthiness of counterparties before contracts are concluded, such as website trust flow checks (Yandex), online reputation and Internet safety service (WebMoney Advisor, Web of Trust), domain name search, online scams checks, anti-virus software.

Users acquire additional information to verify the creditworthiness of their counterparties.

For example, using the Yandex service of trust flow check⁹, the user inserts details in the search box. The details are processed online and converted into tables. They help evaluate the creditworthiness of a counterparty. Certainly, it will not be a 100-percent guarantee of partners' reliability but will expand the user's knowledge of the counterparty's reputation.

The above data sources help reveal the quality of counterparties, their solvency, integrity and evaluate the potential of further cooperation. If the business entity chooses to enter into contracts for supply, purchase and sale, it can refer to the findings of the analysis as described above to determine the appropriate format of settlements with the counterparty in order to mitigate possible risks in the future.

⁹Yandex service for checking the website trust flow. URL: <https://xtool.ru>

Table 1**Publicly available sources on the Internet**

Website	Aspects to be checked
www.nalog.ru	Data verification in the Uniform State Register of Legal Entities
http://kad.arbitr.ru	Check of commercial court files
https://service.nalog.ru/disqualified.do	Register of disqualified person to check whether the counterparty's top managers are mentioned there
https://service.nalog.ru/addrfind.do	Information about mass business registration addresses
https://service.nalog.ru/baddr.do	Data on legal entities which cannot be contacted at the address indicated in the Uniform State Register of Legal Entities
https://service.nalog.ru/zd.do	Data on entities failing to perform tax liabilities
http://www.fedresurs.ru	Check of registers of material facts

Source: Authoring

Table 2**Working document, Check through the Uniform State Register of Legal Entities**

Debtor's Tax ID	Check results			
	Authorized capital, RUB	Core activity	Signatory of financial documents	Amendments to incorporation documents
52XXXXXXXX PAO Machinebuilding Plant	902,027,280	25.30 Production of a steam generating unit, other than central heating boiler	–	–
52XXXXXXXX PAO Instrument Engineering Plant	256,206,678	26.51.6 Production of other devices, meters, equipment and tools for measurements, control and tests	Oleg M. Petrov	–
52XXXXXXXX OOO Khlebozavod	27,819,450	10.71 Production of non-durable bread, pastry, cakes and baked confectionery products	Aleksei A. Ivanov	–

Note. Business data are conditional.

Source: Authoring

Table 3**Working document of the internal controller, Commercial Court Case Files Check**

Taxpayer's ID/Name of Debtor (Counterparty)	Check results			
	Case Number	Current phase / judge	Claimant	Defendant
52XXXXXXXX PAO Machinebuilding Plant	23.06.2017 A00-00000/2017	Arbitration Court of Moscow, A.G. Metel'kova	TRIADA Federal State Unitary State-Financed Enterprise	PAO Machinebuilding Plant
52XXXXXXXX PAO Instrument Engineering Plant	No data			
52XXXXXXXX OOO Khlebozavod	No data			

Source: Authoring based on the web service. URL: <http://kad.arbitr.ru/> (In Russ.)

Table 4**Working document, Check of Register of Disqualified Persons**

Taxpayer's ID of Debtor	Name	Results of Check	
		Disqualified persons in the executive body of the counterparty (organization)	Disqualified persons (CEO)
52XXXXXXXX	PAO Machinebuilding Plant	-	-
52XXXXXXXX	PAO Instrument Engineering Plant	-	-
52XXXXXXXX	OOO Khlebozavod	-	-

Source: Authoring based on URL: <https://service.nalog.ru/disqualified.do>; URL: <https://service.nalog.ru/addrfind.do>

Table 5**Working document, Check of Register of Material Facts**

Taxpayer's ID of Debtor	Results of Check			
	Net assets, thousand RUB	Audit Report on financial statements	Pledged property	Information on restructuring/dissolution
52XXXXXXXX PAO Machinebuilding Plant	Not available	No data	1. Toyota Highlander 2. Lexus LX 570	None
52XXXXXXXX PAO Instrument Engineering Plant	4,290	Financial statements, in material respects, give a fair and true view of the financial position of PAO Instrument Engineering Plant as of 31.12.2017, results of its financial and business operations for FY 2017 in compliance with the Russian rules for financial reporting	None	None
52XXXXXXXX OOO Khlebozavod	No data	No data	No data	None

Source: Authoring based on source data: URL: <http://www.fedresurs.ru>

Table 6**Working document, Check of Mass Business Registration Addresses Database**

Debtor, its address	Number of registered personalities
PAO Machinebuilding Plant	No data
PAO Instrument Engineering Plant	No data
OOO Khlebozavod	No data

Source: Authoring based on the website. URL: <https://service.nalog.ru/addrfind.do>

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Conflict-of-interest notification

We, the authors of this article, bindingly and explicitly declare of the partial and total lack of actual or potential conflict of interest with any other third party whatsoever, which may arise as a result of the publication of this article. This statement relates to the study, data collection and interpretation, writing and preparation of the article, and the decision to submit the manuscript for publication.

Translated Article[†]

GOOGLE TAX: HOW TO AVOID STEPPING BACK IN THE NEAR FUTURE?



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Abstract

Subject This article discusses the issues related to tax changes in the taxation of foreign organizations providing electronic services (e-services) in the territory of Russia. Such changes are expected in 2019.

Objectives The article aims to identify problems in the practice of e-service VAT taxation and tax management, as well as develop recommendations for certain improvements.

Methods For the study, I used the methods of economic analysis, induction, deduction, and comparison.

Results The article reveals the technical (determination of the e-service location) and organizational (unavailability of property in the territory of Russia) problems of effective tax administration. It proposes to use the best foreign practices (the EU case) as part of the VAT reverse charge mechanism.

Conclusions The general rules of e-services VAT taxation will change in the B2B segment from January 1, 2019. The article concludes that the effective mechanism of implementation of e-service VAT taxation is hampered by significant legislative and technical problems. Tax changes introduced from January 1, 2019 can further exacerbate these problems.

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Introduction

Since January 1, 2017, the Russian Federation has introduced the so-called *Google tax*, which involves the Value Added Tax (VAT) taxation of electronic services providers to Russia. The main objective of this legislative initiative was to involve foreign companies providing electronic services to Russian consumers (primarily, natural persons) in the national legal tax field [1–3].

Currently, the tax authorities are only observing the process of registration and payment of VAT.

According to official information of the Federal Tax Service of the Russian Federation (RF FTS), 163 foreign

companies from 29 countries are officially registered as taxpayers on the FTS website in the VAT office, as of July 27, 2018. Among the category under consideration, only five taxpayers have been registered in 2018 (*Table 1*).

The results of the RF FTS declaration campaign for 2017 showed that the total VAT proceeds in the Federal budget from foreign suppliers of Internet services amounted to RUB 9.34 billion. No doubt, this is a significant amount for the budget of the Russian Federation, but the tax potential of this industry is much higher [4–6].

According to economic experts, the industry is able to bring about RUB 182 billion of VAT payment in the RF consolidated budget [7]. The first two years of the existence of the *Google tax* show significant legislative and technical gaps that affect the quality of

[†]For the source article, please refer to: Тихонова А.В. Налог на Google: как не сделать шаг назад в ближайшем будущем? *Международный бухгалтерский учет*. 2018. Т. 21. № 10. С. 1129–1139. URL: <https://doi.org/10.24891/ia.21.10.1129>

administration of this tax and revenue amount to the budget considerably [8].

That is why the Ministry of Finance of the Russian Federation and RF FTS published more than 45 explanatory letters in 2017. In addition, rather significant changes are to be introduced in the tax structural quality after January 1, 2019. This determines the relevance of this study.

The General Rules of Electronic Service VAT Taxation from January 1, 2019

The general concept of taxation rules (up to January 1, 2019) assumes that a foreign organization providing electronic services to individuals, is to pay the Value Added Tax in the Russian Federation [9]. For this purpose, the Russian national legislation provides a special procedure for registration of foreign organizations with the Russian tax authorities¹.

At present, when supplying electronic services, foreign organizations should be registered with the tax authorities to assess VAT, if the customer of services is a natural person (*Fig. 1*).

The exception to this order is the situation when a foreign organization renders such services through its subdivisions opened in Russia. In such a case, there is no need to register with the tax authority. Separate subdivisions are already registered in tax inspections and pay VAT to the budget independently.

However, as of January 1, 2019, the foreign organization supplying electronic services will be vested with the obligation to assess VAT, regardless of who is the customer. According to the adopted law, the current mechanism of tax agent in providing electronic services by foreign organizations to organizations and individual entrepreneurs, registered with the Russian tax authorities, is excluded.

Starting from January 1, 2019, foreign providers of electronic services, as well as foreign agencies, involved in payments with Russian taxpayers that purchase electronic services, will be required to register for VAT payment in respect of such service delivery (B2B) [10].

Until February 15, 2019, foreign organizations providing electronic services to organizations and individual entrepreneurs registered with the Russian tax

authorities (including, for instance, branches of foreign organizations), will have to submit an application for the registration to pay VAT. The registration is mandatory even if the services rendered are exempt from VAT in Russia (for instance, granting rights to use software under the license agreement).

From January 1, 2019, foreign organizations that are already registered and paying VAT in relation to electronic services rendered to Russian customers, namely natural persons, will have to assess and pay VAT in the same way from deliveries to Russian taxpayers, namely organizations and individual entrepreneurs.

Peculiarities of Electronic Service VAT Taxation

Paragraph 1 of Article 174.2 of the Tax Code of the Russian Federation (RF Tax Code) defines 16 types of electronic services, rendering of which through the Internet to Russian users is subject to taxation².

These services are conditionally divided into the following groups.

1. Advertising and Promotion:

- advertising services;
- placement of offers on purchase of goods, works, services;
- services to provide opportunities to forge partnerships between buyers and sellers;
- services on search and/or presentation of the information on potential buyers to the customer.

2. Internet Data Processing:

- granting rights to use software, databases;
- information storage and subsequent processing;
- providing capacity to store data;
- providing access to search engines;
- services on data retrieval, selection and sorting;
- granting rights to use cultural and educational data.

3. Internet Work-Related Services:

- presence in the network, support of electronic resources, providing access to resources;

¹ From January 1, 2018, Russian organizations that are subjects of the national payment system (including telecom operators) and performing intermediary activities on settlements (transfer of funds) with customers of electronic services, are not recognized as tax agents.

² According to the Tax Code of the Russian Federation, any provision of services in electronic form means rendering services in an automated fashion, using information technologies through the information and telecommunication network, including the Internet.

- information systems administration;
- granting domain names, rendering hosting services;
- collecting statistics on websites.

The sale of goods, implementation of software with no data on tangible media, and the provision of consulting services via e-mail, and Internet access services are not included in the previous list [11].

The rule to determine the place of rendering of services is described in Subparagraph 4 of Paragraph 1 of Article 148 of the RF Tax Code. At the same time, Paragraph 3 of Article 148 of the RF Tax Code notes that the place of implementation of related services (works) is determined at the place of realization of basic services (works). The place of implementation of electronic services through the Internet is defined in a special way (Fig. 2).

In the case of such a category of electronic service purchasers, as individuals who are not individual entrepreneurs, a special procedure for determining the location is established.

For instance, when a non-individual entrepreneur's purchasing digital services via the Internet, the Russian Federation shall be the place of services delivery if:

- the natural person resides in the Russian Federation;
- the bank that opens the account for the services payment or the e-money service business are located in the Russian Federation;
- the IP address of the customer purchasing the services is registered in the Russian Federation;
- the International dialing code belongs to the Russian Federation (if services are paid via phone).

There are serious problems in this area that hinder effective VAT administration. For instance, at the moment, it is not clear how the online store can determine the location of the e-service purchaser [12].

The IP address of the individual purchasing the service will fail to answer this question unambiguously, even. The point is that the proxy server is able to transmit traffic absolutely through any country (even through a chain of countries) at the choice of the service purchaser. The service supplier will also locate the specified country as the source of the service request.

In addition, a great number of goods and services via the Internet is currently purchased using electronic wallets. As a result, the bank or e-money service

operator's location is sometimes impossible to identify, especially if there is no customer's telephone number.

Thus, certain technical aspects do not allow the customer to qualitatively perform VAT payment duties, even if there is a due and right wish of the taxpayer, foreign service provider, to do so.

To pay VAT, it is not necessary to open a current account in a Russian bank. This tax can be paid from any other account opened in a commercial bank located outside the Russian Federation.

If a tax agent participates in the sales chain, he/she performs the duties of assessing and paying VAT to the budget. In such a situation, the tax agent may claim a VAT credit, provided that:

- the tax agent is the VAT payer. Hence the conclusion is that taxpayers applying special tax regimes cannot claim a VAT credit for the VAT paid on electronic services;
- goods, works, services are purchased for VAT taxable operations;
- the VAT amount is deducted from the money paid to the foreign company and transferred to the budget.

From January 1, 2019, documentary confirmation of the service implementation place will also be changed for organizations and individual entrepreneurs. In accordance with the current edition of the RF Tax Code, such documents are as follows:

- Contracts concluded with foreign or Russian entities;
- Documents confirming the fact of performance of works (rendering of services).

According to the new rules, the service implementation place concerning individuals, organizations and individual entrepreneurs will be confirmed in the same way, i.e. on the basis of transaction registers indicating information on fulfilment of the conditions stipulated in the second and fourteenth to seventeenth passages of Subparagraph 4 of Paragraph 1 of Article 148 of the RF Tax Code.

The Current State and Issues of Electronic Service VAT Operations

As it was noted, starting from January 1, 2019, regardless of the organizational and legal form, any foreign organization shall be obliged to register with the tax authorities if implementing electronic services to economic entities in the territory of the Russian

Federation. For this purpose, a new scheme of simplified registration as a VAT payer has been introduced into the tax legislation.

The scheme of registration is quite simple: a foreign organization must submit the relevant application and other documents³ within 30 calendar days starting from January 1 and no later than 30 calendar days from the date of commencement of electronic services supply to the Russian customers.

Documents may be submitted in common ways. This can be done personally, through a representative, or by registered mail. However, the most convenient option is an electronic registration via the RF FTS website, with no enhanced encrypted and certified digital signature required. After that within 30 calendar days, the tax authority registers the foreign organization and notifies it about this.

To simplify the procedure of VAT operations and ensure the transparency treatment of VAT assessment, the RF FTS has developed and offers a taxpayer profile account option for foreign organizations that supply electronic services in the Russian Federation⁴.

It is important to note that the documents submitted to the tax authority through the taxpayer profile account and enhanced encrypted and non-certified digital signature signed, are recognized as electronic documents equivalent to hard copies signed by a representative of such an organization with his/her own hand.

The VAT special tax return is the main document administered by the RF FTS for this category of taxpayers. In fact, it consists of two sections: VATable transactions and non-VATable transactions⁵. In this case, the purchase and sales ledgers, as well as the journals of VAT invoices received and issued for electronic services implementation are not assembled by foreign suppliers⁶.

The legislation also defines some peculiarities concerning the procedure of in-house tax control (*Table 2*).

It should be noted that the possibility of requesting information on money transfers to the accounts of foreign organizations within the national payment

systems is an important tool of tax management. It contributes to the determination of the real amount of revenues from the provision of electronic services in the territory of the Russian Federation, especially if there are technical deficiencies in determining the place of implementation of services (as noted before).

However, this approach can be applied only to the digital market majors, while the issue of effective administration of small foreign companies is still a pending one. Therefore, tax management comes down to the analysis of the information submitted by taxpayers, and it is not always true and reliable [13].

In addition, it was previously noted that the availability of a bank account in the Russian Federation is not mandatory for registration with the tax authorities. In this regard, it is not clear how to prosecute a foreign taxpayer in case of detecting the fact of committing an offence, if the majority of foreign taxpayers does not have any property in Russia.

And finally, one of the most significant problems in the e-services VAT tax management is a new transition to tax payment by foreign suppliers in the B2B segment. The matter is that the approach like this will cause an unbalance in foreign companies' VAT payments on electronic and other services rendered in the territory of the Russian Federation. In fact, this creates additional administrative barriers and hinders the development of foreign digital markets in Russia.

Conclusions

The analysis shows that significant legislative and technical problems hinder the successful development of a mechanism of e-services VAT tax implementation. However, the tax changes in this area expected from January 1, 2019, in our opinion, will further aggravate the unregulated nature of tax management.

We believe that the improvement of taxation and tax management of foreign suppliers of electronic services is possible only under appropriate reference to the most advanced international practices, first of all, the ones of the EU countries [14–16]. For instance, the B2B segment uses the *Reverse Charge VAT* mechanism, which involves the transfer of the seller's tax payment to the purchaser, with the simultaneous acceptance of VAT to be paid by the latter.

This mechanism is not just taxpayer convenient, but it also helps reduce the risk of fraud in the field of Internet service trade, making it a minor one.

³ The list of documents is subject to approval by the Ministry of Finance of the Russian Federation.

⁴ The RF Tax Code, Para. 3, Art. 11.2.

⁵ In accordance with the RF Tax Code, Subpara. 26, Para. 2, Art. 149.

⁶ The RF Tax Code, Para. 3.2, Art. 169.

Table 1**Number of foreign e-service supply VAT payers**

Country	Number of Taxpayers 45	Overall Number Ratio (Percentage)
United Kingdom	28	17.2
Ireland	21	12.9
Germany	17	10.4
Netherlands	11	6.7
Luxembourg	6	3.7
Switzerland	5	3.1
Cyprus	4	2.5
France	3	1.8

Source: Authoring based on the Federal Tax Service of the Russian Federation data. URL: <https://lkireg.nalog.ru/ru/registry>

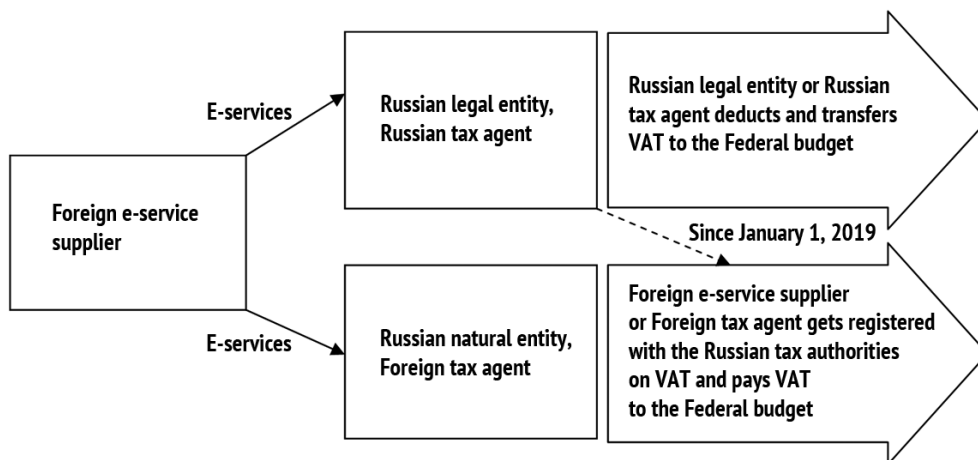
Table 2**Peculiarities of office tax audit of foreign e-service suppliers**

Audit Criterion	Standard Inspection Procedure	When E-Services Providing by Foreign Suppliers
Auditing all-in term	Three months maximum	Six months maximum
Failure to file a tax return	–	The tax authority shall send a notice within 30 calendar days from the date of expiry of the deadline for submission
Deadline for submission of documents from the date of requirements receipt	Ten days	Thirty days
Request for information	–	The tax authority, subject to the consent of the FTS Head (Deputy head), may request information on remittances to the accounts of a foreign organization

Source: Authoring based on the Tax Code of the Russian Federation

Figure 1

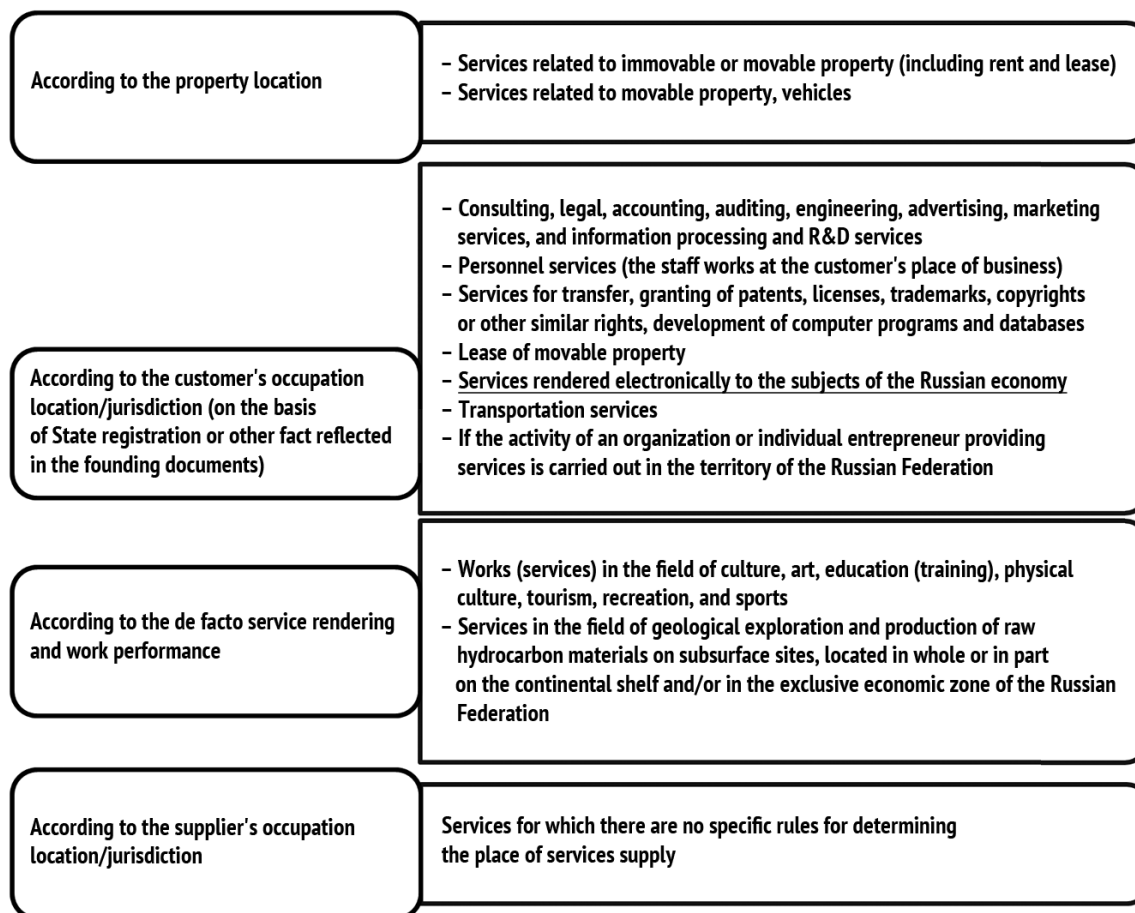
A general procedure of VAT computation and payment when supplying e-services till January 1, 2019



Source: Authoring

Figure 2

Service location for VAT computation



Source: Authoring based on the Tax Code of the Russian Federation

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Conflict-of-interest notification

I, the author of this article, bindingly and explicitly declare of the partial and total lack of actual or potential conflict of interest with any other third party whatsoever, which may arise as a result of the publication of this article. This statement relates to the study, data collection and interpretation, writing and preparation of the article, and the decision to submit the manuscript for publication.

Translated Article[†]

THE TWO-PARAMETER FORMULA OF DEFAULT PROBABILITY TERM STRUCTURE

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Available online 24 December 2018**JEL classification:** C58, G17, G28**Keywords:** credit risk, IFRS reserves, default probability, default term structure, IFRS 9**Abstract****Subject** The article discusses the existing methods to model the term structure of default probability and their drawbacks affecting the practical use.**Objectives** The research is aimed to make effective suggestions to creditors on setting the technique to evaluate the probability of the corporate borrower's default, considering a changeable term before the loan deal ends, without contradicting IFRS 9 – *Financial Instruments*.**Methods** The research represents the economic and statistical analysis, optimizes aspects of special distributions based on statistical data of rating agencies.**Results** I refer to consolidated empirical data of rating agencies on the corporate sector to substantiate the two-parameter formula of term structure of default probability, which does not contradict IFRS 9 with respect to corporate borrowers. In this case, internal bank data are insufficient to build the separate internal model *PD Lifetime* or this process is too arduous.**Conclusions and Relevance** I substantiate the default probability term structure formula, which is best in the pool of fitting distributions, being calibrated with empirically and statistically representative external data of rating agencies, covering a 44-year period. The formula is explicit, without implying complex calculations. The formula may prove useful in calculating the rate of reserves for loan assets, with their terms being coordinated with the principle lending mechanism (SPPI test) with respect to the second impairment phase under the classification given in IFRS 9.

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Introduction

The probability of default (PD), as a key credit risk metric, is assessed for the nearest-year interval in line with the current macroeconomic forecast of the general credit risk profile for the year (point-in-time paradigm, PIT). The through-the-cycle paradigm (TTC) is alternative to the PIT paradigm. In the case of the TTC paradigm, the average annual PD is determined by the economic situation averaged through the cycle. Average

estimated losses, which are backed with economic reserves, are based on the PD PIT. However, PD TTC should be used instead to evaluate the economic capital required to cover unforeseen losses, as per the approach proposed in the International Convergence of Capital Measurement and Capital Standards¹. Neither formula requires the cumulative probability of default $PD(t)$ (for a random period t) to practically implement the advanced approach of Basel II Accord, since the average annual value is sufficient to estimate expected losses, while the maturity adjustment formula

[†]For the source article, please refer to: Помазанов М.В.Двухпараметрическая формула срочной структуры вероятности дефолта. *Финансы и кредит*. 2018. Т. 24. № 8. С. 1920–1937. URL: <https://doi.org/10.24891/fc.24.8.1920>¹ International Convergence of Capital Measurement and Capital Standards: A Revised Framework. Bank for International Settlements, 2004. URL: <https://www.bis.org/publ/bcbs107.pdf>

may be used to measure the capital within the credit risk period².

The adoption of IFRS 9 – *Financial Instruments* made it especially significant to correctly determine the cumulative probability (life cycle) PD^3 . As per IFRS 9, expected losses should be assessed before the end of transactions term, which caused an increase in credit risk, i.e. those assets of the second tier (where the third tier is default as classified in IFRS 9). Therefore, there should be a proven technique to calculate the probability of default throughout the entire life cycle, at least, as $PD(t, PD1)$, where $PD1$ is the probability of default for the year $PD(1, PD1)=PD1$.

It is clear that the trivial *lamp burnout formula*⁴

$$PD(t, PD1) = 1 - (1 - PD1)^t \quad (1)$$

is a too rough semblance, turning out to be conservative for t of over 2 to 3 years. The formula is pretty applicable in case of $t < 1$, indeed.

From fundamental perspectives, multiperiod assessments of $PD(t)$ are based on several approaches and their combination:

- 1) structural models of default through various dependencies of assets behavior;
- 2) models based on research into the proper population of clients, drawing upon survival models and maximum likelihood estimation method;
- 3) models based on the Markov chains (roll rate model) and migration of ratings;
- 4) direct fitting of dependence $PD(t)$ on the basis of observable statistics (including that of rating agencies).

The first approach is embedded into Basel II recommendations for capital adjustment since the economic capital measurement approach entirely draws upon the classic structural approach of Merton,

Black and Scholes [1]. The basic capital requirements evaluation formula was derived by O. Vasicek [2].

In the research referred to herein [3], authors focus on the classical perception of a default as an occasional impairment of assets down to the external debt level, with the theoretical behavior $PD(t)$ being described with the formula resulting from the Merton formula. However, the authors specify the parameters of the formula in line with the effective return on capital, which is measured with the company's rating. Consequently, the capital requirements evaluation approach for multiperiod transactions generates an adjustment which is very close to that stipulated in the Basel II Framework. Empirical calculations refer to four rating agencies' data on the cumulative probability of default in the periods of {1,2,3,4,5} year with respect to several generalized rating grade (AAA, AA, A, BBB, BB, B, CCC/C). It is noteworthy that PD does not fit or fits badly to the AAA/A grades.

As for structural models of default probability [4, 5], a conditional time distribution before the default was used in the case of issuers with their default being unclearly observed or with noise. The model implies the default intensiveness prices, which depends on the current measurement of distance to default and other predictors, which may give additional information about the corporate position. The financial position of a company may be influenced by some diverse factors, including its corporate distinctions, size of the sector, macroeconomic cycle. All these variables are able to impact trends in payment flows and financial leverage. The structural model-based approach allows to accommodate other observable and unobservable predictors alongside with the distance-to-default metric in order to take into account credit risk causes, which are not covered with the *distance-to-default* metric.

The second approach to PD life cycle measurement applies bank statistics, being best compliant with IFRS 9 (B5.5.52 Information of prior periods should be the starting point for further estimation of credit losses). It involves historical data on the life cycle of each particular asset in accordance with censoring, when an asset was opened before the beginning of the period, i.e. no default by the beginning of the period, with the moment of the planned cut-off of the asset taking place in the future as well as defaults of assets opened in the given period and defaults of those ones opened earlier. This method is based on the

² Para. 272, International Convergence of Capital Measurement and Capital Standards: A Revised Framework. Bank for International Settlements, 2004. URL: <https://www.bis.org/publ/bcbs107.pdf>

³ International Financial Reporting Standard 9 – Financial Instruments (edition of August 26, 2015). IFRS 9 was approved by Order of the Russian Ministry of Finance of April 2, 2013 № 36H and must be enforced starting from 2018.

URL: https://www.minfin.ru/ru/document/?id_4=117330

⁴ Exponential dependency of the survival probability on time $F(t, \lambda) = e^{(-\lambda \cdot t)}$, assessed on the basis of the independence of burnout probability at any point of time t from t .

survival function which engenders the likelihood functionality and streamlines optimization issues. In addition to the time (age) parameter, the cumulative probability formula also comprises financial parameters of the asset, security parameters, macroparameters, homogeneous cyclical functions.

The mathematical structure of survivor models underlies the calculation processes described, say, in the research by N.M. Kiefer and C.E. Larson [6]. Such models work for mass (mostly retail) assets, being rather effective. The Cox proportionate hazards model is the most conventional [7] as presented in its contemporary interpretation by J. Bredeen [8]. The Cox model builds on the assumption that the risk function is decomposed into independent products. The first one depends on the exposition time, while parameters of the assets are what matters for the other. Subsequently, two independent predictors are set for the maximum likelihood function – for the term and parameters of the asset separately, thus simplifying the task.

The third approach is about the ultimate number of the borrower's states (rating grades). As part of the third approach, a transition rate matrix is built. During the continuous time Markov chain, the transition rate matrix for the period between dates 0 and t is generated by taking the power of the generator matrix [9]. The generator matrix is squared by number of states $K \times K$ so that the transition rate matrix in the period looks like $(0, t)P(0; t) = \exp(Gt)$. In the homogeneous time case, the product Gt constitutes the product of the matrix time a scalar number, while the exponential function is the ultimate amount:

$$\exp(Gt) = \sum_{k=0}^{\infty} \frac{t^k}{k!} \cdot G^k, \quad (2)$$

or $P(0, t) = \exp\left(\int_0^t G(t) dt\right)$ in non-homogenous case, where the generator function G has the following properties $G_{(i,j)} \geq 0, i \neq j$ and $G_{(i,i)} = -\sum_{i \neq j} G_{(i,j)}$.

Capturing the frequency of state transitions in different periods of time through the maximum likelihood method, components of the generator matrix are assessed. The same is done for components of

the transition rate matrix but in accordance with macroeconomic parameters [10, 11].

The blend of the third and fourth approaches implies a search for the non-homogeneous time generator matrix $G(t)$ using the fit matrix $\varphi(t)$, which is diagonal so that $G(t) = G \cdot \varphi(t)$,

$$\varphi_{i,j} = \begin{cases} 0, & \text{if } i \neq j \\ \varphi_{\alpha,\beta}(t), & i = j \end{cases}, \quad \varphi_{\alpha,\beta}(t) = \frac{(1 - e^{-\alpha t}) \cdot t^{\beta-1}}{1 - e^{-\alpha}}$$

[12].

Parameters α, β are selected by minimizing approximation metrics to observations of the cumulative probability of default, which correspond with various rating grades assigned by Fitch and Standard & Poor's. The two-state class of fit functions is subsequently used to set up the transition rate matrix for the arbitrary time t using the formula (2). This method is applied to calculate the probability of default before the end of transactions with the Bulgarian corporate bonds [13] as part of making provisions and reserves under IFRS 9.

The above approaches (1 to 3) have considerable drawbacks constraining (but not preventing) their practical use. As for the first approach, it depends on the structural model, which is built on a family of arbitrary processes close to the Winner one. Therefore, deviations from real default statistics are usual and natural. Although being reasonably based on the real internal experience, the second approach requires extensive statistics so as to successfully apply evaluation algorithms. The *PD* lifecycle evaluation algorithms are difficult to implement, entailing substantial costs and efforts. The third approach focuses on the ultimate set of rating grades, making the bank evaluate the transition rate matrix in a statistically flawless fashion as part of the internal rating method, and address the continuity issue of default probability assessed through the internal model and scaling it in line with the external one as part of the external rating method. Whereas the extrapolating function is difficult to exercise (for example, via Microsoft Excel), this complicates the practical use of the approach, especially if the accounting requirement to predict the model dependency is observed on the basis of macrofactors [14].

The default risk duration model has been proposed for the first time among arbitrary distribution-based

approaches. Considering the term structure of default probability, the cumulative probability of corporate borrowers' default may presumably be described with the Weibull distribution⁵.

The research by D. Petrov and M. Pomazanov [15] presents a method to calculate the capital adjustment to the term using publicly available data released by rating agencies. Three-parameter function $PD(t)$ lays the basis for the fitting. Its parameters are calibrated with the dependence on PD (1 year). Analytical expressions are proposed, unveiling the term structure of default probability with the high precision fitting. To confirm/amend recommendations of Basel II Accord, we compare results we obtained in evaluating the capital adjustment and Basel term adjustment formula. The nature of the resultant dependencies mainly justifies the term adjustment recommendations. However, we discovered risk-exposed capital may be underestimated in the context of low default probability and maturity of two to three years.

I would like to point out some critical requirements of IFRS 9 concerning the PD assessment within the protracted life of a loan.

1. PD should be calculated on a sufficient sample. It means that the sample should be extensive so as to ensure a representative and meaningful view and verify characteristics of losses. Historical losses data should cover at least one full credit cycle.
2. If assessed for the credit life cycle, PD should be conservatively based on respective extrapolating methods. When extrapolating methods are used to determine PD lifelong metrics, expected credit loss (ECL) should be estimated without any biases.
3. PD estimates should accommodate forecasts, including macroeconomic factors in determining PD life cycle so as to ensure losses are timely recognized.
4. Internal data should be employed to set PD models, if possible, without excessive costs and efforts. The data should constitute a portfolio in the future.
5. If external data or suppliers' models are used, the external calibration example should be representative of the internal risk profile of the current population.

This research substantiates the best cumulative PD calculation formula in the pool of fit distributions, which

is calibrated with external representative data for the longest historical period of 40 and more years, for which such data are available. The formula depends on a cycle and may include information from macroeconomic forecasts. It can be preferably applied to corporate borrowers, the sample of which is not historically representative through internal data of a credit portfolio. The proposed extrapolation of default probability, which is applied to assess ECL-based reserves, does not contradict IFRS 9.

Analysis of Two-Parameter Models of Default Probability Lifecycles through Rating Agencies' Statistics

To find the distribution which would best describe the analyzable data, we compared the cumulative probability of issuers' default presented in the table and provided by rating agencies, and the presumed distribution function. The distribution function parameters were determined with the least square method.

The distribution efficiency metric is represented with R^2 :

$$R^2 = 1 - \text{RSS} / \text{TSS};$$

$$\text{RSS} = \frac{1}{T} \cdot \sum_t \left(\frac{y - \hat{y}}{y} \right)^2; \quad (3)$$

where y denotes empirical data of a rating agency;

\bar{y} denotes data on the cumulative probability of default for each rating grade, averaged for ten years;

\hat{y} denotes the estimated probability of default predicted through an optimized model;

T denotes the maximum duration of empirical sequence of terms.

Negative R^2 metric means that naive average approximation gives the best view of a range of values than the distribution. Negative R^2 will be excluded from the sample. The model with the highest R^2 is taken as the optimal specification for most ratings.

What kind of distributions should be taken into consideration for this purpose? The task may possibly be fulfilled with a decic polynomial but such a solution would not be optimal. Parametric models for default intensity are suggested to include the Weibull distribution, log-logistic, log-normal and exponential

⁵The distribution is given in the following point.

distributions. The expanded list of expectedly useful distributions, which may work for the survival analysis, is given in the monograph by A.W. Marshall and I. Olkin [16]. The authors point out families of the following distributions and select only two-parameter ones⁶:

1) exponential distributions:

- the Weibull distribution:

$$F(x) = 1 - e^{-\lambda x^\gamma};$$

- exponentially tilted distribution:

$$F(x) = 1 - \frac{\gamma}{e^{-\lambda x} - (1 - \gamma)} x \geq 0; \gamma, \lambda > 0;$$

2) logistic distributions:

- log-normal distribution:

$$F(x) = N\left(N^{-1}(p) + \frac{\ln(x)}{\sigma}\right) x \geq 0; p \in (0, 1), \sigma > 0$$

where $N(x)$, $N^{-1}(x)$ denote direct and inverse normal distributions respectively;

- log-logistic distribution:

$$F(x) = \frac{1}{1 + (x/\alpha)^{-\beta}};$$

3) the Gompertz distribution:

- the Gompertz distribution:

$$F(x) = 1 - \exp\{-\xi(e^{\lambda x} - 1)\} x \geq 0; \xi, \lambda > 0;$$

- the negative Gompertz distribution:

$$F(x) = 1 - \exp\{\xi(e^{\lambda x} - 1)\} x \geq 0; \xi, \lambda > 0.$$

To choose the best distribution for purposes of the research, I collected data on the average cumulative probability of corporate borrowers' default, which were provided by rating agencies Moody's, Standard & Poor's, Fitch. The rating agencies have a different track record and credit rating methodology. Multiple gaps S&P and Fitch left in investment rating charts is the first difficulty that arose during data processing. The collected statistics are not enough in the case of issuers with very high and very low ratings. That is why expert assessments are needed, rather than statistical inference. Due to this reason, it is logic to analyze a limited pool of ratings A1–Caa3. Different time horizon showing the data on the cumulative probability

⁶ One-parameter distributions are rejected since they are evidently unable to be an effective extrapolation of *PD* lifecycle.

of default is another distinctive feature. Some ratings of Moody's cover a 17-year span, while the other ones are given for a 20-year period. S&P provides information for a 15-year period. Fitch unfolds data on the first five and ten years. That is why, cumulative terms of one to ten years were chosen for identical evaluation purposes. Empirical data were sourced from annual reports:

– Moody's⁷ – *Corporate Default and Recovery Rates, 1920–2015*, Exhibit 35 – *Average Cumulative Issuer-Weighted Global Default Rates by Alphanumeric Rating, 1983–2015*. The range of ratings A1/Caa3 (15 grades);

– Standard&Poor's⁸ – *Default, Transition, and Recovery: 2015 Annual Global Corporate Default Study and Rating Transitions*, Exhibit 26 *Global Corporate Average Cumulative Default Rates by Rating Modifier (1981–2015)*. The range of ratings A+/B– (12 grades);

– Fitch⁹ – *2015 Transition & Default Studies*, Table *Fitch Global Corporate Finance Average Cumulative Default Rates: 1990–2015*. The range of ratings A/B– (11 degrees).

The best distribution criterion is rather simple.

Distribution *A* is better than distribution *B*, if estimates of distribution *A* are higher than R^2 estimates of distribution *B* in most of the ratings.

Empirical analysis of R^2 estimates with respect to optimal parameters of the same R^2 metrics gave the results presented in *Table 1–3*.

As a result of the empirical analysis, I conclude that the log-normal distribution is the most appropriate option to describe the structure of the default probability in the corporate finance segment among the proposed set of two-parameter families of distributions.

Stationary Parameters of Log-Normal Distribution of Default Probability Term Structure as per Moody's (1983–2016)

The log-normal structure of *PD* time dependence is expressed as follows:

$$PD(t, p, \sigma) = N\left(N^{-1}(p) + \frac{\ln(t)}{\sigma}\right),$$

⁷ Moody's. URL: <https://www.moody.com/pages/guidetodefaultrese arch.aspx>

⁸ Standard & Poor's. URL: <https://www.capitaliq.com>

⁹ Fitch Ratings. URL: <https://www.fitchratings.com>

which has explicit economic interpretation of parameters:

- $PD(1, p, \sigma) = p$, i.e. parameter p is the probability of default within the year interval;
- parameter σ determines the kurtosis of term curve $PD(t)$. The greater σ , the steeper the curve and the weaker the time dependence.

The log-normal distribution has the extreme value of the unconditional default intensity

$\rho(t, p, \sigma) = \frac{d}{dt} PD(t, p, \sigma)$, which is seen within terms $T_{max} = \exp(-\sigma \cdot N^{-1}(p) - \sigma^2)$.

The default intensity decreases within the term of transactions $t > T_{max}$, which is not economically contradictory since the principal default intensity is more probable in the earlier period than the later one. The average time before default, which is weighted at ρ :

$$\bar{T} = \int_0^{\infty} t \rho(t) dt = \exp\left(-\sigma \cdot N^{-1}(p) + \frac{\sigma^2}{2}\right).$$

It is obvious that an increase in p reduces the term of maximum intensity and mean time before default.

To assess values and their properties, such as

- numerical value of σ ;
- dependency of p on the rating grade (hereinafter denoted as $\langle PD1 \rangle$);
- comparison of the value with empirical $PD1$ (statistical default probability of a grade in a year);
- verification of the hypothesis on the dependency of σ on p within the averaged historical interval

let us refer to statistical data of Moody's. The data are presented in the Moody's report, *Corporate Default and Recovery Rates, 1920–2016*, Exhibit 35 – *Average Cumulative Issuer-Weighted Global Default Rates by Alphanumeric Rating, 1983–2016*. Ratings A1/Caa3 (15 grades), range of terms – 1, 2, ..., 20 years.

The sum of squared deviations (3) reaches its lowest if the value of σ equals 1.765. The optimization includes two steps. First, optimal values are found $\langle PD1_{Rating}(\sigma) \rangle$, meaning the minimum of relative squared deviation per each grade. Afterwards the value of σ , which minimizes the total sum of squared deviation for all the grades. *Table 4* presents the results.

As *Table 4* shows, model values of the average annual default probability $\langle PD \rangle_{-1}$ year are not significantly different from empirical values measured through historical data. However, the generally high level of interpolation quality (fitting) results from high R^2 (99+%, except for Caa3). *Fig. 1* depicts the extrapolation quality with respect to a sample of three dependencies of PD term structure on grades.

The following step is to verify the hypothesis assuming that there is/is not monotonous dependence of values of $\sigma(p)$. It means each grade has the optimal σ_{Rating} . The monotonous relation hypothesis is validated by evaluating Spearman's rank correlation¹⁰ between the rating and value of σ_{Rating} . Values of σ_{Rating} are indicated in *Fig. 2*.

Spearman's rank correlation results in $R_{xy} = -0.1$. The following formula serves to validate statistics relating to the dependence hypothesis:

$$t = \frac{R_{xy} \cdot \sqrt{n-2}}{\sqrt{1-R_{xy}^2}} = 0.375, \quad (4)$$

It is subject to t -test (Student's t -test) with $n-2$ degree of freedom, where $n=15$ (the number of grades). The critical value of t , which makes the null hypothesis (zero dependence) with a 90 percent confidence is true, is $t_{crit.(H0)}=0.13$. The critical value of t , which ensures the same confidence level of 90 percent, is $t_{crit.(H1)}=1.78$. It means none of the hypothesis can be accepted at a 90 percent level. The zero dependence hypothesis can be approved at a 70-percent level but this confidence level is insufficient. Therefore, there are not reliable data to find the dependence of $\sigma(p)$. So, $\sigma(p) = const$ is quite a reasonable model, at least, in the case of the mean data of historical periods, i.e. in terms of TTC.

PD Lifecycle Model in Line with the Current Economic Cycle

Empirical analysis of PIT-dependency of the log-normal distribution parameter on an economic cycle is conducted on the basis of Moody's historical records reported in the same *Corporate Default and Recovery Rates, 1920–2016*, but in Exhibit 41 – *Cumulative Issuer-Weighted Default Rates by Annual Cohort, 1970–2016*.

¹⁰ For example, refer to Nasledov A.D. *Matematicheskie metody psikhologicheskogo issledovaniya. Analiz i interpretatsiya dannykh* [Mathematical methods for psychological research. Data analysis and interpretation]. St. Petersburg, Rech' Publ., 2004, 392 p.

Exhibit 41 aggregates annual data on *PD* term structure by consolidated rating grade {Aaa, Aa, A, Baa, Ba, B, Caa-C}, including those averaged by *SG* class (Speculative-grade) from 1970 through 2016. The cyclical behavior of the parameter is studied through grades with a substantial statistical background of defaults {Baa, Ba, B, Caa-C}. Average *PD*-year of *SG* class is taken as the leading cycle indicator. The historical range of *PD* term structure measurements is limited with 2013, which has four annual points of measure, with a maximum of 20 (the largest number of measurements is observed starting from 1997 and earlier), i.e. the number of annual measurements is 44.

The optimal annual value of σ (year) is computed through the same algorithm as is done in the previous point but for fewer rating grades (it does not depend on a grade. There four grades). After the σ time series is measured (year), a statistical test is conducted to verify the hypothesis of significant Spearman's rank correlation between a series of 44 values *PD*1(year) and σ (year). Spearman's rank correlation generates the positive value of $R_{xy}=0.6$, with the *t*-test of 4.84 appearing to be very high, thereby assuring the positive monotonous correlation hypothesis with the confidence level above 99 percent.

The cycle-based model of σ (year) is set on the linear formula:

$$\hat{\sigma}(\text{year}) = \bar{\sigma} + \beta \cdot \left(\frac{PD1(\text{year}) - (\overline{PD1})}{PD1} \right), \quad (5)$$

where $(\overline{PD1})$ is the mean value of *PD*1(year) (it equals 3.8 percent as per Moody's observation statistics for *SG* class), i.e. it refers to *PD* *TTC* in Moody's observations;

$\bar{\sigma}, \beta$ are parameters measured through the global minimum $RSS = \sum_{\text{year}} \frac{1}{T} \cdot \sum_t \left(\frac{y - \hat{y}}{y} \right)^2$ throughout the 1970–2013 observation period (44 points). Searching for the optimal values of $\bar{\sigma}, \beta$, I arrive at $\bar{\sigma}=1,552; \beta=0,412$.

Fig. 3 illustrates the comparison of empirical σ (year) and model parameters of $\hat{\sigma}(\text{year})$. When average annual default probability reaches critical points, values of σ increase, allowing for a greater slope of *PD* term structure in the future.

Direct linear regression of cycle-based annual probabilities of default *PD*1 (year) by values of optimal σ (year) series through model (5) generates regression coefficients and their confidence intervals, indicated in *Table 5*.

Optimal parameters are close to regression one in accordance with the confidence interval, but they are preferable in terms of practical use since they result from direct minimization of errors (3) in accordance with the non-linear nature of the log-normal distribution in the case of *PD* term structure.

Conclusion

Referring to consolidated empirical data rating agencies collected on the corporate sector, I substantiate the two-parameter formula of default probability term structure, which does not contradict requirements of IFRS 9 with respect to corporate borrowers. The sector of corporate borrowers lacks proper internal data, which would be sufficient to set the Lifetime *PD* model. Otherwise such a model requires too much effort and time. To apply the formula, it is enough to calculate average annual probability of company's default *PD*1 using the internal model calibrated with sector mean *PD* *PIT* and accommodating the macroeconomic forecast with respect to the sector. The formula is based on the log-normal family of distributions of dependency term structure *PD*(*T*) given the exposition term (transaction term) $T > 1$ year:

$$PD(T) = N \left(N^{-1}(PD1) + \frac{\ln(T)}{\sigma(PD_{PIT}, PD_{TTC})} \right);$$

$$\sigma(PD_{PIT}, PD_{TTC}) = 1.552 + 0.412 \cdot \left(\frac{PD_{PIT} - PD_{TTC}}{PD_{TTC}} \right).$$

This article does not discuss the method to evaluate PD_{PIT}, PD_{TTC} since it might be the subject of another research. If $T < 1$ year, it is advisable to apply a well-known extrapolation formula of *PD*1 given the term is less than a year $PD(T) = 1 - (1 - PD1)^T$.

The probability of default *PD*1 is computed by calibrating the rating or rating point measured through the internal model. The calibration technique and rating model setting process can be found in my earlier

monograph¹¹. The rating model based on financials of private sector corporations is proposed in the research by A. Karminskii [17].

The findings and results may have the following practical and theoretical scope of application:

– assessment of the rate of provisions for credit assets, when their terms correspond with the principal lending mechanism (SPPI test¹²) at the second

impairment phase, as per the classification given in IFRS 9;

– internal assessment of economic capital requirements for a transaction in accordance with the term;

– assessment of the lowest (break-even) loan rate in line with risk and term of a transaction;

– optimization of the term of a transaction and other possible addenda.

¹¹ Pomazanov M.V. *Upravlenie kreditnym riskom v banke: podkhod vnutrennikh reitingov (PVR)* [Credit risk management in bank: Internal Ratings Approach]. Moscow, Yurait Publ., 2016, 265 p.

¹² For more details please refer to IFRS 9 (2013).

Table 1
Selection of the best-fit distribution, according to Moody's data

Rating	Max <i>R</i> -sq	Weibull distribution	Exponential distribution with the skewness parameter	Log-normal distribution	Log-logistic distribution	Gompertz distribution	Negative Gompertz distribution
A1	Log-normal	0.9959	0.9906	0.999	0.996	0.9906	0.9827
A2	Log-logistics	1	0.9957	0.9994	1	0.9957	0.9642
A3	Log-normal	0.9997	0.9947	0.9998	0.9997	0.9946	0.9717
Baa1	Log-normal	0.9959	0.9937	0.9991	0.9961	0.9936	0.9919
Baa2	Log-logistic	0.9997	0.9971	0.9995	0.9998	0.9971	0.987
Baa3	Log-logistic	1	0.9979	0.9986	1	0.9978	0.9861
Ba1	Log-normal	0.9925	0.9882	0.9984	0.9935	0.9881	0.9851
Ba2	Log-normal	0.9969	0.9948	0.9999	0.9975	0.9948	0.9922
Ba3	Lo-normal	0.9952	0.9916	0.9999	0.9971	0.9913	0.9872
B1	Log-normal	0.9969	0.994	0.9999	0.9988	0.9937	0.9897
B2	Log-normal	0.9913	0.9919	0.9992	0.9952	0.9957	0.992
B3	Log-normal	0.9949	0.996	0.9998	0.9984	0.9986	0.9962
Caa1	Log-normal	0.9848	0.9946	0.9964	0.991	0.9959	0.9914
Caa2	Exponential distribution with the skewness parameter	0.9981	1	0.9994	1	0.9823	0.9999
Caa3	Negative Gompertz distribution	0.9844	0.9578	0.9948	0.9934	0.8006	0.9992

Source: Authoring

Table 2

Selection of the best-fit distribution, according to S&P data

Rating	Max R -sq	Weibull distribution	Exponential distribution with the skewness parameter	Log-normal distribution	Log-logistic distribution	Gompertz distribution	Negative Gompertz distribution
A+	Log-normal	0.9991	0.996	0.9992	0.9991	0.996	0.9828
A	Weibull distribution	0.9994	0.999	0.9971	0.9994	0.999	0.9811
A-	Log-logistic	0.9998	0.9978	0.9988	0.9998	0.9978	0.9872
BBB+	Log-normal	0.9983	0.9958	0.9999	0.9984	0.9957	0.991
BBB	Log-logistic	0.9997	0.998	0.9994	0.9998	0.998	0.9925
BBB-	Log-normal	0.9924	0.9902	0.9979	0.993	0.9906	0.99
BB+	Log-normal	0.9925	0.9904	0.9982	0.9933	0.9909	0.9904
BB	Log-normal	0.9866	0.9869	0.9955	0.9883	0.9894	0.9854
BB-	Log-normal	0.9895	0.989	0.9976	0.9917	0.992	0.989
B+	Exponential	0.979	0.9947	0.9916	0.9831	0.9951	0.9879
B	Negative Gompertz distribution	0.9662	0.9676	0.9812	0.9723	0.943	0.9937
B-	Negative Gompertz distribution	0.968	0.9301	0.9825	0.9753	0.8715	0.998

Source: Authoring

Table 3

Selection of the best-fit distribution, according to Fitch data

Rating	Max R -sq	Weibull distribution	Exponential distribution with the skewness parameter	Log-normal distribution	Log-logistic distribution	Gompertz distribution	Negative Gompertz distribution
A	Log-normal	0.993	0.9823	0.9981	0.9932	0.9823	0.9543
A-	Gompertz distribution	0.9701	0.9902	0.9523	0.9697	0.9903	0.953
BBB+	Log-normal	0.9926	0.9855	0.9954	0.9928	0.9855	0.9663
BBB	Log-normal	0.9831	0.9712	0.9931	0.9837	0.9712	0.9527
BBB-	Log-normal	0.9989	0.9939	0.9994	0.9991	0.9938	0.9742
BB+	Gompertz distribution	0.9527	0.9864	0.9731	0.9557	0.988	0.9665
BB	Log-normal	0.9786	0.9762	0.9928	0.981	0.9793	0.9761
BB-	Negative Gompertz distribution	0.9864	0.9583	0.9953	0.9878	0.9489	0.9995
B-	Exponential distribution with the skewness parameter	0.86	0.9785	0.8909	0.8651	0.9777	0.9204
B	Exponential distribution with the skewness parameter	0.9259	0.9812	0.9528	0.9323	0.9747	0.9622
B-	Negative Gompertz distribution	0.8429	0.3564	0.8639	0.8465	0.297	0.9816

Source: Authoring

Table 4**Values of optimal parameters of lognormal distribution, fitting the historical dependence of default probability on the term, Moody's data**

Rating	<i>PD</i> -1 year, %	< <i>PD</i> >-1 year, %	<i>R</i> -square, %	Average period before default, years	Term before <i>PD</i> intensity maximum, years
A1	0.07	0.04	99.92	1,780	16.6
A2	0.05	0.05	99.99	1,567	14.6
A3	0.06	0.05	100	1,552	14.5
Baa1	0.14	0.07	99.88	1,355	12.7
Baa2	0.18	0.11	99.97	1,040	9.7
Baa3	0.26	0.19	99.97	791	7.4
Ba1	0.47	0.53	99.99	433	4
Ba2	0.77	0.69	99.98	367	3.4
Ba3	1.47	2.02	99.87	177	1.7
B1	2.16	2.96	99.82	133	1.2
B2	3.21	3.97	99.89	105	1
B3	5.36	5.87	99.67	75	0.7
Caa1	5.16	6.13	99.78	72	0.7
Caa2	10.84	11	99.71	41	0.4
Caa3	20.45	15.72	89.65	28	0.3

Source: Authoring

Table 5**Model (5) coefficients estimation based on linear regression**

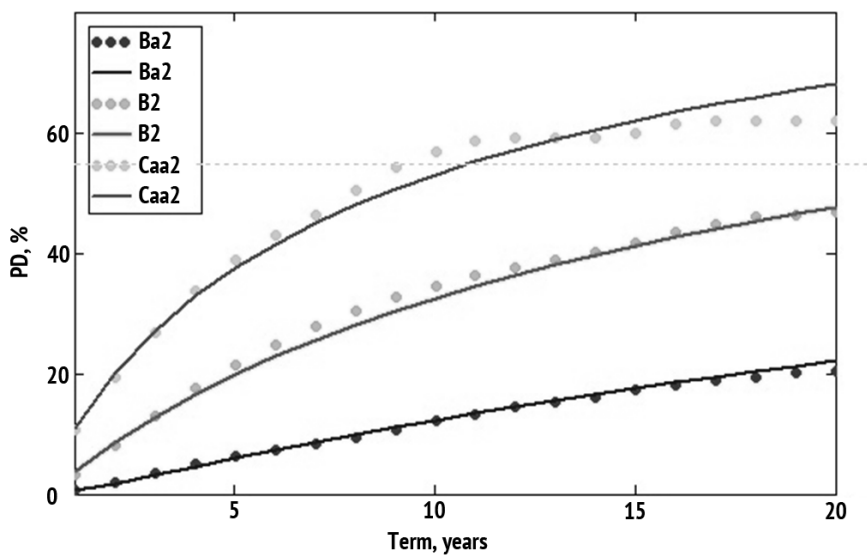
Denotation	Coefficients	Standard errors	Lower 95%	Upper 95%	<i>t</i> -test	<i>P</i> -distribution
σ	1.672	0.06	1.55	1.79	29.5	1.08E-29
β	0.542	0.08	0.39	0.7	7.1	1.22E-08

Note. Regression statistics: Multiple *R* – 73,6%; *R*-squared – 54.2%; Normalized *R*-squared – 53.1%; Standard error – 0.38; Observations – 44.

Source: Authoring

Figure 1

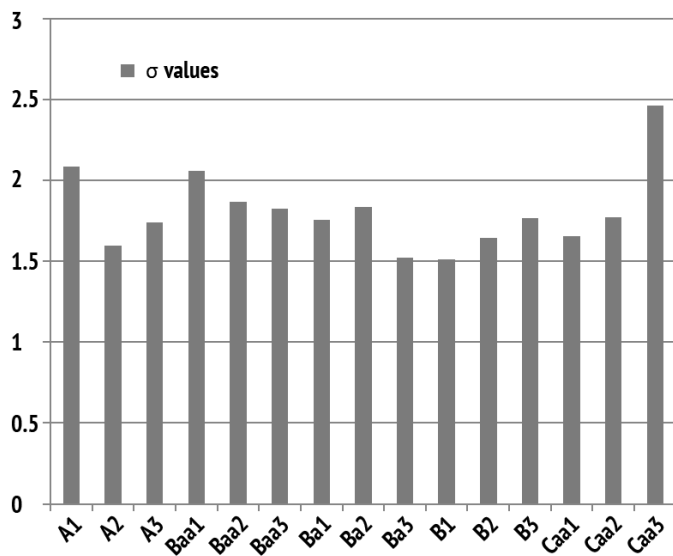
Extrapolated (solid curves) and observed values of default probability for different terms and the three categories of the Moody's rating at constant optimum value σ



Source: Authoring

Figure 2

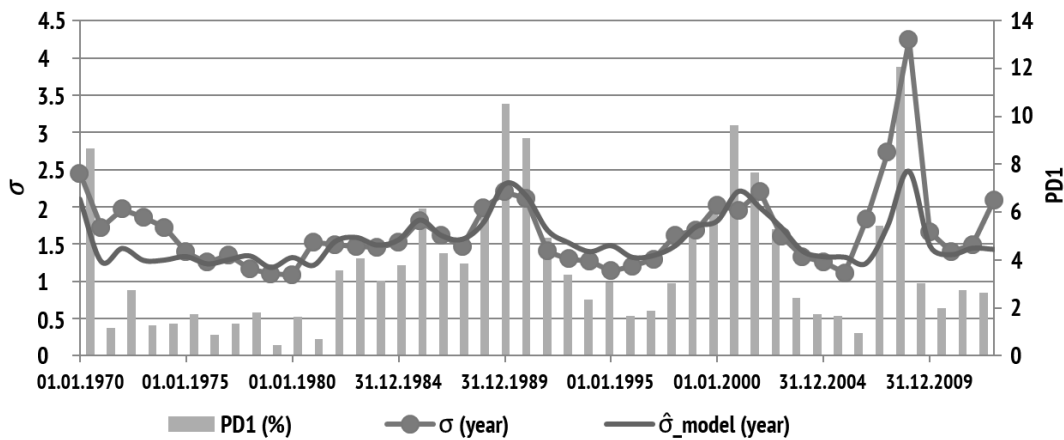
Values of σ (Rating) for the Moody's rating scale grades



Source: Authoring

Figure 3

Time series of empirical and model values of log-normal distribution parameters σ (Moody's data, 1970–2013), and the year-term default probabilities



Source: Authoring

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Conflict-of-interest notification

I, the author of this article, bindingly and explicitly declare of the partial and total lack of actual or potential conflict of interest with any other third party whatsoever, which may arise as a result of the publication of this article. This statement relates to the study, data collection and interpretation, writing and preparation of the article, and the decision to submit the manuscript for publication.

Translated Article[†]

AUTHORITY OF THE CENTRAL BANK OF RUSSIA FROM PERSPECTIVES OF KEYNES'S LIQUIDITY PREFERENCE THEORY



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Abstract

Subject The article discusses and substantiates the authority of the Central Bank of Russia and points out drawbacks of such rationale.

Objectives The research provides the rationale for expanding the authority of the Central Bank of Russia not only as a creditor, but also as a borrower of last resort.

Methods The research involves the historical-logic and functional methods, methods of comparative economic analysis.

Results I found aspects to separate the demand for money as a means of savings and means of payment for productive resources and other capital assets. The article demonstrates that Keynes's liquidity preference theory, as put in *The General Theory of Employment, Interest and Money*, highlights the main guidelines for such aspects and ways to improve the existing monetary system as a central banking mechanism with fractional reserve of deposits.

Conclusions and Relevance As a result of the analysis, I identify specifics in the demand and supply in the monetary market and potential opportunities of the Central Bank of Russia to maintain the policy of differentiated interest rates and subsequently ensure the safety of monetary assets. The banking community has to admit that specific banking risks associated with the identification of rather reliable borrowers cannot be transferred to other financial institutions without affecting the quality of such risks management. The findings can be used to discuss and choose options of the monetary policy.

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Introduction

Discussions on the authority, tasks and policy of the Central Bank of Russia undoubtedly stem from the perceptions that monetary inflation is much easier to unleash than curb since the social construct of money is sluggish. Meanwhile, money is not just a social construct. Today's money historically and logically represents informal and formal institutions. To clarify

how they are organized and way to improve them, it is necessary to answer why the monetary system of any country and its development are shaped by respective central banks, implying fractional reserves of deposits.

Curiously enough, but the liquidity preference theory of John Maynard Keynes explains some key aspects of this issue.

Teaching of John Maynard Keynes in Retrospect

It is noteworthy that few economists, who worked before J.M. Keynes, doubted that in the capitalist

[†]For the source article, please refer to: Гогохия Д.Ш. Полномочия Банка России в контексте теории предпочтения ликвидности Дж.М. Кейнса. *Финансы и кредит*. 2018. Т. 24. № 9. С. 2201–2213. URL: <https://doi.org/10.24891/fc.24.9.2201>

society, available money, which was not earmarked for some consumer needs, flew to markets of capital assets through direct or loan-based channels. It is hard to deny that the commodity-based order of social production, when business entities make decisions on their own and independently on each other, the total value of anticipated monetary savings may differ from the total value of investment planned, i.e. money spent to purchase capital assets. This difference was considered to influence the market rate of interest, which would unavoidably equalize investment and savings after it reached a certain point, since changes in the interest rate had an equal effect on savings and investment. J.M. Keynes expressed serious reservations about the feasibility of such a simple solution concerning investment and savings [1].

According to the theory of J.M. Keynes, the interest rate should not be segregated from money as a marketable asset since in any society people perceive and use money as a form of wealth. Saving it, people feel more safe and secure seeing into the uncertain future. In this respect, J.M. Keynes (unlike contemporary authors) emphasized not only money liquidity as the possibility to use money for various (undefined beforehand) purposes, but the minimum costs of keeping it. People might accumulate goods to a certain extent instead of money, thereby intensifying the diversity and amount of their stocks. As J.M. Keynes reasonably puts it¹, money is a form of wealth, which does not trigger an increase in the carrying costs, while being saved or demanded to a greater extent. According to J.M. Keynes, all durable goods are liquid to a certain extent, causing carrying costs to be incurred. Expenditures on capital assets, which are conceivably less marketable than money, may trigger the risk of losses. Considering the specifics of the commodity-based order of social production, this conclusion seems rather sound. It should be admitted that interest is not a compensation for savings but rather a payment for the loss of liquidity, overcoming the fear of the risk of losses, when money is, in one way or other, invested or lent to other parties.

However, loans are inevitable just due to the fact that the capitalist society tends to purchase and sell capital assets for money. As per Keynes's theory, the demand for money arises from the future plans in such a case. However, if the demand for money results from the future plans, especially in different places, at

different time and on part of different people, and this does not correspond with the way idle funds are allocated, the equilibrium in the monetary market implies an opportunity to borrow money and, consequently, concentration of idle funds, which involves using rather reliable debt instruments. Otherwise autonomous monetary savings will mainly remain idle. Concurrently, governmental debt instruments usually play an important role in creating the comprehensive (internally integral) monetary system ensuring the stability of the national currency. However, it is not only because some demand for money, as a means of saving, shifts to debt instruments. The problem is that the interest rate on debt instruments, which are more reliable than private ones, becomes especially significant. According to J.M. Keynes, it cannot influence and concurrently remain irresponsive to pricing processes in all the markets.

It is worth mentioning that J.M. Keynes was absolutely right indicating that the public perceives and considers any durable business goods and benefits not only from perspectives of their direct purpose (an item of consumption and/or production means) but rather as an asset associated with a certain level of liquidity and costs. General proceeds or expected return on any resource holdings within a certain period equals $(q + L - c)$, where q is a specific service, benefit or income arising from the resource as a means to produce an item of consumption, L is the premium for liquidity, c denotes carrying costs. It is easy to notice, indeed, that price trends depend on the expected return on capital resources. Hence, the versatile formula of return $(q + L - c)$ shall unveil pricing processes, including those associated with term contracts (futures), which are particularly important. J.M. Keynes does not dispute on this issue. On the contrary, he supports the idea, emphasizing that the formula $(q + L - c)$ can serve for computing rates of return no matter whether it is expressed in money or goods.

Furthermore, whereas money is valuable due to high (L), the interest rate on money, which is measured in money itself, cannot be negative or zero². Therefore, it is reasonable, at least, to assess formal grounds and compare other rates of interest on the basis of the rate of interest on money. For example, if the rate of interest

¹ Chapter 17 of *The General Theory of Employment, Interest and Money*.

² Though, unlike commodities, money does not presumably generate income in the form of (q), costs (c) for money are zero too.

on money is, say, 5 percent, and price for wheat, as set forth under a term transaction (shipment within a year), is 4 percent as high as its current price, today's unit of wheat is exchanged for a 105/104th unit of wheat, which is to be shipped to the buyer in a year. In other words, the rate of interest on wheat will be about 1 percent in wheat units. Obviously, if the rate of interest on money was 3 percent, rather than 5 percent, the price for wheat under the term transaction would be different from the current one by 6 percent, rather than 4 percent, with the rate of interest on wheat accounting for about –2 percent. At any rate of interest on money, the weighted average rate of interest on commodities, i.e. rate of interest on various goods expressed in units of such goods, will be positive, negative or zero. Zero weighted average rate means that the market value of goods is not below or above money, thus revealing the mechanism for setting stable prices for goods and, correspondingly, exchange value of a monetary unit at any point of time³.

I should mention that J.M. Keynes was not interested in the equilibrium properties of the zero weighted average rate of interest as he should be. The comparison of commodity-based and monetary rates of interest was necessary to explain why the output and employment relate to money and rate of interest on money more closely than to the rate of interest on wheat or capital equipment, houses, etc.

In Keynes's opinion, the fact that durable goods are relatively rare results specifically in different rates of interest. Any standard of value will do to capture the difference. Meanwhile, whereas liquidity and carrying costs of economic resources vary, the lucrateness of an asset with the highest ($L - c$) for saving purposes can hamper substantial investment in other assets, thus affecting the production and employment particularly due to the fact that the elasticity of money production is null for the private sector. Post-Keynesian literature questions this conclusion since it has become evident for the recent

³ When the equilibrium rate of interest on money is formed, it is very important to consider the difference between the actual price for a piece of goods in the future and the expected (predicted) price which is set in markets of futures. (If price expectations were absolutely definite (completely justified), it would signify the non-existent risk of loss, and the rate of interest on money could approximate zero as much as possible like the weighted average rate of interest (Please refer to J.R. Hicks [4]). It should be clear, however, that people cannot have the full view of the future. Therefore, the positive rate of interest on money ensuring the zero weighted average rate of interest on commodity assets is or at least should be exceptionally important.

decades that monetary authorities let the money supply slide out of their control during the period of economic upsurge. It is no surprise, indeed, considering the ever lasting propensity of commercial banks and informal banking entities to dilute deposit reserve standards set forth by the Central Bank of Russia.

Banking is known to provide (promise) free access to money to those ones who own it, even if most of it has been invested in assets, which cannot be promptly converted into cash. Promising free access to money to business circles, despite its financial fragility, a commercial bank dominates other institutions that are called to accumulate funds as a form of wealth alleviating the anxiety in the face of the uncertain future. Neither development of production and financial markets is able to deprive the commercial bank of this role particularly because the capitalist society, in some way or other, engenders or intensifies what makes people worry in planning their future.

J.R. Hicks was shrewd to note that economy, which massively employs capitalist durable resources, would not have emerged if it had failed to discover what we currently call a bank (monetary) loan. Without knowing that, A. Smith reaffirms the idea describing gimmicks with promissory notes entrepreneurs have by prolonging their bank loans to finance long-term investment projects [2–4].

Condemning such tricky schemes, A. Smith holds that, unlike working capital, which recurrently returns to its owner for being further reinvested, fixed capital cannot be returned, being continuously stable in form. Therefore, banks should confine themselves to the finance of working capital (though it is not that necessary, according to ideas of A. Smith) [4]. Thus, in the uncertain world, people will devitalize considerable working capital only given there exist certain guarantees of free access to liquid capital, as J.R. Hicks indicated [3].

Whereas the demand for more liquid capital increases as the bank interest rate grows, a higher rate complicates the finance of long-term investment project, that obviously can trigger negative implications for the market economy as long as such projects multiply. The 'normal' interest rate is a controversial issue for the economic theory, especially in the post-Keynesian period, supporters of the Keynesian economics mainly believe that the insufficient flexibility of money supply is a key trigger of financial and economic crises. Furthermore, they often voice the idea

that the credit-linked substance of contemporary (banking) money has little to do with the former perceptions of money implying that the amount of money depends on their function of a medium of exchange [5].

In any society, money is obtained in exchange for goods and debt liabilities, i.e. on credit. When previously accumulated funds do not influence the volume of lending, like it happens in case of fractional reserves of bank deposits, a loan constitutes a special and independent source of money supply. As suggested in some hallmark versions of credit-oriented money concepts, the purpose of the central bank system with fractional reserves of deposits is to make the money supply completely endogenous, i.e. dependent on the demand from firms and households within this economic system⁴. The fact that money are exchanged for debt liabilities does not make the money supply more flexible provided the interest rate on bank loans remains rather low and stable over time, which corresponds with the design and capabilities of the contemporary monetary system. It is hard to overlook that central banks tend to increase their bank reserves during financial crises, actively granting loans to major commercial banks at low interest rates. Commercial banks, however, usually temporize making the soft lending proposition to their customers, thus limiting the money supply. It certainly affects the financial position of people who are used to cheap loans when buying goods. This circumstance becomes significant for the economy as a whole when productive resources are concerned [3, 6].

J. Schumpeter noticeably advocates for the credit-linked substance of money. As stated in Schumpeter's *Theorie der wirtschaftlichen Entwicklung: eine untersuchung über unternehmergeinn, kapital, kredit, zins und den konjunkturzyklus* [7], banks create money mainly because innovative entrepreneurs demonstrate their demand for it. Certainly, J. Schumpeter expresses apt views, emphasizing that productive resources can be employed in a new and more efficient manner in the market economy (given the prevalence of private ownership) only if the purchasing power of economic entities changes. In the mean time, as J. Schumpeter also notes, the market economy is modernized not only by innovative entrepreneurs, but also their successors and competitors who master successful innovations, i.e.

⁴ Please refer to researches [3, 6] for the analysis of the existing versions of the endogenous money supply.

those ones which will be, more or less, able to reduce comprehensive costs striving to gain a unit of useful effect, whether it be in manufacturing or mining sectors, transport, commerce or agriculture. Mass demand for money due to such innovations apparently induces the practice of making fractional reserves of bank deposits at least when the practice obviously grows and becomes generally accepted.

What seems to be important is that banking (monetary) lending is effective as a means to place productive resources to the extent to which holder of those productive resources treat and use money not only as a means to acquire goods. J. Schumpeter made a lot of effort proving that the monetary form of capital is a separate aspect to consider, and the stock of money as the fund of purchasing power shall not be equated with the stock of whatever goods. This statement can be convincingly substantiated only if net monetary income (as a source of monetary savings) is recognized as a common motivation for all business entities. In other words, exchanging goods and money, every business entity shall pursue deriving monetary income (through planned purchase and sale). In such a case, entrepreneurs will manage to obtain sufficient resources which are held by others⁵ [7, 8].

It is noteworthy that the specifics of business activities does not discard the fact that any profit is a kind of net monetary income, which is generated by any entity, if people want to save and accumulate products of their activities and performance in the monetary form, willing to pay with goods and thus expanding, if possible, their supply. Making a historical retrospect, J.M. Keynes illustrated that people had such intentions no matter what epoch they lived in.

Demand for Money

In the contemporary society, the stock of money includes not only those forms of money (cash and call deposits) which are spent to purchase goods or make other payment, but also funds in savings accounts and term deposit accounts (money aggregate M2), and monetary funds invested in reliable governmental

⁵ The price for a certain item (for example, manpower services) can be raised but this will not expand the supply of such items if goods are offered in the market solely to acquire other goods. Furthermore, in case of an increased price, the seller gains the same income selling fewer goods, i.e. the income which would suffice to satisfy customary needs. According to M. Weber, such response to increased prices was quite natural before the industrial revolution since it stemmed from a certain lifestyle, which grew even more stable as it was assigned the ethical meaning [8].

securities (money aggregate M3). Certainly, monetary savings, in part or full, may be spent by those who borrow money. Moreover, the existence of bank deposits means that if they did not exist, money invested in them would mainly not have been spent because money in bank accounts was placed in banks for safe-keeping. What banks do with it and why banking development results in the practice of fractional reserves of deposits is another issue, which enables banks to accept money for safe-keeping without any fees as it used to be, but on the contrary pay interests to their depositors. However, this is the other point to discuss since the demand for money as a means of saving should not be mixed with the demand for money as a means of payment for goods, which is to be made by borrowers. It is no coincidence that the demand for money as a means of saving is the focal point in Keynes's proceedings. There are many indisputable points in his system. For example, he holds that the fact that there are liquid assets in the uncertain and risky environment, undermines the reasonableness of holding physical assets and employment-generating production respectively.

I should clarify the idea of J.M. Keynes. It is possible to point out two facts that matter for the contemporary economy. Motivation to save money has been always and everywhere stable and strong, making today's economy no exception. However, the more specific and peculiar physical assets and the higher their carrying costs, the weaker the motivation to accumulate them. The lower (L) and the higher (c) are assessed, the more expensive (unprofitable) the maintenance of physical assets and sale (the least peculiar asset) in case of unfavorable changes in the market conditions. As J.M. Keynes mentioned, in certain situations business entities continue employing physical assets, notwithstanding that they cause losses, since, in addition to zero proceeds, net losses from simple storage is higher than the losses from use. Furthermore, in addition to physical assets and money, there are financial assets, including securities generating a positive interest yield on their nominal monetary value. In this respect, it is natural to ask whether there are reasonable grounds to keep (accumulate) money more than the final stock requires as part of a transaction, while the market offers such securities.

J.M. Keynes confirms this since those who acquire securities shall understand what they can count on or

have to use their securities before the maturity date. If it happened, securities should have been sold in the open market. However, if the market interest rate on securities increases within the period from the initial investment of funds in the securities and its disposal date, the holder of the securities may fail to find a buyer which would be capable of paying at least the initial price, to say nothing about a higher price at which the securities were purchased. This contributes to the importance of expectations about the future changes in interest rates (expectations shaping the current rates of interest), motivation for being prudent and speculative motive for creating the demand for money. Shall the entire amount of interests be considered in relation to risk factors? That is the risk of partial depreciation due to the uncertainty of the future interest rates?

Economists made attempts to develop the theory of demand for money. To an extent their views are difficult to deny. Assume that there is a so short-term item of securities and so reliable (issued by the Central Bank, for instance) that both types of risks are almost indistinguishable. Will interests on such an item of security be almost zero as well? They will obviously not [9–10].

If people could easily acquire reliable securities without additional costs and convert them into cash likewise, they would invest their money into securities until some interest income can be derived. But difficulties and costs that may arise from certain deals still matter for them. These are the reasons why the uncertainty of the future interest rates cannot offset the amount of interests, especially when it concerns the rate of interest on rather reliable assets.

If decisions to purchase, hold and sell reliable securities are not exposed to any risk, simply entailing some transaction costs, why do people avoid paying for goods with securities like is done with money? This question may be simply settled if we remember that, unlike money (as a medium of exchange), even the most reliable securities are not a generally accepted means of payment. If it were different, people would definitely use securities like money to pay for goods, thus reducing transaction costs. Money should not necessarily be a medium of exchange so that business entities could pay with it for goods [7]. People abstain from paying with securities concerned simply because they prefer to rely upon them as a means of saving. Assume that the central bank issues money and

a promissory note and commits to accepting (buying) the promissory note every day at the par or increasing value until the maturity date. In other words, issuing the promissory note, the central bank communicates to would-be holders the price or value of this promissory note as of any day preceding the maturity date. Will such an absolutely reliable promissory note circulate like money? It is highly unlikely that it will not. It may not be due to the fact that some business entities are reluctant to accept such a promissory note as a payment for their goods but rather because many people will not choose to exchange it for goods. In the early 20th century, the U.S. Treasury issued two-dollar notes, undertaking to recall them in three years and pay interests. The notes disappeared from the circulation immediately, though they were issued to increment the money supply circulating in commodity markets.

Therefore, the positive demand for money beyond the reserve required for transaction purposes is easy to explain if market actors may be offered assets which are as functional as money (a means of wealth storage). Short-term governmental debt instruments or saving interest-bearing deposits, which are even better, virtually serve as money since the risk of depreciation on such assets is not higher than the risk of cash depreciation. The very existence of such assets signifies that money invested in them would at least not be spent if there were not such assets. Bank deposits are money, notwithstanding whether they generate interest income or not, *inter alia*, because any bank deposits can be requested back at any time. This aspect is important in terms of money properties as a preferable form of wealth storage mitigating uncertainty risks. Anxiety or fear of unforeseeable circumstances in the future do not make any form of money more preferable if any form of money can be converted into the other at any time. The rate of interest on monetary assets can be adjusted as often as necessary, without having a considerable impact on the demand for money as a means of wealth storage, which is in contrast to the rate of interest on loans borrowers took out using the money to purchase productive resources. The market economy would definitely become more stable if the fluctuating rate of interest on loans is leveled by adjusting the rate of interest on monetary assets more frequently. Hence, the money supply would become more flexible given the demand for money as a means of wealth storage is steady.

Central Bank as a Creditor and Borrower of Last Resort

The State (government or legislature) is the party which always unavoidably participates in the establishment of a central bank. However, the undeniable fact is that the hierarchical banking system rightfully originates as banking business develops.

When bankers began to lend money deposited with them, they were sure to be always capable of performing their obligations, i.e. being able to regain amounts they were called to repay without delays even if some deposits were granted as loans at interest. For instance, they believed that, if needed, they would sell some assets or collaterals provided by borrowers. However, loans from other larger banks appeared to be the only solution to quickly replenish reserves. Some monetary reserves should be kept in major banks' accounts so that they could be more confident in such situations. Banking systems which were growing at the end of the 18th century (England and Scotland) hardly ever differed from today's ones in this respect.

Meanwhile, whereas contemporary central banks issue respective national currencies without being constrained with reserve requirements, they can have an incomparably more flexible policy on interest rates in order to encourage the production of goods, on the one hand, and stabilize prices (exchange value of money), on the other hand. Revising interest rates on monetary assets (bank deposits) can cushion the fluctuating rate of interest on goods, to a certain extent, and commodity value respectively. The rate of interest on asset can adapt itself to the rate of interest on commodities (commodity values) so that the weighted average rate of interest on commodity assets would not significantly deviate from zero. As much as commodity values change due to the modernization of the market economy, which sometimes additionally requires considerable financial injections (depending on the scale and profundity of modernization), there are not reasonable grounds implying that the equilibrium rate of interest on monetary assets, which makes the purchasing power of money stable, will not exceed the rate of interest on bank loans needed to finance innovation. Such a correlation of the interest rate is understood to have a detrimental effect on the financial position of private banks, but the central bank is a different case.

The government should confer the authority of a credit and borrower of last resort on the central bank so as to ensure the sustainable economic development in the long run and address relevant issues. The simplest solution is to make commercial banks act as ordinary branches of the central bank when accumulating funds on their deposit accounts. This will, in no way, affect the pool of commercial banks' resources, if the Central Bank of Russia not only grants ordinary loans but also limits the volume of lending to commercial banks at a low interest rate in line with the amount of funds a commercial bank collected as deposits it opened upon the Central Bank's instruction, guaranteeing the unconditional remedy against inflation. Revising the rate of interest on the deposit (let it be the stabilization account of the central bank) and individual loans, the Central Bank of Russia is able to meet the inflationary expectations within a short period of time and enhance development opportunities of sectors and enterprises notwithstanding their focus on external or internal markets. There are no obstacles to provide a double solution to interest rate issues. It is necessary to prevent that money lent at a preferential interest rate to some bank will be found in the stabilization account of the central bank with other banks. It is not difficult to do so by freezing the difference between the time when loans are granted and interests are paid on this account. A commercial bank will have no gain but rather incur losses if it takes out a comparatively cheap loan from the Central Bank of Russia and places it in the stabilization account with other banks. It is to repay the amount it borrows strictly at the specified date. If the holder of the stabilization account is eligible to interest payments only in a longer period of time (at least one day longer), it will not be profitable and

beneficial to manipulate cheap loans for profiteering purposes.

If the Central Bank of Russia instructed the entity to open a permanent account, it does not mean that the rate of interest on this account will be higher than the rate of interest on loans which commercial banks adhere to as the price for centralized reserves. The rate on deposits will be revised (adjusted) more frequently. This will specifically prevent inflation rates from growing so much so that the deposit rate would be higher than the rate of interest on loans to curb it. Furthermore, equal rates will be quite a normal situation during an increase in the economic growth rates.

As a conclusion I should add that what makes the concept of the stabilization account of the central bank noteworthy is that its implementation will cause the stagnation of market incentives for bank liabilities management. The competition and innovation will be superseded with standardized procedures, which is not a sign of setback in this case.

First, the banking community has to keep in mind that specific banking risks associated with a choice of rather reliable individual borrowers are impossible to transfer to other financial institutions without a detriment to the quality of their management.

Second, those involved in production of goods will finally get what they need, i.e. the absolute preservation of value of their savings and transparent and customary procedures for managing personal bank accounts on permanent terms and conditions. The opportunity to have the value preserved will contribute to more efficient competition in bank lending specifically because there will be no competition of prices in pursuit to attract idle funds to bank account.

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Translated Article[†]

ASSESSING THE RUSSIAN MAJOR BANKS' CONTRIBUTION TO THE SYSTEMIC LIQUIDITY RISK PROPAGATION IN BANKING



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Abstract

Subject The 2007–2009 global financial crisis proved that the banking sector cannot evolve without concerted actions of the regulator. Systemically important institutions *inter alia* generate the systemic risk. The article discusses concepts, phases and tools of macroprudential regulation, evaluates how Russia's Top 10 banks influence the systemic liquidity risk.

Objectives The research develops the aggregate index of major banks' contribution to the systemic liquidity risk.

Methods The research involves the methods of econometric and logical analysis.

Results I built up the weighted aggregate index of Top 10 Russian banks' contribution to the systemic liquidity risk in the domestic banking sector. The article measures the statistical significance of systemic importance factors per each bank. Three group of banks are pointed out, which have certain systemic importance metrics of statistical significance.

Conclusions and Relevance The proposed index is forward looking by nature as compared with Russia's Industrial Production Index and nominal GDP. An increase in major banks' contribution to the systemic liquidity risk hinders an economic growth and IPI trends.

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The 2007–2009 global financial crisis revealed that the banking sector cannot thrive and go forward without concerted efforts of the regulatory authorities. Globally, financial stability issues are coordinated by the Financial Stability Board, which was established by the G20 nations at the 2009 London Summit and called to outline regulatory policy for maintaining the financial stability.

In 2010, the European Union set up the European Systemic Risk Board to conduct the ongoing monitoring of financial risks and evaluate the economic situation of the EU countries.

Hence, the international community admitted that national and supra-national regulators should prioritize the macrofinancial stability through a macroprudential policy.

The term *macroprudential policy* originated in the 1970s. This phenomenon used to be regarded from perspectives of possible measures to mitigate the adverse effect of the banking system on the macroeconomy [1].

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Macroprudential policies envisage a set of actions the Central Bank of Russia undertakes as the regulator to mitigate systemic risks¹.

According to documents of the Bank for International Settlements, there is a reasonable need to shift from the macroprudential *regulation* to macroprudential *oversight and regulation*. Experts believe that the macroprudential policy will limit systemic risks, being countercyclical by nature. That is, it should prevent that the banking market actors would underestimate systemic risks during the period of economic expansion and, correspondingly, overestimate them during the economic recession. Furthermore, macroprudential regulation helps control possible governmental spending on the recovery of certain banks' financial stability after crisis phenomena [2].

Macroprudential regulation tools can be classified through characteristics of the systemic risk.

Timing effects show up when the systemic risk grows over time. Macroprudential policies provide for such effects to eliminate the procyclicality in the banking system.

Spatial effects arise when the systemic risk spreads across the entire banking system. Such effects are taken into consideration to reduce the systemic risk concentration.

The systemic risk may be triggered by macroeconomic, market conditions and systemically important financial institutions [2].

As I mentioned above, such banks generate the systemic risk. Thus, it is important to identify systemic significance tests and measure the contribution of such institutions to the total systemic risk of the banking system.

As per the Basel III Accord and standards of the European Banking Authority (EBA), there are five tests and corresponding indicators (*Table 1*)².

First of all, macroprudential regulation should focus on its sources, i.e. systemically important banks. To timely apply tools of respective policies, it is necessary to

address all systemic risk mitigation aspects step by step.

The systemic significance of each bank should be assessed with respect to different periods to analyze their impact on the total systemic risk. However, Top-10 banks (amount of assets) and their systemic significance should also be taken into account but involving other systemic significance indicators.

Macroprudential regulation requires to use groups of tools influencing the capital, assets and liquidity.

It is worth mentioning that each tool should be applied for some purpose of macroprudential regulation to reduce endogenous risks that may grow into systemic ones due to the procyclicality of banking market actors, their close and mutual relationships based on reciprocal obligations and concerted activities (*Table 2*).

I provide a more detailed description of financial tools helping to achieve specific goals.

The *systemic risk buffer* constitutes an additional capital expressed in a percentage of the risk weighted assets. This instrument increases the long-term resilience of separate segments and financial sector as a whole, helps prevent structural shocks that are not caused by cycles (for example, amendments to accounting rules or standards, etc.).

The capital buffer enhances financial strengths in this case, thus allowing the system survive potential losses.

Although the instrument is mainly intended as a shield from the structural systemic risk, it can also be used for risks associated with business cycles. The instrument may be adopted for one, several or all institutions.

Macroprudential restrictions on an industry or class of assets represent the statutory restrictions on the bank's activities in a certain sector or class of assets, which are measured as a percentage of capital stock.

H6 standards of the Central Bank of Russia (H25 standards for a banking group) make one of the best examples since they set forth the maximum risk per borrower or group of related borrowers (the debt to capital ratio).

The buffer becomes an additional capital for systemically important banks. It is measured like other capital buffers as a percentage of risk weighted assets.

The instrument makes the systemic risk less probable, which may originate from a systemically important bank

¹ Macroprudential Policy. *BIS Papers*, 2016, September, no. 86. URL: <https://www.bis.org/publ/bppdf/bispap86.pdf>

² Basel Committee on Banking Supervision: A Framework for Dealing with Domestic Systemically Important Banks. 2012, October, 17 p. URL: <https://www.bis.org/publ/bcb233.pdf>

curbing its operational risks. The buffer may differ in each institution. The specific amount is determined per each bank in proportion to its contribution to the systemic risk.

The *counter-cyclical capital buffer* is compulsory to increase the amount of capital measured as a percentage of risk weighted assets and can be altered during the financial cycle.

The instrument is intended to hinder the credit expansion and credit bubble, limiting the bank leverage.

On the one hand, as seen in its naming, the counter-cyclical capital buffer reduces the procyclical activities of a bank institution. On the other hand, as the capital buffer increases, banks will continue to grant loans even during crises, thus cushioning a drop in GDP.

The *sectoral (anti-cyclical) capital buffer* is a temporary capital buffer required since banks influence specific sectors or classes of assets to alleviate the lending concentration in sectors exposed to a growing systemic risk.

The sectoral capital buffer is expressed as a percentage of risk weighted assets. It can be adjusted during the financial cycle and set by two methods:

- 1) introducing the weight of sectoral risk (for example, a higher weight is assigned to housing, construction and unsecured retail loans);
- 2) introducing an additional capital buffer in line with risk weighted activities of banks in certain sectors.

Macroprudential restriction on the debt to equity ratio of a bank indicates the minimum threshold of the bank's equity to assets ratio. It prevents banks from incrementing their assets in an uncontrollable manner. The indicator is added to those tools intended to ensure the capital adequacy.

Loan-to-value ratio is the limitation of the maximum loan amount against the value of an assets pledged. The LTV limit directly requires the minimum collateral and predetermines the amount of loan, thus reducing the would-be borrowers' default risk. At the macrolevel, LTV ratio mitigates the systemic credit risk.

Loan-to-income (LTI) ratio limits the biggest amount that can be borrowed against the borrower's income.

LTI ratio is similar to LTV ratio in curbing excessive borrowings. In the mean time, the instrument also serves for making lending decisions with regards to

risky groups of customers. LTI can be more effective than LTV when real estate prices grow since real estate is often used as mortgage.

To prevent a too large gap between assets and liabilities by term and likelihood of the systemic structural liquidity risk, liquidity coverage ratio (LCR) and net stable funding ratio (NSFR) are used.

If the institution depends on short-term sources of finance, it may suddenly run out of liquid assets and have to organize a fire sale of its assets. Such situations trigger financial risks as they are mutually related (systemic structural risk). LCR is a statutory requirement of the regulator, being the ratio of highly marketable assets to liabilities with maturity up to 30 consecutive days.

Unlike LCR governing the short-term liquidity level, the net stable funding ratio (NSFR) relates to a requirement to cover a certain amount of non-current assets with available long-term funds within a year.

Loan-to-deposit ratio (LTD) is the maximum ratio of loans to bank's deposits. It is applied to ease the excessive dependence on less stable sources of finance, make more stable sources of finance more attractive, for example, deposit. It can be altered during the financial cycle.

Macroprudential policy can have a dual effect on the development of a financial system like any restrictions imposed on any system.

All macroprudential regulatory tools are variable and permanent.

Variable tools imply that values of prudential restrictions are revised in line with an economic cycle and applied on a differential basis or modified automatically (systemically important institutions buffer).

Variable tools mostly regulate the procyclicality of banks' activities, influencing their balance (LCR, NSFR, dynamic rates of reserves, counter-cyclical and sectoral capital buffers) or lending terms.

Permanent tools include leverage and capital requirements.

Unlike microprudential regulation, macroprudential regulation draws upon the systems approach allowing to identify peaks of the banking sector with respect to the real economy even if some agents of the banking

system are compliant with microprudential requirements.

It is noteworthy that the macroprudential approach treats the risk as an endogenous factor arising from simultaneous activities of banks or exposure to the same shocks [3].

Table 3 summarizes the principal difference of the regulatory methods.

Goals, purposes and principles of macroprudential policy were articulated after the 2008–2009 global financial crisis when researchers found what caused the financial instability and propagation of systemic risks. Initially, the general purpose of macroprudential policy was to sustain the financial stability. However, this statement needs to be clarified.

There are two main approaches to interpreting the financial stability. As per the first one, financial stability means the effective functioning of the national financial system, though being influenced by external shocks. As per the second one, financial stability results from the resilience of the financial system to internal shocks [4].

The two approaches can be integrated to denote compulsory traits of macroprudential policy:

- it shall be counter-cyclical;
- macroregulation mainly aims to identify, monitor and limit systemic risks and curb social effects of systemic crises affecting the financial system;
- macroprudential regulation shall focus on systemically important financial institutions (too-big-to-fail) as origins of systemic risks;
- such regulation shall ensure the smooth operation of the financial system throughout business cycle phases;
- macroprudential regulation should pursue to reduce possible governmental expenditures to recover the financial resilience of certain institutions or financial system after the systemic crisis [2].

Macroprudential policy also serves for preventing the financial instability. In my opinion, this definition is more comprehensive and concrete than the interpretation based on the *financial stability* term [5].

The financial system is believed to be stable if it is able to allocate resources effectively and absorb shocks,

impede their destructive impact on the real economy and other financial systems [6].

I point out some definitions of financial instability that is the leading idea of macroprudential policy. Financial instability is understood as a situation when the economy may be affected by fluctuating prices for financial assets or instability of financial institutions to fulfill their contractual obligations [7].

Financial instability is also construed as a situation described with three key criteria:

- 1) prices for some key financial assets strongly deviate from their fundamental principles;
- 2) credit market operations are disturbed;
- 3) aggregate expenditures significantly deviate from their benchmark level [8].

So, macroprudential regulation of the banking sector pursues two key goals as follows:

- neutralizing the procyclicality of the banking system and its impact on financial and business cycles (timing effect of the systemic risk);
- reinforcing the sustainability of the financial system, strengthening the ability to overcome economic crises, without causing unfavorable consequences for functions of the system (structural effect of the systemic risk) [9].

Goals determine a set of tasks macroprudential regulation is to address. In 2016, the Financial Stability Board, International Monetary Fund and Bank for International Settlements released a macroprudential policy report³.

The report sorts the tasks into three groups:

- smoothing the financial cycle;
- strengthening the resilience of the financial system to shocks by making capital and liquidity buffers during periods of economic growth;
- monitoring major financial institutions' risks and identifying pipelines of such risks.

Macroprudential policy tasks can be detailed as follows:

- reinforcing the sustainability of financial infrastructure;

³ IMF-FSB-BIS Elements of Effective Macroprudential Policies. Lessons from International Experience, 2016.
URL: <http://www.imf.org/external/np/g20/pdf/2016/083116.pdf>

- preventing the concentration of financial institutions' risks in certain sectors or classes of assets;
- curbing the systemic effect of incentives to support certain financial institutions and reduce the risks of loss of confidence in the financial system;
- stifling an excessive growth in lending and financial leverage in banking;
- preventing the term of assets and liabilities from becoming too unbalanced.

Fig. 1 highlights key phases of macroprudential policy [2].

The effective macroprudential regulation is indispensable without an elaborate mechanism for identifying, assessing and monitoring the systemic risk, i.e. the early warning system which senses the likelihood of financial disparities.

Such a mechanism can be build by banks individually to recover their financial sustainability when their operations exceed thresholds of market environment metrics (exchange rate of the Russian ruble against the dual currency basket, stock indices, volatility of stock indices, spreads between the monetary market rates and key interest rate), macroeconomic indicators (oil prices, GDP growth rates, inflation, etc.) and rates or restrictions (rates of the Central Bank of Russia, survival horizon limit in case of stress tests of liquidity risk, sectoral concentration of the loan portfolio, etc.).

Once the systemic risk is found to be probable or increase, it is necessary to decide which macroprudential instruments should be activated and strengthened/softened/canceled and indicate the time to do so.

Systemic risks are detected and respective tools are chosen through monitoring and analysis of risk metrics and their trends. Selecting the appropriate tools, it is important to know what caused the systemic risk, i.e. too-big-to-fail financial institutions, endogenous cumulative disparities in the banking system or exogenous market factors and macroeconomic shocks.

Macroeconomic instability often activates several tools, which streamlines the attainment of various interim goals. However, it should be remembered that macroprudential policy measures have a reciprocal effect. Each goal requires an individual approach and set of tools.

There are two pending issues of macroprudential regulation to be resolved. There should be a common list of macroprudential regulation measures and methods to evaluate their efficiency.

Nowadays macroprudential regulation is evaluated and coordinated at the international level. First of all, clarity is needed to understand which tools should be used throughout phases of the financial cycle. Researches, which mainly evaluate the impact on banks' balance sheet figures, focus on asset regulation tools only.

The institutional design of macroprudential policy is another matter to discuss. International practices persuade that it is the central bank that should be responsible for macroprudential regulation since it is an integrated regulatory authority in the financial market, thus proving to be the most constructive option. Experts point out drawbacks and advantages of such regulation (*Table 4*).

Currently, Russia's banking sector stagnates. According to S&P Global Ratings, the banking sector should expect the following challenges to come in 2018:

- escalating competition among banks against low economic growth rates and dropping interest margin;
- expanding market presence of State-owned banks⁴;
- increasing concentration risks, especially loan portfolio [10].

As for positive trends, non-performing loans will freeze at a 10 percent level, while retail lending is expected to grow.

In 2017, the Central Bank of Russia underlines the following material risks:

- reserves risks;
- concentration risks since the concentration of major borrowers is predicted to increase;
- fair value risk associated with securities.

Bank authorities should toughen their regulatory activities and find new methods to support failing banks in order to address and resolve the existing challenges of the financial sector.

In the summer of 2017, the Central Bank of Russia had to assume the financial recovery campaign for Otkritie

⁴ At the end of 2017, State-owned banks are predicted to account for 62 percent of the market.

Bank (systemically important bank) and BINBANK. Therefore, anticipating probable challenges and avoid the bailout of large banks, the macroprudential policy mechanism shall be refined.

As mentioned above, the community lacks a clear understanding which tools would be appropriate for financial cycle phases. In Russia, the integrated regulatory authority maps risks and assigns indices to each of them [11–14].

As put in the financial stability overviews for 2016, the Central Bank of Russia recognizes the following types of risks:

- sovereign risk;
- bank risk;
- market risk (currency and equity risks);
- liquidity risk;
- real economy risk;
- foreign trade risk.

I suggest using the aggregate index of major banks' contribution to the systemic liquidity risk, which is weighted by the systemic importance degree of a bank. If banks are evaluated this way, this will allow to pinpoint the source of the systemic risk and group major banks having the same systemic significance characteristics, thus applying macroprudential policy tools on an *ad-hoc* basis.

Thresholds of the aggregate index of major bank's (Top 10) contribution to the systemic liquidity risk propagation may indicate when liquidity tools of macroprudential regulation shall be integrated⁵ [15–17].

Based on the data array from January 1, 2012 through August 1, 2017, I set a regression for each bank and assessed their determination coefficients reflecting the systemic importance of each bank. They are taken as each bank's weight to compute the aggregate index as of each date. The variable of each bank's

contribution to the variance of net liquidity position of the bank system was taken as a dependent variable:

$$RC = \text{cov}(nlp, NLP) / \sqrt{\text{VaR}(NLP)},$$

where *nlp* is surplus (shortage of) liquidity of each bank; *NLP* is surplus (shortage of) liquidity in the banking system.

nlp, as of each date, is computed as the balance of the bank's liquid assets and current liabilities (up to 30 days). *NLP*, as of each date, is measured as difference between the banking system's amount due to the Central Bank of Russia and amounts expected from it.

Systemic significance factors are accepted as regressors (*Table 5*)⁶ [18].

The research provides the following results.

1. I built up the weighted aggregate index of Russia's Top-10 banks' contribution⁷ to the systemic liquidity risk of the Russian banking sector (*Fig. 2*).
2. Statistical significance of regressors (systemic significance factor) was measured to apply macroprudential policy tools to each of Top-10 banks on an *ad-hoc* basis.

The research demonstrated that

- Bank's liabilities, approximating metric *Size* are not statistically significant for Top 3 banks of Russia. Therefore, international experts' hypothesis is verified stating that the size of a bank is a necessary but still insufficient metric to understand the bank's contribution to the systemic liquidity risk⁸;
- dependence on the interbank lending market is statistically significant with respect to Top 5 banks (in terms of assets and capital) to measure banks' contribution to the systemic liquidity risk (Sberbank, Russian Agricultural Bank, Otkritie Bank);
- the share of individuals' deposits that gives an approximation for the substitution among the banking sector's deposits is a statistically significant criterion for four banks (VTB24, Alfa Bank, Promsvyazbank, Otkritie Bank).

⁵ Guidance to Assess the Systemic Importance of Financial Institutions, Markets and Instruments: Initial Considerations. Briefing Paper for the G20 Finance Ministers and Central Bank Governors, 2009. URL: <http://www.imf.org/external/np/g20/pdf/100109a.pdf>

Financial Stability Risks, Monetary Policy and the Need for Macro-Prudential Policy (Speech by V. Constancio, Vice-President of the ECB, Warwick Economic Summit, 13.02.2015). URL: <http://www.ecb.europa.eu/press/key/date/2015/html/sp150213.en.html>
What Is Systemic Risk? URL: <http://www.systemic-risk-hub.org>

⁶ Global Financial Stability Report: Grappling with Crisis Legacies, 2011.

⁷ Top 10 banks were selected in terms of assets and capital, as of August 1, 2017. Please refer to the website URL: www.kuap.ru (In Russ.)

⁸ Significance of regressors is hereinafter assessed within a 99-percent confidence interval.

1. Three groups of banks were found, for which some systemic importance metrics are statistically significant (*Table 6*).
 2. I analyzed hypothesis on the sign of regressor coefficients with model values (*Table 7*).
 3. The index is showed to be a leading indicator with respect to nominal GDP and quarterly growth rate of Industrial Production Indicator (*Fig. 3*).
 4. Using the Granger causality test, I detected the cause-and-effect relationship between the index and quarterly growth rate of Industrial Production Index. These are changes in the first index that are followed by unidirectional changes in the second one.
- The proposed index can be used by the Central Bank of Russia's department in charge of financial stability.

Table 1**Criteria and key metrics of systemic importance of banks**

Criterion	Metric
Size	Amount of assets. Amount of liabilities. Risk weighted assets / GDP. Liabilities / capital. Liabilities / GDP. Bank's market share. Bank's market capitalization / general capitalization of banks. Value of off-balance sheet receivables and liabilities
Interdependency	Interbank loans granted. Interbank loans taken. Securities in circulation
Substitution	Retail deposits. Retail loans. Stocks and bonds pledged to secure REPO transactions
Complexity:	
– institutional	Number of branches. Number of subsidiaries. Number of foreign companies
– international	Receivables and liabilities denominated in foreign currency
– operational	Amount of OTC derivatives. Percentage of interbank loans taken out from non-residents within total interbank loans. Valued of asset-backed debt

Source: Authoring

Table 2**Macroprudential policy tools and their metrics in terms of its objectives**

Tool	Metric	Objectives	Respective risk
Tools for capital			
Counter-cyclical capital buffer	Counter-cyclical capital buffer	Smoothing the procyclical activity of the bank in the short run. Curbing and preventing an excessive growth of lending and leverage	Credit risk: a decreased growth of a loan portfolio through more valuable funding
Sectoral capital requirements	Volume and price of loans per tool. Restrictions on the sectoral concentration of borrowers. Restriction on the price for loan backing. Position limits on securities	Curbing and preventing an excessive growth in lending and leverage. Smoothing and preventing the concentration of financial institutions' risks in certain sectors or classes of assets	
Tier I capital buffer for systemically important banks	Tier I capital buffer for systemically important banks	Increasing the adequacy of systemically important banks' capital to cover unexpected losses	Disparity risks of systemically important banks
Tools for liquidity			
Counter-cyclical liquidity requirements	LCR (liquidity coverage ratio)	Current liquidity regulation	Funding liquidity risk
	NSFR (net stable funding ratio)	Regulating non-current liquidity and share of unstable funding	
	LTD (loan to deposit ratio)	Loans (deposit)	
Market premiums and rebates	Discount ceiling to secure loans. Liquidity premium. Financial market depth	–	
Tools for assets			
LTV / LTI	The loan-to-value ratio. The loan-to-income ratio	Decrease in loss given default of banks. Decrease in the probability of borrower's default	Credit risk
Dynamic reserves	Making additional reserves during the period of economic expansion to utilize them during the economic recession	Smoothing a decrease in the bank's margin during crises	

Source: Authoring

Table 3**Differences between microprudential and macroprudential regulations**

Indicator	Microprudential regulation	Macroprudential regulation
Goals	Protection of depositors and creditors' interests. Ensuring the financial sustainability of certain banks	Mitigation of the systemic risk, effect of the procyclical nature of risk assessment
Role of macroeconomic indicators and risk assessment approaches	Material risks for specific banking groups and inherent risks The risk assessment method involves the analysis of standard forms of bank reporting	Assessment and mitigation of systemic risks The risk assessment method is based on the scenario analysis and stress testing of the banking system (top-down)
Prudential standards implementation technique	Bottom-up	Top-down
Disclosure	Confidential standard reports	Wide use of assessments, including macroprudential early warning indicators

Source: Authoring

Table 4**Strengths and weaknesses of macroprudential regulation by central banks**

Strengths	Weaknesses
Effective exchange of results with respect to the monetary and macroprudential policy	Conflicting goals of monetary and macroprudential policies
Central bank's intention as a creditor of last resort to maintain the financial stability of the entire banking system	Versatile and understandable tools of monetary policy unlike measures of macroprudential policy. Consequently, the public confidence risk arises with respect to the independence of the integrated authority's policy

Source: Authoring

Table 5**Criteria and metrics of banks' systemic importance used as regressors**

Criterion	Metric
Size	Bank's liabilities
Interdependency (with banking system)	Balance of interbank loans (granted and obtained) and comprehensive liabilities
Substitution	Stocks and bonds as part of REPO transactions. The ratio of individuals' term deposits in total deposits of the banking sector
Complexity: – operating activity – international activities	Share of amounts due to foreign banks in total interbank loans obtained. Balance of bank's receivables and liabilities denominated in foreign currency

Source: Authoring

Table 6**Grouping of banks by statistically significant indicator**

Statistically significant indicators	Banks
Size and substitution, substitution_deposits	VTB24, Alfa Bank, Promsvyazbank, National Clearing Center
Relationship (interbank) and complexity of operations (complexity_operational)	Sberbank, Russian Agricultural Bank, Otkritie Bank
International operations (complexity_international)*	VTB, Gazprombank, Moscow Credit Bank

* The indicator proved to be statistically significant within a 90-percent confidence interval.

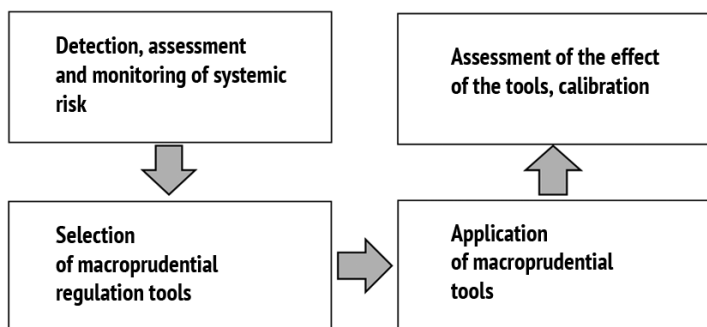
Source: Authoring

Table 7**The impact of the regressors on the bank's contribution to systemic liquidity risk**

Criterion	Hypothesis	Banks	Regression coefficient sign
Substitution (deposits)	The fact that the bank is important in accumulating deposits has the positive effect on its contribution to the systemic liquidity risk	VTB24.	+
		Alfa Bank	+
Relationship	The fact that the bank depends on interbank loans increases its contribution to the systemic liquidity risk	Sberbank.	–
		Russian Agricultural Bank.	+
		Otkritie Bank	+
Size	The greater the bank's assets (liabilities), the greater its contribution to the systemic liquidity risk	VTB24.	–
		Alfa Bank.	–
		National Clearing Center.	+
		Russian Agricultural Bank.	–
		Otkritie Bank	+

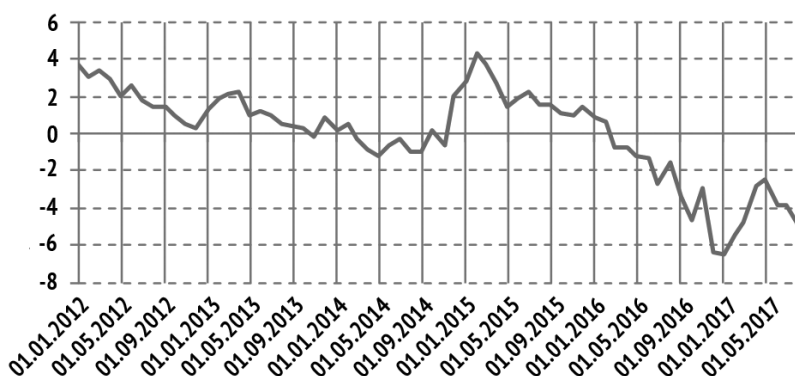
Source: Authoring

Figure 1
Macroprudential policy phases



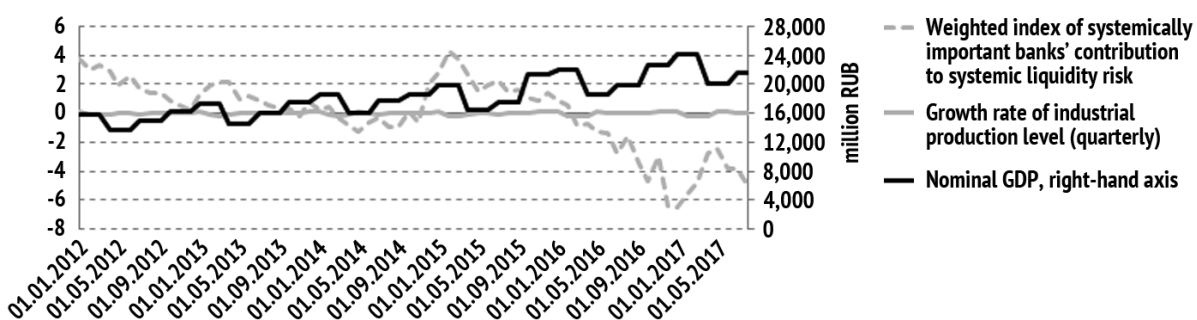
Source: Authoring based on [5]

Figure 2
Chart of weighted contribution index of Russia's Top 10 banks to the systemic liquidity risk (DD/MM/YY)



Source: Authoring

Figure 3
Changes in Industrial Production Index, its growth rates and nominal GDP (DD/MM/YY)



Source: Authoring

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Translated Article[†]

THE CONTEMPORARY GLOBAL DERIVATIVES MARKET: OPPORTUNITIES FOR RUSSIA



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Abstract

Subject The research focuses on economic relations arising from deals with derivatives on international and national stock exchanges.

Objectives The research represents a comparative analysis of various financial derivative instruments used worldwide. We trace new trends in their development and discern where and how they will be used in the Russian regions.

Methods We apply the dialectical method of research into economic phenomena, scientific abstraction, analysis, synthesis, grouping and comparison, visual analysis of financials.

Results We articulated why it is more preferable to conclude OTC derivative contracts as opposed to those traded on stock exchanges. The article also challenges the financial derivatives market in Russia and what it should await in the future, mentioning its actors' needs at the current phase of its development.

Conclusions and Relevance There should be a specialized national platform for derivatives trade. It will expand their use for international payments and mitigate economic risks of national parties to foreign economic trade. We systematized how various business segments may use them in Russia, thus determining probable risks and opportunities. This amplifies scholarly views of the system for international settlements and deals with these instruments, unveils its substance and shows how it can be improved. The findings and conclusions can be applied by experts in international finance, researchers, attendants of professional advancement courses, students and postgraduates in higher schools of economics. This material may also prove useful to traders handling investment processes in financial markets.

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Financial derivative instruments (derivatives) serve for hedging operations of today's international businesses

among other key means. However, their scope of application gets more diverse as the global and national financial markets evolve. Derivatives is a brainchild of financial intermediaries, which consider wants and needs of financial market actors and existing financial mechanisms and offered instruments that would be

[†]For the source article, please refer to: Заболоцкая В.В., Квиткина Ю.А. Современный мировой рынок деривативов: перспективы для России. *Финансы и кредит*. 2018. Т. 24. № 10. С. 2184–2203. URL: <https://doi.org/10.24891/fc.24.10.2184>

more efficient for consumers, unlike market assets underlying such instruments¹. Parameters and qualities of derivatives are more robust as opposed to ordinary market assets, being much more lucrative for financial market actors². Derivatives stipulate terms, time for income to be paid, interests on financial liabilities, specifics of tax treatment, higher liquidity and investment opportunities, lower agency fees and other substantial terms.

Derivatives are popular among various actors of the financial market, such as governments, leaders of financial departments in major corporations, dealers, brokers and individual investors [1]. However, those ones holding financial derivative should scrutinize them and take into consideration that derivatives can be used to hedge risks associated with business operations. Doing so will help use derivatives as effectively as possible.

According to the Bank for International Settlements, in international trade, derivatives are subdivided into exchange-traded derivatives and over-the-counter derivatives (OTC derivatives). *Fig. 1* depicts their distinctive features.

To get the overall understanding, the derivatives market should be analyzed by place at which such derivatives are used.

As reported by the World Federation of Exchanges, in the global market of exchanged-traded derivatives 48 stock exchanges recorded a 0.2 percent decline in trade in 2016, while 25.03 billions of fixed-term contracts were concluded in 2017 (10.5 billion of options and 14.5 billion of futures)³. As compared with 2005, overall trading volume has increased by 170.4 percent, which is the average annual growth rate of 9.3 percent, for the recent 12 years. Regionally, an increase in trading volumes in the Americas (by 5.8 percent) was offset by a decrease in the trading volumes in Asia Pacific and EMEA (by 3.5 and 5.3 percent respectively).

¹ Fel'dman A.B. *Proizvodnye finansovye i tovarnye instrumenty* [Derivative financial and commodity instruments]. Moscow, Finansy i Statistika Publ., 2003, 463 p.

² Loginov E.L., Loginova V.E. [Derivatives in the Russian economy: Strategic management trends asymmetric of distribution market]. *Finansy i kredit = Finance and Credit*, 2012, no. 30, pp. 26–33. URL: <https://cyberleninka.ru/article/v/derivativy-v-rossiyskoy-ekonomike-strategicheskie-trendy-upravleniya-asimmetrichnostyu-raspredelelynyh-rynkov> (In Russ.)

³ Annual Statistics Guide. IOMA Derivatives Market Survey 2017. World Federation of Exchanges. URL: <https://www.world-exchanges.org/home/index.php/statistics/annual-statistics>

In 2017, classes of assets also underwent some changes, as depicted in *Fig. 2*. While the percentage of equity derivatives and interest derivatives rose by 3 and 2 percent respectively (48 and 16 percent of total derivatives traded in 2017), the percentage of currency derivatives remained unchanged (11 percent). This made the percentage of commodity and other derivatives reduce totally by 3 and 1 percent, thus accounting for 24 and 1 percent.

Trade generally intensified in the Americas, which account for 43 percent of total trade volumes, because the same trend was seen in all product lines other than equity traded funds (ETF). In 2017, fewer contracts were concluded in Asia Pacific, where 34.8 percent of total contracts were sold, after the number of commodity derivatives reduced, which used to account for almost 38 percent of total trading volume in the region. Trade in derivatives is 22.2 percent of total contracts in the EMEA region. Fewer contracts were concluded there as trade in equity derivatives, currency derivatives and others decreases. *Fig. 3* shows the structure of the exchange-traded derivatives market in 2017 by region and type of underlying assets.

As reported by the World Federation of Exchanges, trade in option contracts grew by 10.8 percent, while futures contracts got back by 6.9 percent in 2016, thus spurring the percentage of options contracts (out of total) from 38 percent in 2016 up to 42 percent in 2017 but suppressing the percentage of futures contracts from 62 percent in 2016 down to 58 percent in 2017. *Fig. 4* illustrates the positive trend of the growing number of stock exchange contracts.

Although secondary securities are still the most actively traded derivatives, making 48 percent of total volume, they continue to go below 50 percent of total contracts for the second year in a row. Total volume of trade in derivatives rose by 5.4 percent against 2016, thus multiplying the volume of equity options, futures and stock index options by 3.9, 12 and 21.5 percent respectively. Trade in stock index futures and ETF decreased by 7.1 and 3.6 percent in 2016. In the mean time, in the Americas and Asia Pacific accommodating almost 80 percent of total financial derivatives traded, traded contracts went up by 2.4 and 23.9 percent respectively. The EMEA region saw a 10.9 percent decrease.

Interest rate derivatives are 16 percent of total fixed-term contracts traded in 2017, with more than 3.9 billion of contracts, being the absolute maximum in

the analyzable period (from 2005). Trade in such contracts expanded by 13.1 percent in 2016 after short-term interest rate (STIR) and long-term interest rate (LTIR) options and futures grew. Accounting for almost 94 percent of total interest rate derivatives, the Americas and EMEA saw a rise in interest rate derivatives by 11.7 and 18 percent respectively in 2016.

In 2016, trade in foreign exchange derivatives (11 percent of total trade in derivatives) reduced by 3.2 percent in 2016 mainly due to a 19.9 decrease in trading volume in the EMEA region, which accounts for 32 percent of total trade in such contracts. In the mean time, the Americas and Asia Pacific registered an 18.8 and 3.8 increase respectively in 2016.

As for commodity derivatives, trading volumes have decreased for the first time within the analyzable period (from 2005) by 14.5 percent as compared with 2016 year-on-year. This results from a slump in trading volumes in Asia Pacific (by 25.3 percent), where 56 percent of contracts circulated. There was an increase in trading volumes of commodity derivatives (by 3.5 and 6 percent respectively) in the Americas and EMEA. However, commodity derivatives are the second most popular product in 2017, making 24 percent of total exchange-traded derivatives.

The class of other derivatives encompasses a wide array of products, including Volatility Index (VIX) options and futures, real estate derivatives (REIT derivatives), dividend index derivatives, contracts for differences (CFD) and inflation futures and options. This category shrank by 4.3 percent in 2016 as a result of a slowing down trade in the Johannesburg Stock Exchange and Japan Exchange Group by 36 and 6 percent respectively in 2016.

Although total financial derivatives were traded in 2017 as were in 2016, the percentage of exchange-traded equity, interest rate and commodity derivatives shifted to 48, 16 and 24 percent respectively of total exchange-traded contracts (in comparison with 45, 14 and 28 percent in 2016).

According to the Bank for International Settlements⁴, the global OTC derivatives market observed the amount of unsettled OTC term contracts to overwhelm the previous declining trend and assumed to grow in H1 2016. Conditional amounts grew from USD 482 trillion as of the end of 2017 up to USD 542 trillion as of

the end of June 2017, thereby approximating the previous year level. Contributing to a more substantial market and credit risk of counterparties, their gross market value had even a greater drop in H1 2017, from USD 15 trillion down to 13 trillion, as showed in *Fig. 5*.

In 2008 and onward, the market value of all OTC derivatives exceeded the lowest value year-on-year, i.e. being USD 14 trillion. Reshaping the gross market value with respect to legally binding bilateral offsetting agreements (rather than collateral), gross credit risks has also reached their lowest level since 2007. They decreased from USD 3.3 trillion as at the end of December 2016 by USD 2.8 trillion as at the end of June 2017.

Interest rate contracts notably dominate OTC derivatives markets. Therefore, this segment and its trends determines the general situation. The conditional amount of unsettled OTC interest-rate derivatives rose from USD 368 trillion to 416 trillion in H1 2017. Contracts denominated in all key currencies, other than yen, appreciated. As USD exchange rates of key currencies grew during the period, the USD value of contracts denominated in the above currency responded likewise. However, after being adjusted for changed in the foreign exchange rates, conditional amounts increased.

A growth in conditional amounts results from interest-rate contracts with one-year maturity of less. They rose from USD 160 trillion as of the end of December 2016 up to USD 193 trillion as of the end of June 2017. The fact is evidence that a grow is triggered by higher positions and hedging at the short end of the yield curve as a response to changing expectations about the future monetary policy in leading countries of the world.

Despite growing conditional amounts, gross market value of OTC interest rate derivatives continued dropping, down to USD 8.5 trillion as of the end of June 2017, reaching their record low since 2007. The gross market value of USD-denominated contracts decreased by 22 percent in H1 2017, down to USD 1.8 trillion. Contracts denominated in JPY and EUR demonstrated a similar declining trend for the same period, a 16 percent decline, down to USD 0.6 trillion, and a 14 percent decline down to USD 4 trillion respectively. In opinion of top experts of the Bank for International Settlements, the decline is indicative of an increasing long-term yield. This narrows the gap between market

⁴ BIS Statistics Explorer. Derivatives Statistics. The Bank for International Settlements. URL: <https://stats.bis.org/statx/toc/DER.html>

interest rates as of the reporting date and rates prevailing as of the contract signing date.

In OTC currency markets of financial derivatives, conditional amounts hit their record high of USD 77 trillion in the end of June 2017 in comparison with USD 69 trillion in the end of December 2016. The dynamics of short-term instruments, such as foreign exchange forwards and swaps, induced a growth in the OTC derivatives market. Unlike other OTC derivatives, most foreign exchange derivatives make counterparts pay off the conditional amount at the maturity date. Therefore, such derivatives can be considered as a form of secured borrowing with respective risks associated with foreign currency repayments and liquidity.

The market of foreign exchange dealers gets more concentrated in H1 2017, though the concentration of reporting dealers, that is measured with the Herfindahl index (a greater index means the predominance of several dealers in the market), went downward steadily throughout the years after the 2007–2009 global financial crisis. As seen in *Fig. 6*, the trend vanished in 2015 when the lowest Herfindahl index was 444 for all the currencies as a whole.

In the case of foreign exchange forwards and swaps, the Herfindahl index grew from 444 at the end of June 2014 up to 488 at the end of June 2017. This means that larger dealers won a considerable share of the market in this period. Higher concentration ratio was also observed in the case of all principal currencies, USD, EUR, JPY, GBP. Although these statistical data are germane to conditional amounts of debt, trade dynamism data presented in the 2016 review of the Bank for International Settlements revealed high concentration in foreign exchange markets.

Besides, the practice of central counterparty clearance (CCP) gained momentum in markets of OTC derivatives. As for the credit default swaps market, the segment of principal counterparties expanded from USD 4.3 to 4.9 trillion in H1 2017, though total conditional amount of unsettled credit default swaps tapered off (*Fig. 7*). Hence, the share of unsettled credit default swaps processed through CCP went up from 44 percent at the end of December 2016 up to 51 percent at the end of June 2017. Comprehensive value of bilateral contracts between reporting dealers reduced to USD 2.9 trillion in H1 2017. It is worth mentioning that these shifts correspond with the novation of contracts with dealers and central counterparties.

As for markets of OTC interest rate derivatives, the CCP share remained almost unchanged in H1 2017. Reporting positions of dealers increased concurrently with the conditional amounts up to USD 320 trillion at the end of June 2017. Cleared positions still accounted for 77 percent as were in the previous year.

Thus, we infer distinctive characteristics of the global financial derivatives market during the crisis and post-crisis periods of the global economic development.

1. The percentage of exchange-traded derivatives have been observed to grow for the recent several years, while OTC derivatives demonstrate the opposite trend, thus indicating that the global financial market actors changed their nature and preferences.
2. The global secondary trading market is dominated by exchange-traded equity derivatives and OTC interest rate contracts.
3. International secondary trading demonstrated the fastest pace of growth than identical local contracts (country/stock exchange) among all the contracts in circulation. This signifies that the global financial derivatives market actors are willing to trade abroad [2].
4. Global market actors opt for USD as the underlying currency of financial derivatives, however, currencies of the emerging Asian economies also become more frequent.
5. During the post-crisis period (in 2017 against 2016), total trade in derivatives fell by 14.5 percent on stock exchanges mainly due to the reduced extent of agriculture, non-precious metals and other commodity contracts.
6. In 2016–2017, exchange-traded power contracts accounted for the largest share in derivatives trade. They were followed by contracts involving non-precious metals, agriculture, other resource-based commodities, precious metals and derivative commodity indices.
7. During the post-crisis period, power engineering, agriculture and metal derivatives were the sectors that were flourishing in terms of international trade. So, trade has its own specifics in the Americas. Trade in agricultural, exchange-traded power and precious metal contracts account for 33 percent, 40 percent and 44 percent of deals respectively. The Asia Pacific economies feature massive trade in secondary agricultural contracts (65 percent), non-precious

metals contracts (89 percent) and other derivatives (99 percent). A considerable part of power (44 percent), commodity derivatives (100%) and contracts for precious metals (16%) was made in the EMEA region in terms of trading volumes.

So, we discerned the following patterns in the development of the global derivatives markets before, during and after crises. The patterns supplement the findings made by O. Masood, F. Bashir, A.L. Sahi [3], N.N. Rubtsov [4], J.E. Jarett [5], A.V. Kavkin [6].

1. Financial crises transform the nature and preferences of the global financial derivatives market actors, that is, speculative deals are secondary to hedging contracts. Moreover, the derivatives market morphs structurally. Commodities, price indices and currency become underlying assets of deals. Anticipating a new economic crisis worldwide, market actors get involved into speculative derivatives deals.
2. Financial crises boost the development of new types of financial derivatives, which subsequently become very common and attractive for market actors.
3. As OTC derivatives are more frequently used as a speculative instrument, new crises originate (global financial crises of 2008) and risk hedging instruments gain momentum on stock exchanges.
4. At the current development phase, the global financial derivatives market offers a variety of means to hedge against financial risks, which are mostly regulated by the State. The State pursues to strengthen mechanisms for corporate management of risks and market infrastructure, and implement promising instruments and incentives for developing and consolidating national markets by introducing new derivatives and setting special trading platforms.

Russia is still on the margins of the global derivatives market. A.K. Kochieva and A.G. Zaporozhskaya analyzed the development of the investment market [7], these are major national corporations that are able to enjoy advantages of derivatives. Considering the current development level of such corporations and their numbers, we can conclude that derivatives are not widely used in Russia due to the scarcity of such corporations and their sectoral specifics. The issues are also reviewed in the proceedings by N.S. Kozyr' and A.V. Getmanova [8].

We suggest the Russian companies should draw upon the developed economies' practices of implementing

the expanded financial derivatives system making those countries flagship platforms for corporate innovative development. This will possibly help Russia gain a larger niche in the global derivatives market.

Furthermore, there is not a uniform open platform in Russia for common profit-making entities to make deals with derivatives. To promote derivatives in Russia, it is necessary to primarily set up a specialized trading venue that is to duly provide relevant information to participants, thus stimulating the use of financial derivatives for hedging risks of companies involved in foreign trade. This issue is also investigated in proceedings by A.A. Svetlov [9] and M.A. Dmitrieva [10].

Thus, bolstering the national derivatives market through specialized platforms, the State should outline the respective regulatory and legislative framework, provide necessary information and streamline trade in secondary contracts and re-use of such (*Fig. 8*).

Reviewing the existing regulatory and legislative framework of the derivatives market, we should highlight only two documents. These are Federal Law of April 24, 1996 № 39-ФЗ, *On the Securities Market*, and Instructions of the Central Bank of Russia of February 16, 2015 № 3565-У, *On Types of Financial Derivative Instruments*, which insufficiently define the market actors, their functions and key aspects of derivative transactions.

In our opinion, such specialized venues for derivatives trade will induce positive economic and financial effects for large companies and medium-sized and small businesses. To say it in other words, they will focus the public and financial institutions' attention on such venues, inspiring them to master the practice of handling the instruments. It is worth mentioning that our views are shared by, for example, E.F. Avdokushin and A.V. Krylov⁵.

Specialized venues would generally contribute to the development of Russia's financial system and attracting new foreign investors, which should pursue to hedge international dealings. S. Litvinova delves into the efficiency of this process [11]. Considering ethnic distinctions of the Russian society, growing trade driven by such venues presumably spur the demand for such financial instruments since the Russian businesses

⁵ Avdokushin E.F., Krylov A.V. [The place and role of financial innovation in the origination and development of financial economy]. *Vestnik IMSIT*, 2013, no. 3-4, pp. 3-6. (In Russ.)

strive to cut their costs, risks and other unreasonable spending, which is, however, indispensable without high professional qualification and financial literacy.

It is noteworthy that the Russian businesses should in no way confine themselves to one or several derivatives only. *Table 1* presents our recommendations for certain business segments in Russia to use derivatives.

For example, when foreign exchange rates demonstrate explicitly negative volatility, foreign exchange derivatives may serve for hedging the available fund in the future. This is especially important during the Russian ruble devaluation. Interest rate derivatives should indeed be more widely used to hedge the volatility of interest rates. Equity derivatives can work for investing activity since they may be a hedge against risks of failure to obtain the agreed upon stocks, yield on them or the other party's refusal to acquire them [12]. Credit default derivatives is a hedge against the credit risk or interest rate risk, being of practical significance in case of non-performing loans in Russia during 2014–2017⁶ [13].

Fig. 9 schematizes positive effects of derivatives that have not yet been common to the Russian financial system, and possible risks.

Summarizing the above, we outline key trends in the development of the derivatives market in Russia.

1. Under the current circumstances, the regulatory and legislative framework governing the financial derivatives market is not well elaborated. In this respect, it is reasonable to amplify the legislation guiding the market by amending the Federal Law, On Commodity Exchanges and Exchange Trade, in line with the proposed novelties. Furthermore, it seems to be the right time for the Central Bank of Russia to mandate the establishment of a specialized venue in order to regulate the financial derivatives market and transact in it. Whereas derivatives are virtually digital products, they are subject to tax. However, the Russian Tax Code fails to stipulate any rules for charging taxes on secondary financial contracts, thus

triggering respective trade risks. Hence, we consider it legitimate to spell out the taxation procedure for transactions with derivatives in the Russian Tax Code and locate the place of such transactions by introducing the term digital product and additional clauses into Article 38 and Article 146 of the Russian Tax Code classifying taxable items.

2. If established, specialized derivatives trading venues will embrace more market actors, thus fostering the active development and growing turnover. Currently, the Russian derivatives market mainly provides for foreign exchange derivatives of speculative nature, which are initiated by large Russian multinational companies. The specialized derivatives trading venues will not only involve new market actors, but also contribute to mastering financial derivatives, which are yet uncommon to the Russian market, thus reshaping the general structure of the Russian derivatives market. Such transactions will serve as a hedge against possible financial and business risks.
3. What Russia's derivatives market distinctive is that national companies show no interest and motivation to use financial derivatives due to their poor financial literacy. Moreover, the Russian entities have no tradition of hedging their financing and operating activities against risks. As the business environment and business mentality currently transforms, many national entities tend to this segment of the financial market willing to make secondary transactions for risk hedging purposes.

Promoting and implementing new financial derivatives in various sectors of the economy, the State will thereby create a new and internationally compliant model of the Russian financial model, let willing national companies and foreign investors enter the national derivatives market. Implemented in real business practices, methods and schemes for handling financial derivatives will be an advanced shield to protect commercial interests and hedge against risks as part of international settlements and transactions.

⁶ Temishev M.Kh. [Credit derivatives as a method for credit risk management]. *Finansy i kredit = Finance and Credit*, 2007, no. 12, pp. 44–57. (In Russ.)

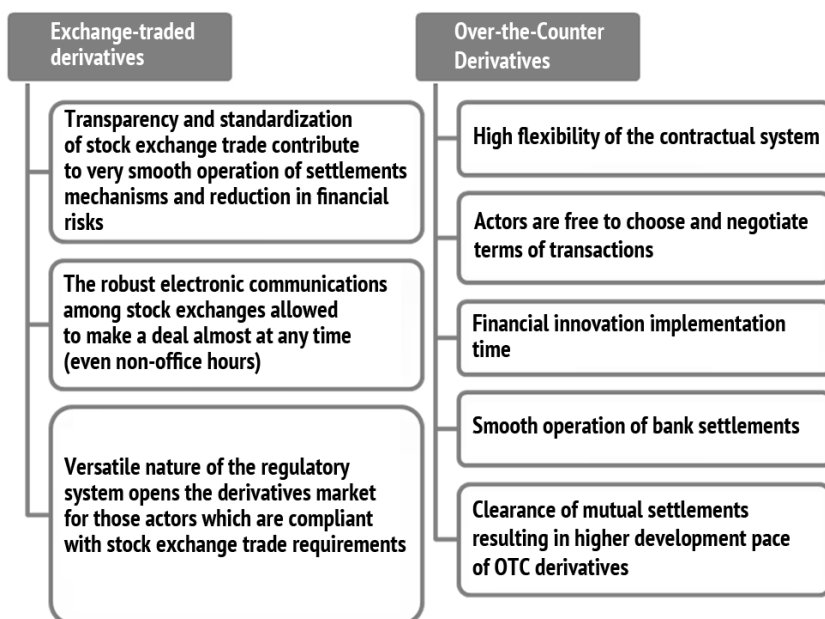
Table 1**The practical use of specific types of derivatives in Russia across business segments**

Type of derivatives	Brief description	Type of derivatives holder	Strengths	Weaknesses
Equity derivatives (over-the-counter options, warrants, equity swaps)	Financial instruments for exchange, arrangements for shares in the future at fixed prices. Over-the-counter equity derivatives are special-purpose contracts applied to stock index, portfolio of shares or a specific type of shares	Large business	Opportunity to conclude an individual agreement between the investor and issuing dealer. Very flexible structure of an instrument in terms of exercise price, term and payment terms	Credit risk is attributed to the investor of the deal
Foreign exchange derivatives (foreign exchange forwards, swaps, options and futures)	Financial instruments allowing for an exchange of two currencies at a specific date or during a period of time in the future at the agreed upon exchange rate	Large and medium-sized business	Hedging opportunity for the investor (buyer of a term contract) against risks associated with changed in the foreign exchange rate. The risk for the seller of foreign exchange option is mitigated (offset) with fees	Futures and options require that certain financial resources be available (as much as initial margin) for purposes of transactions
Interest rate derivatives (interest rate swaps, cap and floor options, agreement for pegging interest rates, etc.)	Financial instruments for pegging the interest rate (for profit generation, repayment of a loan in the future, exchange of payments in case of fluctuating interests rates, etc.). These are types of term contracts for ensuring the specific interest rates in the future	Large and medium-sized business	Mitigation of interest rate risks. Opportunity to lock in the yield on corporate and government bonds. Ensuring the acceptable level of deposit rates	Fees are paid upon the purchase of foreign exchange option
Commodity derivatives (commodity forward, commodity swap, commodity futures, commodity option)	Financial instruments for exchange, delivery of commodities, services, work in the future at a specific price	Large, medium-sized and small business	Opportunity to find a seller/buyer in the future. Hedge against increased prices upon the provision of an asset to be acquired in the future. Hedge against decreased prices upon the provision of an asset to be sold in the future	Payoff on a derivative contract directly depends on interest rates
Credit default derivatives (credit default swap, credit-linked notes, etc.)	Financial instruments for transferring credit default risks associated with an asset from one person to the other without selling the asset	Banks	Opportunity to sell loan risks without selling loans to other banks. Preservation of customers' confidence in the bank. Lower legal and some other initial costs. Mitigation of tax risk exposure	Difficulty to forecast the volatility of price for an asset in the future. Unfairly and unreliably assessed credit risks causing the loss and excess costs

Source: Authoring based on: Levin V.S., Matveeva T.A. [Classification of derivative financial instruments]. *Finansy i kredit = Finance and Credit*, 2011, no. 39, pp. 9–14. (In Russ.); Kiselev M.V. [Functions of derivatives]. *Finansy i kredit = Finance and Credit*, 2008, no. 3, pp. 45–49. (In Russ.)

Figure 1

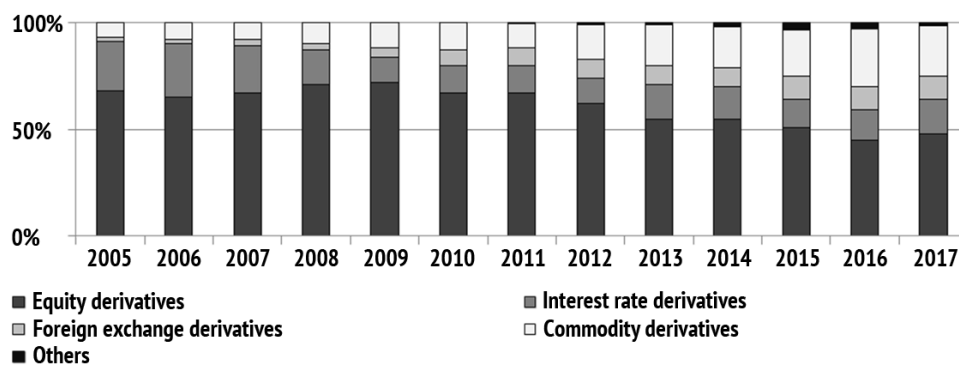
Distinctive features of exchange-traded and over-the-counter derivatives



Source: Authoring

Figure 2

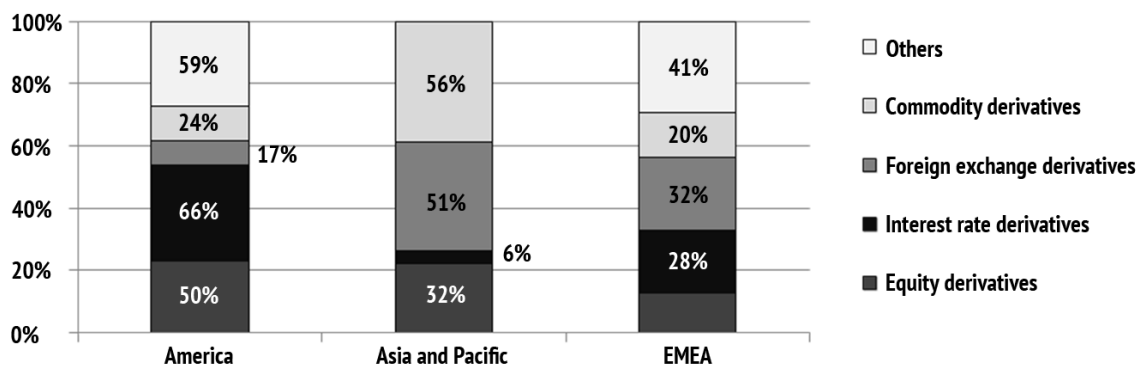
Trends in the structure of exchange-traded derivatives by number of contracts traded in 2005–2017, percentage point



Source: The World Federation of Exchanges data

Figure 3

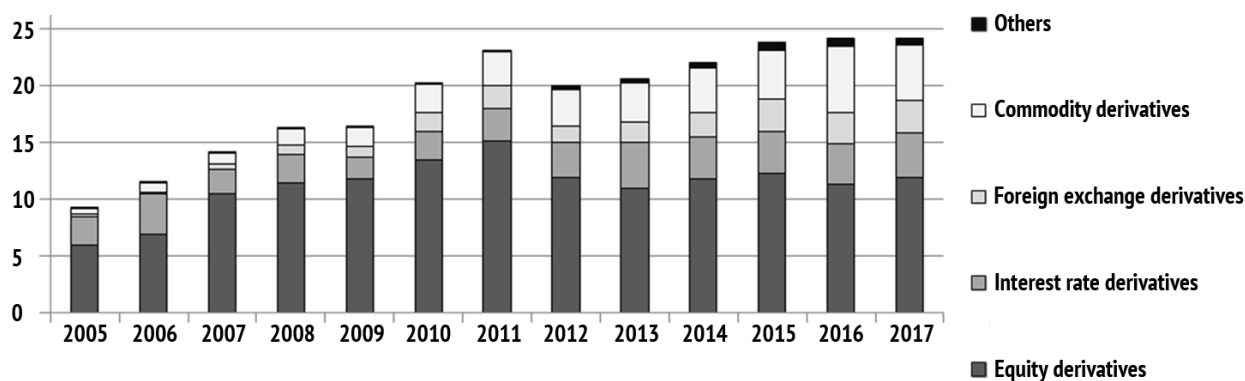
The structure of regional trading volumes of exchange-traded derivatives by type of underlying assets in 2017, percentage



Source: The World Federation of Exchanges data

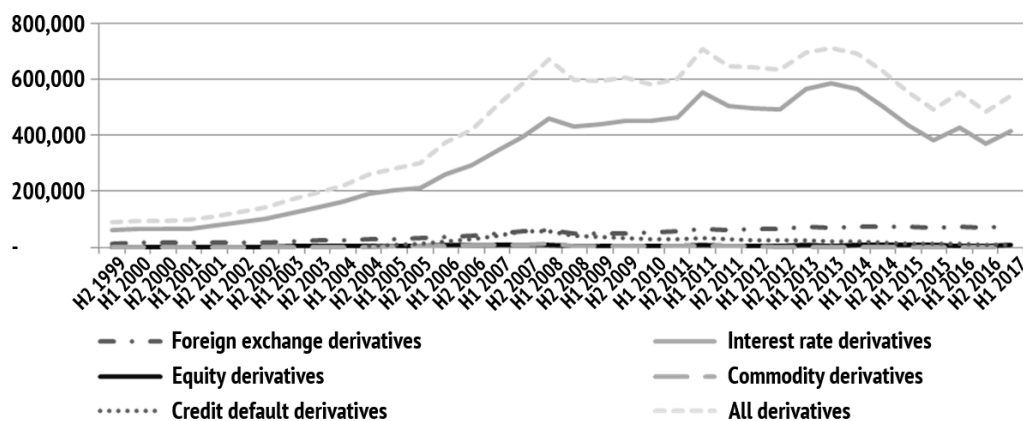
Figure 4

Trends in exchange-traded derivatives traded worldwide in 2005–2017, million contracts



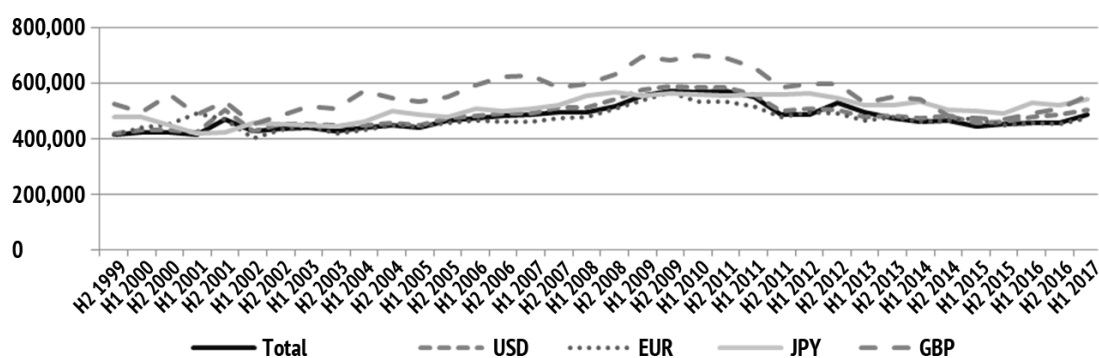
Source: The World Federation of Exchanges data

Figure 5
Development trends in the global over-the-counter derivatives mark



Source: The Bank for International Settlements data

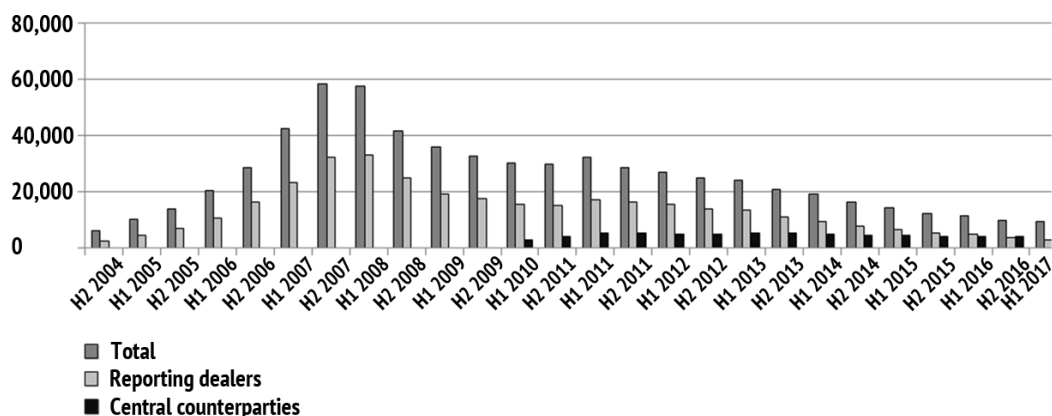
Figure 6
Trends in over-the-counter foreign exchange forwards and swaps by type of currency used worldwide in 1999–2017, by the Herfindahl index, percentage point



Source: The Bank for International Settlements data

Figure 7

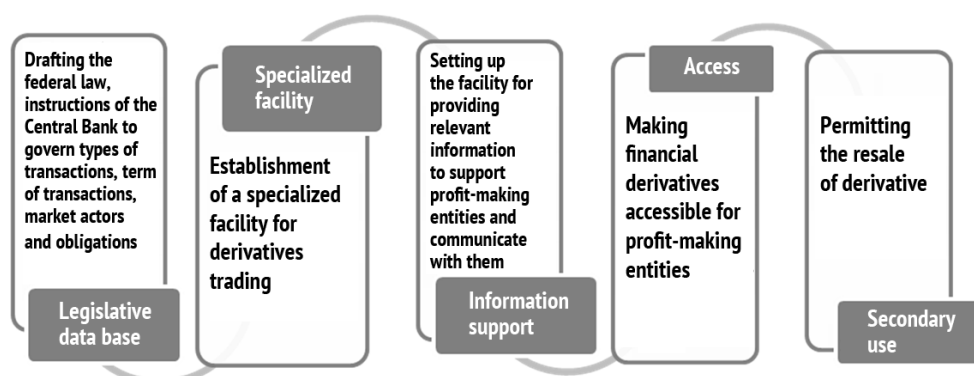
Trends in contingent liabilities related to over-the-counter credit default swaps in 2004–2017, billion USD



Source: The Bank for International Settlements data

Figure 8

Steps to establish specialized derivatives trading venues: Arrangement and implementation



Source: Authoring

Figure 9

Probable positive consequences and risks associated with the inclusion of derivatives into Russia's financial system

Probable positive effects	Possible risks
<p>Attracting new market actors by defining their rights and obligations and offering a wide array of financial derivatives.</p> <p>The market rearrangement from the speculative nature to hedging.</p> <p>The use of diverse financial derivatives.</p> <p>Increase in financial literacy and culture of hedging the financing and operating activities.</p> <p>Opportunity for the Russian financial derivatives to enter the international market and take the leading positions</p>	<p>National profit-making companies' avoidance of the facility due to mentality reasons.</p> <p>Difficulty to set up the relationship between the trade repository and facility.</p> <p>Multiple new foreign actors will squeeze national companies and speculate on prices for underlying assets.</p> <p>Non-existent information technologies required for appropriate operation of information facilities</p>

Source: Authoring

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Conflict-of-interest notification

We, the authors of this article, bindingly and explicitly declare of the partial and total lack of actual or potential conflict of interest with any other third party whatsoever, which may arise as a result of the publication of this article. This statement relates to the study, data collection and interpretation, writing and preparation of the article, and the decision to submit the manuscript for publication.

Original Article[†]

INTEGRATED MANAGEMENT ANALYSIS OF INNOVATION: A CONCEPTUAL AND METHODOLOGICAL FRAMEWORK



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Abstract

Subject The contemporary market economy has no alternative but to go down an innovation development path, necessitating the research into the theory, methodology and methods of innovation in management analysis. This facilitates adequate and effective decisions concerning innovation management.

Objectives The research reviews a conceptual and methodological framework for integrated management analysis of innovation, which constitutes an absolutely new kind of management analysis revealing the robust information about the innovation-driven performance, untapped resources and opportunities for their mobilization.

Methods The methodological framework builds upon a conceptual approach to integrating innovative processes, conceptual basis of business-specific types of management analysis to study innovation, and the Balanced Scorecard concept (namely, its innovation component).

Results The integrated management analysis of innovation is showed to comprehensively study the formation of relevant resources, costing, outcome of innovation, and crucial processes relating to consumers and competitors. The set of indicators includes metrics of innovation, investment, competitive and market analysis, which may serve for examining the innovative performance from operational, tactical and strategic perspectives. The integrated management analysis of innovation comprises the assessment, evaluation and estimation of indicators.

Conclusions and Relevance The integrated management analysis of innovation is a fairly effective tool to supply the managing process with necessary information since it views innovation as a single construct.

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Introduction

As we can see from the experience of developed countries, the high level of economic development depends on a number of conditions, with the accumulated scientific, technical, industrial and investment potential, institutional factors of the technological progress and State support of innovative transformations being the main ones.

The contemporary market economy has no alternative but to go down an innovation development path, which boosts the need for research into the theory, methodology and methods of the innovation

component of management analysis. This, in turn, makes it possible to take adequate and effective decisions as regards innovation management by an economic agent (entity).

The innovation development concept is gradually turning into a focal point of most natural and technical branches of science and humanities. Economics plays a special role in studying the diverse effect of innovations on various aspects of life in the contemporary society. The existing need to speed up the transition of a particular country to an innovation-driven economy calls for the intensification of research into innovative development issues. This forms and strengthens

[†]The English text was provided by the author.

competitive advantages of each economic entity in the contemporary changing world, which is one of the key tasks in ensuring its survival and prosperity. The innovative level and innovation efficiency that the economic entity has achieved largely determines whether the task is effectively addressed. Competition entices economic entities to ensure economic viability both through a more reasonable use of production and financial resources and by attracting investors to renovate and expand business. This is preceded by innovation activities aimed at developing capital investment options designed to reveal and support competitive advantages. Such advantages mean fewer risks, higher return on investment as compared to rivals in a specific market niche. The market niche may mean a particular kind of activity aimed at creating consumer values, or a geographic area, but in any case potential business propositions need to be substantiated in terms of innovation on the basis of a clear information database and convincing analytical calculations.

The importance of the above issues requires to improve an analytical support of the managerial decision making process as regards innovation (in its broad sense, that is, including investment and marketing), which, in my opinion, is the most important part of an organization's economic activities under the current conditions.

In view of the above mentioned, I suggest using integrated management analysis of innovation that I have designed as a tool to provide an analytical support in innovation management.

The Methodology of Research

The methodological framework of the research summarized herein is based on the following elements:

- 1) a conceptual approach to the integration of processes that make up the organization's innovation activity;
- 2) the conceptual principles of business-specific kinds of management analysis used to study innovation;
- 3) the Balanced Scorecard concept (its innovation component).

Let us take a brief look at each of them.

According to my own definition, innovation is the process of finding and using S&T achievements with the help of R&D efforts which make it possible to create and introduce innovations that result in certain effects

inside the company and/or in the domestic and/or foreign market.

As for the place and the role of innovation in the contemporary market economy, the assessment of integrative processes in the field of innovation acquires critical importance. The problem is that innovation yields the maximum effect if it is closely integrated with investment, creation of new production facilities, design and financing. If so, it not only reduces the general innovation cycle but also triggers a synergistic effect, i.e. an additional effect caused by close partnership of all the parties involved in a single technological treadmill.

The development of science and innovation appears to call for joining the efforts of scientists, those developing innovations, designers, investors, developers and builders in the course of implementing the so called integrated innovation activity. In other words, today's situation requires a fundamentally different interaction pattern for all participants to the single technological treadmill, and the development of integration processes in innovation should be encouraged in every possible way.

Consequently, effective innovation management is only feasible if this activity is regarded as a single complex. As a result, all economic functions of management (accounting, analysis, planning, etc.) also become integrative by nature.

It is natural that the strongest synergistic effect is achieved in an integrated system where the entire complex of processes of development, creation and use of innovation objects of capital investment is implemented in the form of a single innovation project.

Effective management of such a project calls for the development and application of methods, procedures and indicators of management analysis. The distinguishing feature of contemporary management analysis lies in its influence on the process of accounting so as to obtain relevant analytical information.

A broader interpretation of the notion *management accounting* by Ch. Horngren and J. Foster [1] may be of interest to researchers: it implies the identification, measurement, collection, systematization, analysis, decomposition, interpretation and communication of information needed for a management system. In this case management analysis is understood as a component of management accounting.

Some authors, for example, C. Drury [2], imply that management analysis is part of management accounting and refer to the definition of the latter as a system for providing relevant information for managers to make more substantiated management decisions inside a particular economic agent in order to boost the performance of current operations and overall effectiveness of its activity.

The contemporary theory and practice of management analysis have various approaches to its classification [3–5].

Moreover, some understand the term *classification* not as an elaborate scheme that distinguishes 10 business-specific kinds of analysis [6], but as a way of distinguishing relevant kinds of management analysis based on object-functional characteristics aiming to use the opportunities of their integral inclusion for a synergistic effect. As a result, any required number of analysis types can be singled out, which allows to use a new approach to economic processes based on the integration of techniques pertaining to different kinds of analysis.

For a better understanding of specific features of the proposed classification, we consider it useful to define in reasonable detail the following characteristics of each business-specific kind of corporate management analysis (*Table 1*): the object of analysis, subject of analysis, goal of analysis, and main information sources.

With this in mind, the proposed goal setting includes such steps as assessment, evaluation and forecast of indicators characterizing resources, costs and results of the corresponding type of corporate activity. When analyzable indicators are assessed, their factual and baseline values (targets, values of prior period) are juxtaposed, the deviation of actual values from baseline values is identified and quality of those deviations is assessed. Evaluating the deviations of the analyzable indicators reveals factors that brought them about while relevant techniques of factor analysis help determine the effect of each one. In forecasting the indicators under study, multiple options are offered through relevant forecasting methods depending on expected changes in internal and external conditions of the company's operation. It is obvious that assessment, evaluation and forecasting are closely interrelated as each subsequent action is based on the preceding one. For example, the evaluation results from the

assessment of indicators while forecast stems from the outcome of the evaluation.

The Balanced Scorecard Concept (BSC) as an instrument applied in strategic management was developed by the U.S. scientists R. Kaplan and D. Norton in the early 1990s [7]. The concept evolved both in their works [8–11] and proceedings of some other foreign economists [12–17]. The concept has proven its practical viability.

Generally speaking, the Balanced Scorecard can be characterized as a system of parameters describing the overall performance of an organization in the contemporary market economy.

The fact of being called Balanced Scorecard reflects the balance between short-term and long-term goals, financial and non-financial indicators, basic and auxiliary parameters, as well as internal and external factors of business operation.

The main purpose of the Balanced Scorecard is to transform the company's strategy into specific tangible objectives, indicators and, eventually, actions (measures).

The Balanced Scorecard system is based on the cause-and-effect relationship, factors of achievement and interrelation with financial indicators.

The Balanced Scorecard comprises four basic interrelated elements – financial and customer perspectives, components relating to internal business processes and those ones dealing with staff training and development. The components are represented in the light of key problems, strategic objectives, indicators and their target values as well as strategic measures. In addition, the component of internal business processes consists of other three elements, i.e. innovation, operational and after-sale service.

The BSC metrics allow to comprehensively characterize the performance of both commercial, government and non-profit organizations. The metrics are relatively few in numbers (about 25 scores on average) and they are formed with the vision and strategic goals of any particular organization, which means they have individual features. They represent the balance between external accounting data for owners (stakeholders) and clients and internal characteristics of the most significant business processes, innovations, training and growth. This is the balance between results of the organization's previous performance and future growth. The system constitutes a combination of

objective, easily measurable results and subjective, somewhat arbitrary parameters of the future growth.

In other words, when describing the corporate strategy, the BSC serves as a mechanism for implementing this strategy, rather than a mechanism for defining it. The Balanced Scorecard is not only a tactical or operational assessment system. It does not replace the routine parameter assessment system. The BSC metrics are selected in such a way so as to make managers and employees focus on the factors that will significantly drive the company's ability to compete in the market. At the same time, the BSC should be available as an information source to employees at all levels.

For innovation companies the BSC serves as a means of long-term strategic management while its assessment component is used to solve the key tasks of the management process.

The innovation component of the Balanced Scorecard can be presented as *Table 2*.

Just like any other BSC metric, the indicators of its innovation component are always specific to any particular organization and determined by the corporate innovation strategy. Nevertheless, to illustrate this, we will highlight several common metrics of the innovation process that characterize its strategic goals, being mostly versatile for all kinds of organizations (*Table 3*).

As showed in my previous publications, the metrics of the BSC innovation component may be used as a database for strategic innovation analysis in any company which uses the Balanced Scorecard [18]. Such analysis constitutes a part of strategic management analysis and consists of assessment, evaluation and forecasting of certain metrics [19, 20].

Having determined that the development of integration processes in innovation is possible, necessary and viable and revealed an objective need to possibly combine the analysis of this activity with some of the most important kinds of management analysis, including strategic management analysis, we shall proceed to the conceptual basics of an absolutely new kind of management analysis – integrated management analysis of innovation.

Results

When characterizing the most important organizational and methodological issues relating to a fundamentally new kind of management analysis – integrated

management analysis of innovation – one should keep it in mind that this kind of analysis is, first and foremost, aimed at uniting innovation management analysis and investment management analysis. It is therefore reasonable to link the result of this integration, that is, innovation and investment management analysis, to competitive management analysis and marketing management analysis.

In my opinion, programme and methodological questions relating to integrated management analysis of innovation should be strictly considered in the following sequence: identify the object and subject □ identify goals and principles of analysis □ develop a system of indicators □ select information sources □ select methods of analysis □ determine areas of application of the results.

Identification of object and subject of integrated management analysis of innovation

When identifying the object and subject of integrated management analysis of innovation (the first programme-methodological question), I propose the following definitions.

The object of integrated management analysis of innovation is the innovation activity (in a broad meaning of the word, that is, including investment) of companies which have opted for an innovative development path or continue the transition. In such companies, innovation and investment activities are integrating irreversibly. Therefore, it seem extremely unreasonable to conduct innovation management analysis separately from investment management analysis and further integrate the results.

The subject of integrated management analysis of innovation is a set of processes constituting the formation of relevant resources, costs incurred and results obtained during the analyzable activity. The results, costs and efficiency of resource use are largely determined by:

- the extent to which the scale and structure of innovation corresponds to the current and, in particular, future needs of the market of innovation products and technologies,
- the competitiveness of innovation (as compared with competitors).

In the light of the above mentioned, the subject of integrated management analysis of innovation should also include the most important processes happening

in the consumer market and the company's competitive environment.

Identification of goals and principles of integrated management analysis of innovation

Goals and methodological principles of integrated management analysis of innovation shall be set (the second programme-methodological question) after the main goal and more local goals it consists of are identified.

While the company transits to the innovation economy, the main goal of integrated management analysis of innovation is to provide top management and owners with complete, accurate and quality information about the company's innovation-driven performance, untapped resources and opportunities for their mobilization.

The main goal of integrated management analysis of innovation consists of local goals (subgoals) connected with the relevant kinds of management analysis. These subgoals may be defined as follows:

- in the case of innovation management analysis, revealing the scientific and technical level, progressivity ratio and commercial demand for innovations as well as the innovation activity and how the innovation activity is encouraged in the company;
- in the case of investment management analysis, assessing if the company has enough investment resources, financial support of the innovation activity from budgets of all levels, domestic and foreign capital, and evaluating the efficiency of investments in innovations;
- in the case of competitive management analysis, assessing the competitiveness, intensity of innovation creation, saturation of the company with innovation, its technological dependence, duration of the innovation completion cycle and copyright protection of innovations;
- in the case of marketing management analysis, assessing the integrity of innovative product development, use of the latest and emerging technologies, demand for innovation of processes, and ubiquitous approach to the use of innovative processes.

The strict adherence to the system of local subgoals allows to implement the main goal of integrated management analysis of innovation.

To increase the scientific level of integrated management analysis of innovation, it is essential to determine the principles for applying it during analytical procedures.

Specific principles of integrated management analysis of innovation include:

- 1) the *key link* principle in partially integrated analysis;
- 2) the principle for prioritizing the corporate innovation activity in terms of transit to the sixth wave of innovation.

These are basic characteristics of principles for the integrated management analysis of corporate innovation.

The key link principle in partially integrated analysis

It is relatively simple to select the *key link* at the initial stage of integration procedures. If the object of these procedures is a modern university, all business-specific kinds of analysis subject to integration are characterized by long planning horizons because of the lengthy process of professional training. Therefore, it is strategic management analysis that will play the main role in the integration.

The task becomes somewhat more challenging with a more complicated, partially integrated object of analysis, for example, the innovation activity (including investment activity). The integration of these two kinds of activity is unbiased and fast. The *invest-all-in-innovation* principle gains momentum in the area.

Given the above mentioned, four local kinds of management analysis of innovation (innovative, investment, marketing and competitive) are not completely equal. Their integration is based on innovation management analysis which corresponds with the integrated character of the relevant kind of activity. That is why capabilities of investment management analysis, marketing management analysis and competitive management analysis are partially used in innovation management analysis, rather than being completely absorbed by the latter kind of analysis.

The principle for prioritizing the corporate innovation activity in terms of transit to the sixth wave of innovation

As seen in numerous definitions of innovation in contemporary economic literature [21–24], most authors consider innovations to comprise not only

brand new novelties but also different kinds of improvements and modifications, the existence of which tends to blur boundaries between innovative and non-innovative products.

In my opinion, innovative products driving the company to the sixth wave of innovation must be a priority in the innovation activity.

The basic discoveries and inventions as part of the sixth wave of innovation result from a qualitative breakthrough in improving the key factor and the core of the fifth wave of innovation, which includes microelectronics, software development, radio engineering, machine building, information and communication technologies, laser technology. Considering the existing rate of long-term technical and economic development, a steady growth in the currently prevailing fifth wave of innovation is about to reach its ceiling, unveiling the general outlines of the sixth wave of innovation. The boundaries between fundamental technologies (biotechnology, nanotechnology, material engineering and IT) are getting increasingly blurred. The role of nanotechnology is especially important as it will power a breakthrough to new horizons of computer science, molecular biology, genetic engineering and medicine.

Developing a system of indicators for integrated management analysis of innovation

Based on the above mentioned considerations, a system of integrated innovation indicators was developed using the existing statistical practice of accounting in this field and non-accounting sources.

The most important and pending methodological issue of integrated management analysis of innovation (both for the purposes of research and application) is the information and analytical support of management. The main barrier is the lack of a well-tested system of indicators, which constitutes the third problem of integrated management analysis of innovation performance.

Constructing an analytical system of indicators is technically difficult because of the complexity of 'merging procedures' as part of integrated analysis. First, indicators that belong to different types of management analysis (innovation, investment, market, and competition) are to be considered jointly. Second, it is very desirable to use the same (structurally identical) indicators for measurement, cost engineering, planning

and forecasting as it would make it possible to reduce the workload on analysts, planning specialists and cost engineers.

I believe that among the variety of innovation indicators the priority should be assigned to those ones having scientific and technological impact, competition, quality, complexity and commercial potential.

It seems advisable to consider the proposed metrics, first of all, as homogeneous groups (within the limits of specific areas of management analysis), and, second, to differentiate the analytical metrics by three phases of innovation – creation, adoption and outcome [25–26].

Having grouped the metrics by specific areas of management analysis for the purposes of its further integration, I build a scorecard comprising 21 key indicators that form four groups. The scorecard (*Table 4*) allows to comprehensively assess innovation performance in a company.

Let us focus on each group of indicators.

The first group includes five analytical indicators of innovation analysis *per se*. They primarily characterize the scientific and technological level of innovations being created.

The progressivity indicators of innovation (1.1) reflect the percentage of forward-looking process/product innovations in the total number of process/product innovations created by the company.

The S&T indicator of introduced innovations (1.2) shows the share of new (that is, excluding upgrades and modifications) product innovations in the total number of product innovations.

The indicator of innovation activity (1.3) is the percentage of the total number of innovative products, i.e. new, upgraded and modified ones in the company's output.

The indicator of the commercial demand for innovation (1.4) is calculated as the average number of licensing agreements per process/product innovation.

The indicator of incentives to innovate (1.5) is the ratio of net income from innovation (in its broadest sense) to the company's payroll in the innovative business unit.

The above indicators of innovation analysis primarily reflect the scientific and technological level of innovation, its commercial value and monetary incentives in innovation. However, it is not enough to

rely on them only to advance innovation at the corporate level and succeed in this field if due attention is not paid to competitors' achievements. For this purpose, it is necessary to resort to competitive analysis that relies upon the competitive intelligence, seeking to reveal the strengths and weaknesses of the main competitors.

The second group of analytical indicators – competitive analysis metrics – contains six items.

The competitiveness indicator (2.1) is the weighted average score reflecting the competitiveness of innovative products, which is calculated by the percentage of innovative products of any competitiveness in the total sales of innovative products and score of each competitiveness level.

The indicator of innovation intensity (2.2) shows the total number of created process/product innovations per innovator.

The indicator of process innovation density (2.3) is determined by dividing the number of process innovations in use by the total number of all technological processes.

The indicator of technological dependence (2.4) is the ratio of process/product innovations used (adopted) under licensing agreements to the total number of process/product innovations.

The indicator of legal protection for innovation (2.5) is computed as the ratio of the number of product innovations protected with at least two copyright certificates (a patent for an invention, a utility model, a patent for an industrial design, or a trademark certificate) to the total number of created product innovations.

The indicator of the innovation duration (2.6) reflects the mean time (years) needed to create (use, master) process/product innovations.

The indicators of competitive analysis characterize solely corporate relations with its existing and potential competitors and resulting adjustments to the innovation strategy. It is therefore necessary to supplement competitive and innovation analysis with market research data.

The third group of indicators – those of market analysis – consists of four analytical indicators.

The indicator of the comprehensive development of product innovation (3.1) is the ratio of the number of

product innovations that are compliant with key requirements (environmental, after-sale service, and security) to the total number of created product innovations.

The indicator of the advanced technology use (3.2) is the share of the advanced technology groups in the company that use process innovations in the total number of advanced technology groups.

The indicator of demand for process innovation (3.3) is the ratio of the number of process innovations that created and used by an analyzable company to the total number of process innovations created by the company and used by other companies in the industry.

The indicator of versatile applicability (3.4) is calculated as the ratio of the application scope of process/product innovations to the total number of the consumption segments in the national economy.

The above indicators of market analysis reflect the sustainability of the innovating company in the innovation market.

The fourth group of indicators – those of investment analysis – includes six analytical indicators.

The indicator of financial aid from the State (4.1) is the ratio of funds received from the government to total spending on innovation from all financial sources.

The indicator of the company's reliance on commercial loans (debt ratio) (4.2) is the ratio of commercial loans for innovation to total spending on innovation from all financial sources.

The indicator of the company's financial independence (4.3) is the ratio of equity earmarked for innovation to total spending on innovation from all financial sources.

The financial indicator of technological dependence (4.4) is the ratio of procurement expenditures on innovations under licensing agreements to total expenditure on innovation.

The indicator of foreign equity (4.5) is the ratio of foreign capital invested in innovation to total investment in the company's innovation.

The indicator of national equity (4.6) is the ratio of domestic investment in innovation to total investment in the company's innovation.

The investment analysis indicators disclose sources of funding and investment in innovation in an analyzable company.

In my opinion, the proposed system of the key indicators of integrated management analysis of innovation (*Table 4*) is versatile to a large extent, being practicable for examining operational, tactical and strategic aspects of innovation in almost any entity. The system implies that the indicators are assessed, evaluated and projected at the end of every month, at the end of every year, and for the effective period of the strategy being developed respectively.

However, when conducting integrated management analysis of innovation, the strategy should accommodate to corporate distinctions, thus requiring to supplement the above system of indicators with innovation indicators of the company's Balanced Scorecard. The most general ones are given in *Table 3*.

Selecting sources of information for integrated management analysis of innovation

When addressing the programme-methodological issue so as to determine what forms, methods and sources are appropriate to collect necessary data, it is advisable to apply the so called unformalized data collection methods [4, 27].

In my opinion, the main sources of information for integrated management analysis of innovation are:

- up-to-date statistical reports;
- management accounting data;
- findings of an expert opinion poll among the most competent professionals in an analyzable industry;
- findings of the competitive intelligence;
- findings of surveys among clients and consumers.

The first two sources of primary data are traditional and more credible than the other three, which are considered unformalized sources of information.

It should be kept in mind that modern techniques for applying unformalized data collection methods for purposes of the analysis have grown very sophisticated. Practical specifics of a dedicated expert survey among high professionals is thoroughly described in scholarly literature [28].

Competitive intelligence is a crucial source of primary information for integrated management analysis of innovation.

Competitive intelligence is supposed to examine the competitive environment, purposefully gather a certain

information about competitors so as to make decisions about the strategy and tactic of doing business [29].

Competitive intelligence is

- 1) collection and processing of data from various sources to make decisions and improve the competitive advantage of a profit-making entity. Unlike industrial espionage, competitive intelligence is performed legally and in compliance with ethical standards;
- 2) the structural unit of a company that performs the above functions;
- 3) a set of measures aimed at providing the information and analytical support to managers through specific data collection methods so that they get a deep understanding of the current position of competitors and development trends in their operation.

As part of competitive intelligence, the statics and dynamics of the competitors' innovative business are analyzed using publicly available and partially restricted information. Findings of such analysis should be delivered to the company management and stakeholders on a timely basis.

The outcome of customer and consumer surveys and the first two sources of primary information are treated as traditional, revealing the demand for new products and services that will be valuable for customers and consumers in terms of price, quality, functionality, image, reputation, relationship and service [8].

Selecting methods for integrated management analysis of innovation

As for the selection of methods for integrated management analysis of innovation (the fifth methodological issue of integrated analysis), it should be noted that any of the six classification groups is acceptable [27].

1. Unformalized (logical) methods are based on the logical description of analytical procedures, rather than the use of rigorous analytical dependencies. They include methods of expert assessment, scenarios, psychological and morphological comparison, scorecards, systems of analytical grids, etc. Such methods are biased due to the analyst's intuition, experience and expertise.
2. Elementary methods for microeconomic analysis aim to analyze the company's performance and identify a capabilities for improvement. Factor analysis

methods (tools) is of special significance in this group. These are replacement chain methods, arithmetic differences method, method for identifying the isolated influence of factors, differential, logarithmic and integral methods.

3. Traditional methods of economic statistics are designed to quantify phenomena and processes. They are specifically adapted to research into social and economic systems. They have a great scope of application in all branches of microeconomic analysis. These are the arithmetic mean, grouping method, basic time series methods, indexing method. They are conventionally referred to as traditional because of their predominance, simplicity and historical background.
4. Mathematical and statistical methods (stochastic modeling) rule out the recurrence of the required phenomenon to forming the totality, which is typical of experiments. Correlation between individual factors and indicators is extremely high. It is not always possible to model the required situation. The analyst should, therefore, have a very clear idea of the conventionality of quantitative estimates yielded by such methods and should not overemphasize them. By using these methods – correlation and regression analysis, dispersion analysis, cluster analysis, methods of modern factor analysis, methods of space-time totality processing, it is possible to predict the dynamics of the key indicators, develop scientifically proven standards and identify the most significant factors.
5. Decision making methods are used when the same person is responsible for justifying a decision analytically and making it. This requires to master techniques that were developed as part of the decision theory: situation analysis and forecasting, imitation modeling, decision tree, linear programming, uncertainty analysis.
6. The methods of financial computing (discounting and compounding, cash flow analysis) are based on the time value of money. They help make managerial decisions that prove to be effective in the long run. Decision makers and analysts, who assist them, must be capable of doing such computing.

Application scope of findings of integrated management analysis of innovation

Analytical findings (first of all, a set of metrics for innovation, investment, marketing and competitive

analyses) can be applied at various tiers of the governance hierarchy, thereby reinforcing the scientific underpinning of projections, concepts, strategies and development programs and improving innovation management (in its broadest sense) in a company (industry or region). The results also seem useful for furthering the theory and methodology of economic analysis.

The analytical findings can be applied in the key areas as follows.

1. As a contribution to the theory and methodology of economic analysis.
 - 1.1. Substantiating a choice of alternative innovation projects, which are compliant with certain criteria of activity-specific analysis.
 - 1.2. Revealing capabilities for unformalized analysis methods as part of integration procedures and selection of the most successful innovation project.
2. As an improvement to the information and analytical support of decision making in management.
 - 2.1. Comprehensive assessment of the current condition of innovation, innovation trends and development factors.
 - 2.2. Identifying untapped reserves and growth opportunities.
 - 2.3. Developing a set of extrapolating and exploratory benchmark-based forecasts as part of short-, mid- and long-term planning.
 - 2.4. Articulating development concepts and improving innovation management in the foreseeable future.
 - 2.5. Outlining alternative strategies for reaching innovation goals.
 - 2.6. Designing regional special-purpose programs of governmental support to priority innovation development.
 - 2.7. Setting up a system of indicators and innovation monitoring.

Let us dwell upon some of the key areas for using the analytical findings.

To substantiate a choice of alternative innovation projects, which are compliant with certain criteria of activity-specific analysis, it is necessary to assess innovative projects the company plans or borrows in terms of a local kind of management analysis as per

relevant metrics. For example, when innovation analysis is performed, the following criteria of the project success are applied: innovation progressiveness, S&T level, commercial viability.

When investment analysis is performed, investment project success criteria include the equity-to-assets ratio of the company in financing the innovation, financial indicator of technological dependence, relative investment per innovative product, etc. Marketing specialists in charge of marketing analysis pay much attention to the market share of a new product, its development complexity and its usability, etc. Competitive intelligence officers and analysts go for the competitiveness metrics, legal protection of innovations, development time, etc.

Whereas it is possible to identify capabilities of unformalized analysis methods in implementing integration procedures and selecting the most successful innovation project, this is indicia of an idiosyncratic algorithm for integrating findings of activity-specific types of management analysis. The algorithm implies the expert panel method and procedures for reconciling experts' opinions on the degree of alternative innovation project success.

Comprehensive assessment of the current innovation, trends and development factors is based on a specially designed scorecard of integrated management analysis that contains 21 indicators (*Table 4*) and addresses the above questions.

Identifying untapped reserves and opportunities for innovative growth is a logical step to continue and develop the previous scope of application. For example, if the innovation activity indicator, which is measured as the ratio of the total number of innovative products to the company's output, is lower in the reporting period than in the baseline period, then obviously there are untapped reserves for improvement. If the indicator of innovation activity that is measured as the proportion of fundamentally new innovative products, is much lower than the previous indicator, the company has reserves for spurring its innovative growth.

A set of extrapolating and exploratory normative projects for short-, mid- and long-term planning is developed before a concept and strategy for the company's innovative development is created. The projections are an essential element of information and analytical support of appropriate decision making processes.

In developing concepts for the development and improvement of innovation management in the foreseeable period, an integrated analysis of this activity provides reliable scientific grounds for substantiating the mission, goals and objectives of the company's development for an extended period of time. One should bear in mind that the scientific validity of the concept increases if the overwhelming majority of the known activity-specific types of management analysis are used as the most comprehensive integrated analysis, rather than separately.

In outlining alternative strategies for attaining innovation goals, it should be remembered that the strategy requires to specify the company's development in much more detail than the concept. Moreover, unforeseen (at the stage of strategy development) changes in external and internal operational conditions may occur during the strategy implementation. So, unlike the concept, several alternative development strategies are usually created. The role of innovation analysis can hardly be overestimated.

In preparing targeted regional programs of State support to priority areas of innovation, integrated management analysis (especially its innovation and investment components) enables government agencies to identify the most promising trends in innovative development and provide them with extensive support.

In setting up a system of indicators and innovation monitoring, it is extremely important to select appropriate indicators and make sure that monitoring is done on a regular basis. Otherwise companies will unavoidably adopt an innovation-based development model any time soon.

Discussion

I believe that the findings associated with the creation of the conceptual framework for integrated management analysis of innovation as a brand new type of management analysis that allows to study innovation in its broadest sense are unprecedented and can therefore be considered as new and unique.

In the mean time, it is unreasonable to overlook the existing research into the analysis of innovation, which was conducted by the most prominent scholars and experts.

I suggest reviewing some of them.

R. Kaplan and D. Norton characterize innovation as one of the most critical internal business processes and point out two components [8]: the identification of the market and creation of the product (service). Hence they indicate two steps in analyzing the innovation process. As part of the first step, the analysis should answer two questions adequately and accurately:

1. What top values will the customer pursue tomorrow?
2. How does innovation allow to detect competitors delivering such goods and services?

This analysis could be measured with the number of entirely new products and services developed, success in developing specific products and services to target customer groups, or just the preparation of market research into the future customer preferences. These metrics forerun the second step of the analysis that consists of three elements:

- 1) basic research to develop brand new products and services for delivering value to customers;
- 2) applied research to employ the existing technology for producing the next generation products and services;
- 3) focused development efforts to bring new products and services to market.

J. Pearce II and R. Robinson largely associate the analysis of innovation with the study into two types of risk triggered by innovation: market and technological risks [30]. Market risks arise from uncertainty as to the existence of a market niche for a new product or service, its size and pace of the market growth, which raises concerns as to whether anyone is going to buy them. Technological risks are caused by the uncertainty of technological development, complexity of creating technical standards and generally accepted models: which of the available technologies will actually work? Technological risks are of critical significance to innovative products, while market risks matter to business models and processes. In analyzing innovation risks, it is necessary to research the market and new applications for the existing technologies.

According to C. Christensen and M. Raynor, the analysis of the innovation process will make it more predictable as it answers the following key questions [31]. How can we win the most powerful competitors? What products will customers want to buy? Who are the best customers for our products? How should the scope of

the business be properly defined? How should the loss of product identity be avoided? How should the company develop its subversive activities? How should the strategy development process be managed? What sources of funding shall be used? What contribution do top managers make to promote a new business?

R. Grant proposes analytical principles to ensure a higher efficiency of the strategic management of innovation [32]:

- evaluating the potential for an innovation to create value;
- assessing the relative advantages of licensing, alliances, joint ventures and internal development as strategic options for exploiting innovation;
- identifying the relative advantages of being a leader or a follower in innovation.

R. Grant also underlines the fundamental dilemma of innovation since innovation is an unpredictable process that requires the favorable organizational background, while the strategy is about making decisions on the allocation of resources. Obviously, it should be taken into account when performing the strategic analysis of innovation.

According to G. Hamel, the analysis of each innovation process as part of innovation management is confined to the following questions [33]. Who owns the innovation process? Who has the power to change it? What are success metrics? Who applied for the innovation process? Who will participate in the innovation process? What are inputs or data of this process? What analytical tools are used? What events and milestones drive this process? What kind of decisions does this process generate? What are decision-making criteria? How are decisions communicated? Who are the decisions communicated to? How does this process link to other management systems?

After documenting the details of each innovation process, interested parties such as the process owner, regular participants, and anyone else who might have a relevant point of view, are summoned. They assess the process in terms of its impact on a management issue the company is tackling.

Having summarized the above opinions of some leading scholars in innovation management, I would like to point out drawbacks of their innovation analysis concepts.

1. As a rule, innovation analysis implies relevant questions are addressed using seemingly unformalized methods, while there is no conceptual approach to conducting the analysis.
2. Innovation research issues may be diverse by nature depending on researchers' preferences and assumptions (marketing, technology, finance, management). They primarily focus on market research into innovation, thus hampering a comprehensive analysis.
3. There is no generally accepted system of indicators (except for, perhaps, some general metrics of the innovation component of the Balanced Scorecard, which may be specific to a company since they depend on its strategy) and innovation analysis procedure.

The above drawbacks can hardly render an adequate information and analytical support for an effective decision making process in innovation management.

Referring to the assumption that effective innovation management is practicable when this area of business is viewed as a holistic system in which processes of development, creation and use of innovations form a single innovation project, I have created a conceptual framework for integrated management analysis of innovation. It allows to overcome, to a large extent, the above drawbacks and helps increase the effectiveness of innovation management.

I also worked out key methodological aspects of integrated management analysis of innovation (a system of analytical indicators including generally accepted analytical indicators (*Table 4*), as well as metrics of the innovation component of the Balanced Scorecard (*Table 3*), analysis procedures, main sources of information for the analysis, analysis methods, areas of application).

I therefore provide a more detailed, better reasoned and explained solution to the issue of improving information and analytical support to innovation management through the development of a conceptual framework of integrated management analysis of innovation as compared with other works on the subject. The proposed solution contributes to scientific knowledge about modern innovation management.

Conclusions

Having outlined the conceptual and methodological framework for integrated management analysis of

innovation as a fundamentally new type of management analysis and, consequently, a new analytical tool of innovation management, I can make the following conclusions.

1. Effective innovation management is feasible only when this area of business is viewed as a holistic system in which the combination of development, creation and use of innovations form a single innovation project.
2. To manage such projects effectively, it is necessary to create and apply a new type of management analysis – integrated management analysis of innovation.
3. The main purpose of integrated management analysis of innovation is to provide managers and owners of a company with complete, accurate and quality information about the effectiveness of its innovation-driven operation, untapped resources, and the possibility of their use.
4. The goal consists of activity-specific subgoals that are related to an activity-specific type of management analysis used to study innovation: innovation analysis, investment analysis, competitive analysis; market analysis.
5. A system of indicators of integrated management analysis of innovation incorporates indicators of innovation analysis, investment analysis, competitive analysis, and market analysis, which are largely versatile and can be used to scrutinize every aspect of innovation (operational, tactical and strategic) in almost any company.
6. If specific features of a company have to be taken into account when conducting an integrated management analysis of innovation from a strategic perspective, the above system of indicators is supplemented with the innovation component of the company's Balanced Scorecard.
7. Integrated management analysis of innovation includes the assessment, evaluations and forecast of indicators.
8. The analytical findings could be used not only to improve information and analytical support to innovation management, but also to further the theory and methods of economic analysis.

Further Research

The conceptual and methodological framework for integrated management analysis outlines the new area

of research and practice and provides a sort of theoretical guidance for further development of this analytical tool for innovation management, especially in terms of its application.

There are several trends to follow in studying integrated management analysis of innovation:

- 1) expanding the system of key indicators of integrated management analysis of innovation (*Table 4*) and their further elaboration in pursuit of a greater accuracy of comprehensive research into innovative performance;
- 2) developing the criteria to evaluate the deviation of actual key indicators of integrated management analysis of innovation from their baseline values in terms of materiality;
- 3) setting up statutory values for each key indicator of integrated management analysis of innovation, and introducing a three-group classification (best, medium, worst);
- 4) creating a method to rank innovation performance through scoring by experts who use the key indicators of integrated management analysis;
- 5) forging specific methods for evaluating (factor analysis) and forecasting each of the key indicators of integrated management analysis of innovation;
- 6) devising a system of indicators and methods for integrated management analysis of innovation that would take into account features of industry-specific innovation in companies operating in different branches of the economy;
- 7) developing economic and mathematical models and software that would allow to use integrated management analysis of innovation for innovation management.

Table 1

Business-specific kinds of management analysis of an organization and its main characteristics

Characteristics of analysis			
Object	Subject	Goal	Sources of information
Intracompany management analysis (analysis of production costs)			
All kinds of production costs	Production and economic activities	Assessment, evaluation and forecast of resources, costs and results of production activities	Financial and management accounting data
Management analysis in investment			
Investment	Investing activity processes	Assessment, evaluation and forecast of resources, costs and results of investing activity	Financial and management accounting data
Management analysis in innovation			
Innovation	Innovation processes	Assessment, evaluation and forecast of basic elements of innovation activity	Financial and statistical accounting, sociological data
Management analysis in logistics			
Logistics	Logistic processes	Assessment and evaluation of resources, costs and results of logistic activity	Financial and management accounting data
Management analysis at the organizational and technical level			
Material and technical resources	Renewal of material and technical resources	Assessment and evaluation of costs and results of material and technical resources development	Financial and management accounting data
Management analysis of social and labor relations			
Social and labor relations	Current social and labor relations	Assessment and evaluation of the current condition and development of social and labor relations	Financial and statistical accounting, sociological data
Management analysis of the economic potential			
Economic potential	Current economic potential and its development	Assessment, evaluation and forecasting of the current and future potential	Financial and management accounting data
Management analysis in marketing			
Marketing	Marketing processes	Assessment, evaluation and forecast of resources, costs and results of marketing activity	Marketing research data

Management analysis of competition			
Competition	Competitive advantages, specific characteristics of competitors	Assessment, evaluation and forecast of competitive positions	Competitive intelligence data, accounting and financial reporting data
Strategic management analysis			
Corporate development strategy	Processes of long-term development	Assessment and evaluation of strategy, monitoring and adjustment	All kinds of financial and management accounting data

Source: [6]

Table 2
The innovation component of the Balanced Scorecard

Key issue of Balanced Scorecard innovation component	Strategic goal of innovation process	Innovation process indicator	Target value	Strategic innovation event
What innovation goals should be set to implement objectives of subsequent operational process, after-sale service, customers and financial process?	-	-	-	-
	-	-	-	-
	-	-	-	-
	-	-	-	-
	-	-	-	-
	-	-	-	-

Source: Authoring

Table 3
Some common metrics of Balanced Scorecard innovation component

Strategic goal of innovation process	Metric
Revealing clients' needs, which are acceptable for the company, for producing new goods and services, which would be of great value for customers in the future	Customers' preferences which are acceptable for the company, concerning the possibility to produce new goods and services; Ranking each type of customers' preferences, which are acceptable for the company, concerning the possibility to produce new kinds of goods and services; Estimated volume of the market of new goods and services to be produced; Tentative prices for new kinds of goods and services to be produced
Use acceptable innovations to offer goods and services that will enable the company to stay ahead of competitors	The number of working versions of brand new goods or services developed before their were released in the market; Development time of brand new kinds of goods and services; Satisfaction degree of customers' wants concerning brand new kinds of goods and services
Profound research into brand new kinds of goods and services creating value for customers	The number of brand new kinds of goods and services; The share of brand new kinds of goods and services in total sales; Launch of a new kind of goods against a planned or rival product
In-depth research into opportunities for using the existing technological processes to produce the next generation goods and services	Capability of production process; The number of kinds of the next generation goods and services that can be produced using the existing technological processes
Purposeful development of new kinds of goods and services to promote them in the market	The pace at which new kinds of goods and services are promoted in the market; The share of new kinds of goods and services which instantly met customers' expectations; Losses from sales of new kinds of goods and services with the delayed release due to the correction of the initial project drawbacks; Break-even time

Source: Authoring

Table 4**The system of key indicators of integrated management analysis of innovation**

Indicator	Application by phase of innovation		
	Creation of innovation	Adoption of innovation	Outcome
1. Indicators of innovation analysis	+	+	+
1.1. Progressiveness of innovation	+	–	–
1.2. Scientific and technological level	–	+	–
1.3. Innovation activity	–	–	+
1.4. Commercial demand for innovation	+	–	–
1.5. Innovation Incentives	–	–	+
2. Indicators of competitive analysis:	+	+	+
2.1. Competitiveness	–	–	+
2.2. Innovation intensity	+	+	–
2.3. Process innovation density	–	–	+
2.4. Technological dependence	–	+	–
2.5. Legal protection of innovation	–	–	+
2.6. Time to create innovation	+	–	–
3. Indicators of market analysis:	+	+	+
3.1. Comprehensive development of product innovation	–	–	+
3.2. Use of advanced technology	+	–	–
3.3. Demand for process innovation	–	–	+
3.4. Versatile applicability	–	+	–
4. Indicators of investment analysis:	+	+	–
4.1. Financial aid of the State	+	+	–
4.2. Debt dependence	+	+	–
4.3. Financial independence	+	+	–
4.4. Financial indicator of technological dependence	+	+	–
4.5. Foreign equity	+	+	–
4.6. National equity	+	+	–

Source: Authoring

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I, the author of this article, bindingly and explicitly declare of the partial and total lack of actual or potential conflict of interest with any other third party whatsoever, which may arise as a result of the publication of this article. This statement relates to the study, data collection and interpretation, writing and preparation of the article, and the decision to submit the manuscript for publication.