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Heilongjiang Province's Engagement in BRI

Song Linlin

Abstract

As one of the nine border provinces in the country, Heilongjiang Province has 2,981 kilometres of Russian-Russian border and 25 national first-class ports. In the past five years, Heilongjiang Province, based on the prominent geographical position in the core of Northeast Asia, has actively promoted the national strategy of the Belt and Road Initiative, deepened on open cooperation with countries in the Northeast Asia, and focused on developing economic cooperation and trade with Russia while building a new pattern of openness to the outside world. This paper in detail elaborates the progress of Heilongjiang Province's participation in the Belt and Road Initiative (BRI) in aspect of "five links" construction, namely, policy coordination, connectivity of infrastructure, unimpeded trade, financial integration and closer people-to-people ties, since the implementation of the Belt and Road Initiative in 2013, and further proposes feasible countermeasures.

Keywords: the Belt and Road Initiative; Heilongjiang Province; Northeast Asia regional cooperation; Russia; policy coordination; connectivity of infrastructure; unimpeded trade; financial integration; closer people-to-people ties

JEL Classification: F15, F18, F43

Introduction

In September, 2013, Chinese national president Xi Jinping proposed the major initiative of "Jointly Building the Silk Road Economic Belt" and "the 21st Century Maritime Silk Road" in Kazakhstan, the world's largest landlocked country, and in Indonesia named as "Thousand Island Country", which portrayed to the world a picture of "shared responsibility for the world and promoted global development". The initiative is a great practice in building a community of human destiny, which is of epoch-making significance for creating a new pattern of China's all-around openness, accelerating the great rejuvenation process of the Chinese nation, and promoting world peace and development. In March 2015, the National Development and Reform Commission, the Ministry of Foreign Affairs, and the Ministry of Commerce issued document named *Vision and Action for Promoting the Construction of the Silk Road Economic Belt and the 21st Century Maritime Silk Road* (from now on referred to as "*Vision and Action*"). This document defines the Belt and Road Initiative as "policy coordination, connectivity of facility, unimpeded trade, financial integration, and closer people-to-people ties" (from now on referred to as "five links") (Li Yan, 2018, pp. 16–21). As one of the nine border provinces in the country, Heilongjiang Province has 2,981 km of Russian borders and 25 national first-class ports. In the past

five years, Heilongjiang Province has exerted its geographical advantages, actively participated in the Belt and Road Initiative, and focused on strategic docking with Russia and achieved fruitful results. This paper reviews in detail the progress and challenges faced by Heilongjiang Province in attaining the goals of "five links", and then proposes feasible suggestions for deepening all-round opening up in Heilongjiang Province.

The Conceptual Framework

The body of the paper consists of five parts. First, as concerns policy coordination, Heilongjiang Province introduced relevant policies and implemented them under the guidance of the Belt and Road Initiative. It covers three planning of the construction of the Eastern Land-sea Silk Road Economic Belt, the construction of "China-Mongolia-Russia Economic Corridor" Longjiang Land-sea Silk Road Economic Belt, and a new pattern of all-round opening up of "One Window, Four Districts". Accordingly, Russia also promulgated relevant documents in response to Heilongjiang Province's planning, which contributes to effective docking between two sides, which could promote Heilongjiang Province's exchanges and cooperation with Russia in various fields and better accelerate the in-depth development of China-Russia comprehensive strategic partnership of cooperation. Second, connectivity of infrastruc-

ture has achieved remarkable results. The channel construction layout and Unicom have made significant progress, especially in the expansion of land and sea combined transport lines, the normal operation of Harbin–Europe Train and Harbin–Russia Train, the construction of cross-border bridges, the opening of oil and gas pipelines, and the opening of container hubs, the construction of high-speed railways, the renovation of hub airports and branch airports, and the construction of Sino-Russian information hub projects.

What is more, Breakthrough progress of “three bridges, one island, one corridor, one port” will promote the multi-point connectivity of cross-border infrastructure, optimise the pattern of opening up, which can boost Heilongjiang Province’s entering a new era of opening to the outside world. Third, from the aspect of unimpeded trade, Heilongjiang Province mainly focuses on economic and trade cooperation with Russia. The part shows that Heilongjiang’s economic and trade cooperation with Russia in the past decade has shown the progress from the illustration of the data. At the same time, Heilongjiang Province has taken actions to transform traditional trade structure, and vigorously developed “Internet + trade”, which has made significant progress, especially in the construction of cross-border e-commerce demonstration system. Fourth, from the perspective of financial integration, Heilongjiang Province has strengthened cooperation in finance with the countries in Northeast Asia. It will promote the circulation of currency and financial intermediation to optimise the allocation of resources, create a stable financing environment for participating in the Belt and Road Initiative, and assist its more open and deeper cooperation in a wider range. With regards to the status quo of investment attraction, the total amount of foreign investment utilised in Heilongjiang Province continued to maintain a steady growth trend in 2010–2017. In terms of financial services, Heilongjiang Province has made certain progress in the areas of facilitation and corporate financing channels. Also, as China enters the new economic normal, investment growth in Heilongjiang has slowed. Fifth, concerning closer people-to-people ties, in the field of science and technology education, some of colleges and universities in Heilongjiang Province have succeeded in cooperation of running a school with others in foreign countries, which can boost the exploration of new educational mechanism

and mode and enhance the breadth and depth of educational cooperation and exchange.

Moreover, as an important window and a node city to the north, Heilongjiang Province has always played a leading role in the scientific and technological cooperation with Russia and has established several scientific research cooperation projects and cooperation platforms. In cross-border tourism, in recent years, the tourism industry in Heilongjiang Province has continued to grow in a positive trend. Based on the unique advantages of the original ecological environment, Heilongjiang Province’s tourism industry has been vigorously developed.

Finally, the paper proposes feasible suggestions for Heilongjiang Province’s better participation in the Belt and Road Initiative. Heilongjiang Province should explore a cross-border cooperation path suitable for the provincial conditions and the national conditions of neighbouring countries, and deepen all-round exchanges and cooperation with the Belt and Road countries. Heilongjiang Province should accelerate the construction of all-round infrastructure, speed up the construction of major international passages along the border, and promote trade and investment liberalisation and facilitation. Heilongjiang Province should improve the cultural exchange mechanism with the Belt and Road countries, encourage local cultural exchanges, and further expand domestic and international influence.

I. Heilongjiang Province’s Progress from the Perspective of “Five Links”

Policy coordination

Heilongjiang Province has actively responded to and participated in the national strategy of the Belt and Road Initiative. Based on analysing the superior design and the advantages of the province, it successively proposed a series of plans that met the needs of the province’s cooperation with other countries and of regional cooperation in Northeast Asia, which could deepen the integration of interests of all participating countries.

Preliminary exploration: the construction of the Eastern Land-sea Silk Road Economic Belt

In November 2013, the Third Plenary Session of the 18th CPC Central Committee adopted *the Decision of the Central Committee of the Communist*

Party of China on *Comprehensively Deepening the Reform of Some Major Issues* and clearly promoted the construction of the Silk Road Economic Belt and the Maritime Silk Road to form a new pattern of all-round opening. Therefore, the construction of the Silk Road Economic Belt has been established as a main national strategy for China to achieve the next stage of development in its internal affairs and diplomacy. In August 2014, the Standing Committee of the Provincial Party Committee studied the construction of the Eastern Land-sea Silk Road Economic Belt and proposed to incorporate the construction into national planning and to focus on connectivity of the national Belt and Road Initiative with the provincial Five Major Planning and Provincial 13th Five-Year Plan. This plan aims to accelerate infrastructure interconnection of Heilongjiang Province with neighbouring provinces and regional countries and promote the transformation and upgrading of international economic and trade cooperation. After the plan was submitted, President Xi Jinping made important instructions to encourage this idea definitely.

At the beginning of 2015, Heilongjiang Province issued a document named *the Work Plan for Promoting the Construction of the Eastern Land-sea Silk Road Economic Belt*. It proposes to build a cross-border transportation system for the Harbin-Manzhouli-Russia-Europe Railway, speed up the infrastructure interconnection, accelerate the construction of supporting service facilities, increase energy resources cooperation and development efforts, strengthen the construction of cross-border industrial parks and industrial chains, extensively carry out humanities science and technology exchanges and cooperation, so as to clarify the planning and construction goals of Heilongjiang Province's construction of the Eastern Land-sea Silk Road Economic Belt.

In-depth Advancement: the Construction of "China-Mongolia-Russia Economic Corridor" Longjiang Land-sea Silk Road Economic Belt

In December 2014, the Heilongjiang Provincial Party Committee Economic Work Conference clearly stated for the first time that it would speed up the construction of the "China-Mongolia-Russia Economic Corridor" Longjiang Land-sea Silk Road Economic Belt (from now on referred to as "the Longjiang Silk Road Belt"). The Longjiang Silk Road Belt is generally east-west,

westbound connecting the Russian Siberian and Baikal-Amur Railways to the hinterland of Europe, eastbound radiating Japan, South Korea and other Northeast Asian countries, and connect to North China, East China, South China. The construction can be summarised as being based on Heilongjiang Province and integrating into the Belt and Road Initiative. At the beginning of 2015, the Heilongjiang Provincial Government Work Report clearly stated to deepen the all-round exchanges and cooperation with Russia to promote opening up, implement the national strategic plan of the Belt and Road Initiative, and accelerate the construction of the Longjiang Silk Road Belt, and strengthening all-round exchanges and cooperation with Russia. As a result, the plan for the opening up of the new pattern of Heilongjiang Province is rapidly transformed from the construction of the Eastern Land-sea Silk Road Economic Belt to the construction of Longjiang Silk Road Belt with a clearer concept and richer content.

The "Longjiang Silk Road Belt" takes Harbin as the centre and goes west to Manzhouli to connect with the Eurasian Continental Bridge via the Russian's Chita; connects the Heihe River to the Siberian Railway to the north, echoing the Silk Road on the land; East to Suifenhe to the Russian Far East port that can reach Japan, South Korea, North Korea; south through Dalian into East China, South China and the Bohai Sea, the Yangtze River Delta, the Pearl River Delta; then connected to the Maritime Silk Road. The goals of "Longjiang Silk Road Belt" are to continuously improve the construction of an export-oriented economic system, create a convenient and smooth international channel, and build a cross-border transportation network for Russia and connecting Asia and Europe. The centre of this "net" is Harbin. The four veins are the Daqing-Harbin-Jiamusi-Tongjiang Railway, Suifenhe-Manzhouli Railway, the Harbin-Heihe Railway, and railways along the border, which link to the Russian Siberian Railway and the Baikal-Amur Railway to jointly form international cargo passage network to link Asia and Europe. This line will attract a large number of production factors to gather along the line, in which domestic and overseas industrial parks and cross-border industrial chains are essential elements to jointly build a new growth pole for Northeast Asia regional economy.

Table 1
Proposed time and name of strategies

Time	National strategies	Time	Heilongjiang Provincial strategies
2013.09	The Belt and Road	2014.04	Eastern Silk Road Belt
2014.09	China-Mongolia-Russia Economic Corridor	2014.12	Longjiang Silk Road Belt
		2017.08	All-around openness pattern of "One Window, Four Districts"

Source: the author.

Comprehensive Improvement: A New Pattern of All-round Opening up of "One Window, Four Districts"

In April 2017, the 12th Party Congress of Heilongjiang Province proposed to focus on optimizing the openness pattern by deepening the national strategy of the Belt and Road Initiative, actively participating in the construction of China-Mongolia-Russia economic corridor, strengthening cross-border infrastructure construction, improving the openness platform, developing export-oriented industries, expanding foreign exchanges and cooperation, and accelerating the formation of a new pattern of all-around openness. It is a strategic move by Heilongjiang Province respond to the important instructions of Heilongjiang General Secretary Xi Jinping during his investigation in Heilongjiang that Heilongjiang should respond to the national strategy of the Belt and Road Initiative, participate in the construction of China-Mongolia-Russia Economic Corridor, and continuously expand the opening up. Heilongjiang Province has accelerated the promotion of cross-border infrastructure construction, the development of export-oriented industrial clusters, the establishment of an open platform, and the expansion of external cooperation in all directions, and established and improved the planning and design of a new pattern of opening up.

In August 2017, Zhang Qingwei, secretary of the provincial party committee, emphasised at the special meeting of the Leading Group for Promoting the Construction of the Belt and Road Initiative in Heilongjiang Province. He said that the whole province should thoroughly implement the spirit of important speech to Heilongjiang and Belt and Road Forum for International Cooperation Summit, more actively dock the Belt and Road Initiative and the construction of China-Russia-European

Economic Corridor, continuously improve the level of docking with the Russian Far East, create an important window for China's opening to the north, build Heilongjiang Sino-Russian Free Trade Area, key development and open experimental zone along the border, cross-border economic cooperation demonstration zone, logistics hub extending to Europe and Asia (i.e. "One Window, Four Districts"), which would accelerate the formation of a new pattern of all-around openness. "One Window, Four Districts" is Heilongjiang Province's serve to national strategy and to positive measures for development itself. In terms of geography, Heilongjiang Province will give full play to the traditional cooperation advantages with the Russian Far East and extend to Russia and Europe. In the field, we will transform from economic and trade cooperation to all-around cooperation.

Docking of China and Russia Relevant Planning

In recent years, China and Russia have successively signed *the Outline of Cooperation between Northeast China and Russia's Far East and Siberia (2009–2018)*, *the Outline of the Construction of China-Mongolia-Russia Economic Corridor*, *China-Russia Joint Statement on the Construction of the Silk Road Economic Belt and the Construction of the Eurasian Economic Union*, *China-Russia Cooperation Planning in the Russian Far East (2018–2024)* and other documents. In May 2018, Heilongjiang Province established *the Joint System of Heilongjiang Province's Cooperation with Russia*, and Harbin City proposed *A Three-year Action Plan for the Construction of the Belt and Road Initiative (2019–2021)*, which laid a good foundation for Heilongjiang's cooperation with Russia. Russia has also intensively introduced *Social and Economic Development Plan for the Far East and Baikal Region*, *Development Concepts for Border Areas*

Table 2
Channel layout planning of the infrastructure of HLJ Province

Channel	Layout planning
Land and Sea Combined Transport	<ul style="list-style-type: none"> – by Sea (ports): China's Guangzhou-Ningbo-Shanghai-South Korea's Busan-Japan's Niigata-Russian Far East's Vladivostok-Nakhodka-Vostochny – on land (railways): Suifenhe-Manzhouli-Baikal-the Russian Siberian Railway and west to the Baltic coast and the ports of Hamburg and Rotterdam.
Railway Transport	<ul style="list-style-type: none"> four main railway lines: <ul style="list-style-type: none"> – Dalian Port-Tongjiang-the Russian Siberian Railway and Bea Railway – Russia Vladivostok's ports-Suifenhe-Manchuria-Russia's Siberian Railway connected to the Hamburg and Rotterdam ports – Blabovichsk-the Siberian Railway and the Baikal-Amur Railway – Laoheishan-Dongning-Suifenhe-Hulin-Raohe-Fuyuan-Tongjiang-Mingshan-Xunke-Heihe-Mohe and other ports – the Siberian Railway and Baikal-Amur Railway.
Highway Transport	<ul style="list-style-type: none"> – local expressways in the Harbin metropolitan area – Suihua-Daqing, Harbin-Wuyuan, Shuangyashan-Baoqing, etc. – first-class and second-class highways along the border roads (Mohe-Dongning) – the boundary river bridges (Heihe-Dongning-Luogu River)
Water Transport	<ul style="list-style-type: none"> – Harbin Port and Jiamusi Port as the hub – Heihe, Fuyuan and other ports as nodes – Tongjiang Port-Russia's Khabarovsk-Gongqingcheng-the Strait through Heilongjiang River – Fuyuan Port-Qianfu Railway-the Yujita Gangyuan Economic Zon-Yujita Deepwater Port Area
Aviation Transport	<ul style="list-style-type: none"> – Harbin Taiping International Airport as the hub (China-Russia-Central Europe-North America) – regional airports as the nodes (Qiqihar, Mudanjiang, Jiamusi, Heihe, Mohe, Fuyuan and others) – Sino-Russian cargo charter flights (Harbin Airport-Russia's Yekaterinburg Airport)
Pipeline Transport	<ul style="list-style-type: none"> – Sino-Russian Mohe-Daqing oil transport pipeline – the Sino-Russian eastern natural gas transport pipeline from Heihe River – the second-line project of Sino-Russian crude oil pipeline – the Mohe-Daqing double line – the Sino-Russian East Line natural gas pipeline project
Grid Transmission	<ul style="list-style-type: none"> – the cross-border international transmission line in Heihe, the border of Sino-Russian and the transmission line of Harbin-Tangshan
Cable Communication	<ul style="list-style-type: none"> – the International Communication Gateway Bureau in Harbin – the Arctic Circle Europe-Asian optical cable communication backbone network(Russia's Murmansk-along the Arctic sea-through the Bering Strait from Vladivostok-via the Suifenhe River and Harbin)

Source: Song Linlin, 2018, pp. 35–42.

Such as the Far East Federal District and the Baikal Region, Leaping Social and Economic Development Zone Law, On the Free Port Law of Vladivostok, the Development Concept of Binhai No. 1 and Binhai No. 2 International Transportation Corridor, the Law on Prolonging Tax Preference for Large-scale Investment Projects in the Far East Federal District, and the Strategy of Social and Economic Development in the Far East and Baikal Regions Before 2025, which were beneficial to cooperation upgrade of laws and regulations between Northeast China and the Russian Far East.

II. Connectivity of Infrastructure

Vision and Action pointed out that connectivity of infrastructure is a priority area for the Belt and Road Initiative. In the past five years, Heilongjiang Province has strengthened its connectivity with neighbouring countries in the field of infrastructure construction projects, jointly promoted the construction of cross-border multi-domain channels, and gradually built an infrastructure network that would radiate Northeast Asia and connect to Europe and America. And until now, Heilongjiang Province has made significant pro-

gress, especially in the expansion of land-sea transport routes, the normal operation of Harbin-Europe Train and Harbin-Russia Train, the construction of cross-border bridges, the opening of oil and gas pipelines, the opening of container hubs, the construction of high-speed railways, the renovation of hub airports and regional airports, and the construction of Sino-Russian information hub engineering project (Table 2).

The Construction of “Three Bridges, One Island, One Corridor, One Port”

Road connections are a prerequisite for unimpeded trade. Guided by Xi Jinping's important speech on Heilongjiang in 2016, Heilongjiang Province proposed to use “three bridges, one island and one port” as a breakthrough to accelerate infrastructure construction and promote multi-point docking of cross-border infrastructure. It is a crucial task to promote the province's in-depth participation in the Belt and Road Initiative and improve cross-border infrastructure interconnection and has made breakthrough progress.

Specifically, Heilongjiang Province has implemented the construction of Tongjiang Railway Bridge, Heihe Highway Bridge, Dongning boundary Highway Bridge and Heixiazi Island Port, and made a good connection with the Russian Binhai No.1 International Corridor, and form an interaction with Vladivostok Free port, which is bound to build a cross-border multiple transport corridor to extend to Russia, Asia and Europe, and integrate an interconnected network of infrastructure, including railways, highways, waterways, aviation and pipelines. The construction of “three bridges, one island and one port” is a new way for Heilongjiang Province to rely on domestic, regional cooperation and focus on opening up to Russia to create a new all-around openness to Europe, the United States, Japan, South Korea, Hong Kong, Macao and Taiwan. During the period of the Third Five-Year Plan, Heilongjiang Province has accelerated the improvement of the vital content of cross-border infrastructure construction.

Normal Operation of Harbin-Europe Train

On January 5, 2017, Harbin-Europe Train was formally incorporated into the China-European train chart and became a famous brand in China and Europe. At present, China's 3C products, daily necessities, textile products, Volvo vehicles are con-

tinuously sent to the hinterland of Europe, while imported auto parts and high-end daily necessities from Europe are also sent from Harbin to all parts of the country. With the increase of freight volume, the operating hours and operating costs of Harbin-Europe Train are further compressed, and a standardised, professional and normal operation mode has been formed. For the time being, Harbin-Europe Train has become a cross-border railway line for China's railway transportation to Russia with the shortest time, the lowest cost and the best environment.

The Construction of Land-sea Transport

Harbin-Suifenhe-Russia-Asia land-sea transport, centred on Harbin and supported by Harbin-Mudanjiang-Suifenhe-Dongning industrial belt, with the help of the Russian Far East port groups, has opened “Chinese-Foreign-Foreign” international cargo corridors to Japan and South Korea and “Chinese-Foreign-Chinese” domestic trade goods cross-border transportation corridor, “Foreign-Chinese-Foreign” Eurasian international transport corridor, which is an important result on connectivity of China's the Belt and Road Initiative with Russia's Eurasian Economic Union and South Korea's Eurasia Initiative.

Harbin-Suifenhe-Russia-Asia land-sea transport has penetrated Europe and Asia, which has outstanding potential. The goods are transported from Harbin via Suifenhe Port and Russian Far East Port to Busan, South Korea, 224 km shorter way than via Dalian Port, and 1390 km and 740 km respectively to Niigata and Yokohama, and 2,000 km to the west coast of the United States. It can effectively accelerate Heilongjiang Province's economic and trade cooperation with the Russian Far East, Japan and South Korea. Since the official opening in June 2016, 94 trains and 10,500 TEU have been issued, with a volume of 158,000 tons and a value of 950 million yuan. The domestic trade goods import ports have been extended to 15 in Shanghai and Taicang, and the transportation commodities have been expanded to various varieties such as grain, petrochemical and timber. On April 11, 2017, the express route from Russia Oriental Port to Taicang Port in China was opened (only nine days from Dongfang Port to Taicang Port and then returning to Dongfang Port). The three flights per month are the most efficient and the shortest.

Table 3

Import and export of merchandise trade between China and Russia in 2013–2018

billion dollars

Year	Total Volume	Year-on-year growth, %	Accounted for China's import and export volume, %	Export volume	Year-on-year growth, %	Accounted for China's export volume, %	Import Volume	Year-on-year growth, %	Accounted for China's import volume, %
2013	89.2	1.1	2.1	49.6	12.6	2.2	39.6	-10.2	15.3
2014	87.17	5.6	2.2	49.11	7.2	2.3	38.06	3.7	2.1
2015	68.44	-28.6	1.7	36.74	14.2	1.8	31.70	3.1	2.0
2016	62.97	8.7	1.9	32.19	-34.5	1.5	30.78	-19.1	8.5
2017	84.85	17.7	2.0	43.29	17.8	1.9	41.56	31.0	2.2
2018	105.41	9.1	2.3	47.18	9.1	1.9	58.23	39.4	2.8

Source: Statistical bulletin (2013–2018). China Customs Administration. <http://www.customs.gov.cn/>.

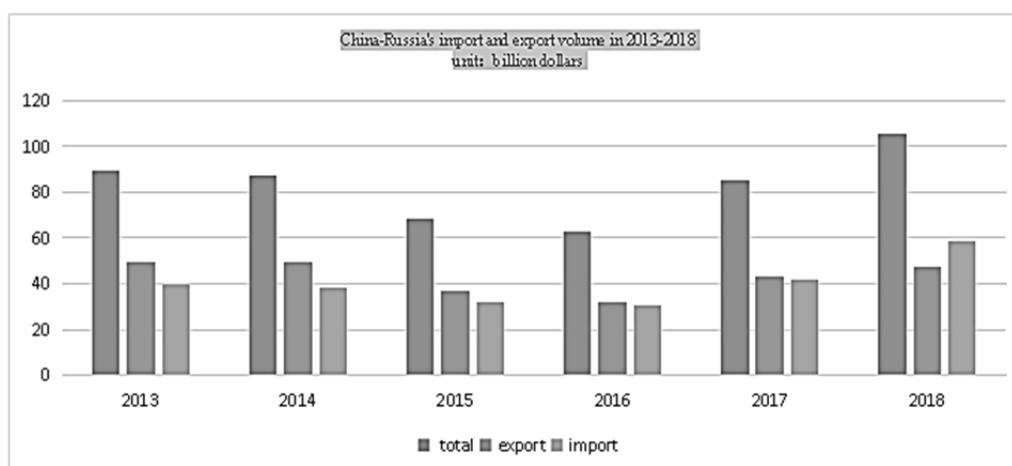


Fig. 1. China-Russia's import and export volumes in 2013–2018 in billion dollars.

Source: Statistical bulletin (2013–2018). China Customs Administration. <http://www.customs.gov.cn/>.

The Construction of Oil and Gas Pipelines

The Sino-Russian crude oil pipeline starts from crude oil pipeline Skovorodino distribution station in the Russian Far East, crosses the Chinese border, passes through Heilongjiang and Inner Mongolia, and ends at the Daqing terminal station in Heilongjiang. The pipeline is nearly 1,000 kilometres long and has a designed annual oil transportation capacity of 15 million tons, with the maximum annual oil transportation capacity of 30 million tons. In January 2011, the Sino-Russian crude oil pipeline was officially put into operation. The Sino-Russian crude oil pipeline transportation contract of 15 million tons per year and 20 years is officially fulfilled. The Sino-Russian East Line natural gas pipeline project

includes the “Siberian Power” pipeline in Russia and the Chinese territory of the Sino-Russian East Line natural gas pipeline project (i.e. Heihe-Shanghai), totalling more than 6,000 kilometres. The newly built pipelines in the Chinese territory are 3,371 km, which are approved in phases according to the northern, central and southern sections (Heihe-Changling, Changling-Yongqing, Yongqing-Shanghai). The Heihe-Changling trunk line is 715 kilometres long, which is the most difficult route construction project with the highest technical requirements, the most difficult construction conditions. The project plans to start production in Heilongjiang and Jilin sections at the end of 2019. The whole line will be completed and put into use in 2021, which will connect the

Russian natural gas resources with key natural gas markets in Northeast China, Beijing-Tianjin-Hebei and Yangtze River Delta, and interconnect with the existing regional gas pipeline network. Therefore, the pipeline will supply clean and high-quality natural gas resources to the Northeast, Bohai Bay and Yangtze River Delta regions, reducing emissions of carbon dioxide and sulfur dioxide by more than 160 million tons per year¹.

III. Unimpeded Trade

Vision and Action pointed out that investment and trade cooperation is an essential part of the Belt and Road Initiative. In recent years, Heilongjiang Province has focused on promoting the upgrading of foreign trade structure, deepening economic and trade cooperation with Russia, expanding trade cooperation, and accelerating the reform of trade structure.

Good Trends of Development of Foreign Trade and Economic Development

The current cooperation between China and Russia, especially in the Russian Far East, has entered the best period. Just as in September 2018, Xi Jinping judged the advantages of Sino-Russian cooperation in the Far East at the Fourth Eastern Economic Forum: China and Russia's geographical advantages of cooperation are unique, with each other's largest neighbours; the relationship between the two countries is at its best in history with comprehensive strategic cooperation partnership; cooperation policies are firmly guaranteed with the revitalization of old industrial bases such as Northeast China and the integration of the Russian Far East into national development strategy; the cooperation mechanism between the two countries is complete and efficient including Northeast China and the Russian Far East and Baikal Intergovernmental Cooperation Committee and the Industrial Council, and a dialogue meeting between Chinese and Russian local leaders. At the end of 2018, the trade volume between China and Russia exceeded 100 billion US dollars for the first time. Just as Premier Li Keqiang said at the press conference of the NPC&CPPCC, we could grasp not only big projects, trade in bulk commodities but also help small and micro enterprises, including cross-border e-commerce

cooperation. It is possible to cooperate with the aerospace industry and to promote non-governmental exchanges, which is to use all the energy and resources to consolidate the achievements of China-Russia economic and trade scale which had exceeded 100 billion US dollars, and try to double it (Table 3).

Heilongjiang Province is located in the centre of Northeast Asia and is the longest province bordering China and Russia. The economic and trade cooperation with Russia is the top priority of constructing Heilongjiang Province's opening up. The development orientation of "opening a window and building four districts" will realise the transformation of Heilongjiang Province's economic and trade cooperation with Russia to all-round cooperation, and cooperation with neighbouring regions will extend to cooperation with Russia and the European region. And finally, Heilongjiang Province can achieve the construction of a new pattern of opening up to the outside world, focusing on cooperation with Russia to promote the all-round revitalisation of Heilongjiang. Since the new century, Heilongjiang Province's import and export trade with Russia has grown at a faster rate and is in an upward spiral trend. Since 2007, the trade volume between Heilongjiang Province and Russia has exceeded 10 billion US dollars for the first time, achieving a leap-forward development of trade with Russia. In 2009, affected by the financial crisis, bilateral trade volume fell sharply. In 2011, the Sino-Russian crude oil pipeline was put into operation, and the trade volume increased significantly. In 2018, Heilongjiang Province's trade with Russia was once again greatly improved (Table 4).

In promoting the construction of the Belt and Road Initiative, Heilongjiang Province has continued to deepen exchanges and cooperation in various fields in Northeast Asia countries such as Japan, South Korea and Mongolia. In 2018, the import and export trade volume of Heilongjiang Province with Japan, South Korea, and Mongolia accounted for 13.6 per cent, 8.8 per cent, and 5.4 per cent of the province's total foreign trade, respectively, with a significant increase from 2017. It can be seen that there is still much room for cooperation and development in the future among countries in the Northeast Asia region (Table 5). At present, the trade volume with Singapore also has restorative growth somewhat (Table 6).

¹ https://www.sohu.com/a/244411504_738536.

Table 4

Import and export of merchandise trade between Russia and HLJ Province in 2008–2018

billion dollars

Year	Total Volume	Year-on-year growth, %	Export volume	Year-on-year growth, %	Import Volume	Year-on-year growth, %	Accounted for HLJ's import and export, %	Accounted for China's import and export, %
2008	11.06	3.1	7.97	-2.5	3.09	20.9	48.3	19.5
2009	5.58	-49.6	3.27	-59.0	2.31	-25.4	34.4	14.4
2010	7.47	34.0	4.28	31.1	3.19	38.1	29.3	13.5
2011	18.99	154.0	4.35	1.5	1.464	360.0	49.3	24.0
2012	21.31	12.2	5.16	18.6	1.615	10.4	56.3	24.2
2013	22.36	5.8	6.91	34.0	1.545	-3.3	57.1	21.8
2014	23.26	4.1	8.93	29.2	1.435	-7.1	56.9	18.9
2015	10.85	-53.4	2.08	-76.7	8.77	-38.9	51.7	15.9
2016	9.19	-15.3	1.70	-27.7	7.49	-11.9	55.6	13.2
2017	11.09	22.5	1.63	-2.6	9.46	28.2	58.1	13.1
2018	18.19	64.7	1.12	-29.5	17.07	80.4	69.8	17.3

Source: Department of Commerce of Heilongjiang Province. <http://www.hljswt.gov.cn/zongheyewu.php?cid=40>.

Harbin Customs District P.R. China http://harbin.customs.gov.cn/harbin_customs/467898/467900/467901/index.html.

2018 Heilongjiang Statistical Yearbook. Heilongjiang Bureau of Statistics. <http://www.hlj.stats.gov.cn/tjsj/tjnj/>.

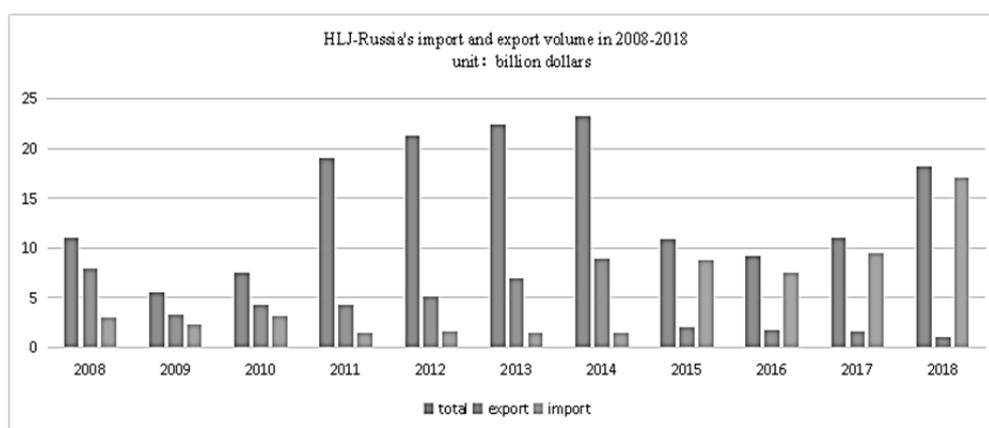


Fig. 2. Import and export of merchandise trade between Russia and HLJ Province in 2008–2018.

Source: Department of Commerce of Heilongjiang Province. <http://www.hljswt.gov.cn/zongheyewu.php?cid=40>.

Harbin Customs District P.R. China http://harbin.customs.gov.cn/harbin_customs/467898/467900/467901/index.html.

2018 Heilongjiang Statistical Yearbook. Heilongjiang Bureau of Statistics. <http://www.hlj.stats.gov.cn/tjsj/tjnj/>.

Transformation and Upgrading of Traditional Trade and Remarkable Achievements of “Internet + Trade”

At present, the traditional trade province of Heilongjiang is vigorously promoting cross-border “Internet + trade” and exploring a new mode of

the cross-border e-commerce business. Harbin and Daqing were approved by the National Development and Reform Commission to become national e-commerce demonstration cities. Harbin, Mudanjiang and Suifenhe were approved by the General Administration of Customs to become

pilot cities for cross-border trade e-commerce services. Harbin Economic and Technological Development Zone, Suifenhe Border Economic Cooperation Zone, Daqing E-commerce Industrial Park and the E-commerce Enterprise Park of Mudanjiang Economic Development Zone were approved by the Ministry of Commerce to become a national e-commerce demonstration base. The e-commerce and logistics enterprises such as Heilongjiang SEG International Trade Co., Ltd., Heihe Zhongji E-Commerce Co., Ltd., Heilongjiang Ruston International Logistics Co., Ltd., etc. have been approved by the Ministry of Commerce as e-commerce demonstration enterprises of the Ministry of Commerce. The construction of cross-border e-commerce demonstration system in Heilongjiang Province has achieved remarkable results (Table 7).

IV. Financial Integration

Vision and Action pointed out that financial integration is an essential support for the construction of the Belt and Road Initiative. Whether it is facility connectivity or unimpeded trade, you need to invest a lot of money. The financial cooperation between Heilongjiang Province and the countries in Northeast Asia has promoted the circulation of money and financial resources to optimize the allocation of resources, create a stable financing environment for participating in the Belt and Road Initiative, and assist in a wider range of open and deeper cooperation (Yang Daoling & Xu Tingting, 2018, pp. 27–29).

The Status Quo of Investment Attraction

In 2010–2017, the total amount of foreign investment utilised in Heilongjiang Province continued to maintain a steady growth trend. As of November 2018, Heilongjiang Province has actually utilised 58.931 billion US dollars of foreign capital and utilised 3,057.396 billion yuan (\$ 522.75 billion) of funds outside the province. At present, 51 in Fortune 500 companies have invested in 104 projects in Heilongjiang Province to promote the adjustment of the province's industrial structure and drive the development of emerging industries (Zhang Zhuomin, n.d.) (Table 8). At the same time, with the Chinese economy entering a new normal, the growth rate of foreign investment in Heilongjiang Province has slowed down (Table 9).

Table 5

The statistics of the import and export of trade volume between HLL Province and Northeast Asian countries in 2014–2018

Year/Countries	2014			2015			2016			2017			2018		
	Total	Total	Year-on-year growth, %												
Russia	232.6	108.5	-53.4	51.7	91.9	-15.3	55.6	110.9	22.5	58.1	181.9	64.7	69.8	69.8	64.7
Japan	3.7	3.3	-12.3	1.6	3.8	16.5	2.3	4.3	13.9	2.2	3.6	-17.4	13.6	13.6	-17.4
South Korea	4.4	3.5	-19.2	1.7	1.89	-46.6	1.6	1.93	2.2	1.0	2.3	19.2	8.8	8.8	19.2
Mongolia	1.4	1.2	-11.3	0.58	0.8	-39.0	0.69	0.9	26.6	0.5	1.4	52.4	5.4	5.4	52.4

Source: http://harbin.customs.gov.cn/harbin_customs/467898/467900/467902/index.html.

SongLinlin, 2018, pp. 516–519.

Xiong Juan, Su Zheqiong, 2018, pp. 48–51.

Table 6

The statistics of the import and export situation of HLG Province's trade with Singapore in 2017–2018

billion dollars

Year	Total volume	Year-on-year growth, %	Accounted for HLJ's import and export, %	Export volume	Year-on-year growth, %	Export volume	Year-on-year growth, %
2017 (1–11)	1.05	0.1	5.7	0.72	-23.5	0.33	209.3
2018	0.43	-60.0	1.6	0.15	-79.1	0.28	-21.2

Source: http://harbin.customs.gov.cn/harbin_customs/467898/467900/467902/1354091/index.html.

Table 7

E-commerce demonstration system

City/zone	Category	Approval authority
Harbin, Daqing	National e-commerce demonstration city	National Development and Reform Commission
Harbin, Mudanjiang, Suifenhe	Cross-border trade e-commerce service pilot city	China Customs Administration
Harbin Economic and Technological Development Zone, Suifenhe Border Economic Cooperation Zone, Daqing E-commerce Industrial Park, Mudanjiang Economic Development Zone, E-commerce enterprise park	National e-commerce demonstration base	Ministry of Commerce, China
Heilongjiang SEG International Trade Co., Ltd., Heihe Zhongji E-commerce Co., Ltd., Heilongjiang Russian Express International Logistics Co., Ltd. Etc.(8 enterprises)	E-commerce demonstration enterprise	Ministry of Commerce, China

Source: the author.

Table 8

The statistics of HLJ Province's foreign investment actually utilised in 2010–2017

billion dollars

Year	The total amount of foreign investment	Year-on-year growth, %	Foreign loan	Foreign direct investments	Year-on-year growth, %	Number of projects for contracted foreign direct investment (unit)
2010	27.6	9.9	1.0	26.6	12.7	147
2011	34.6	25.3	2.1	32.5	22.0	131
2012	39.9	15.5	0.9	39.0	20.1	98
2013	46.4	16.3	0.3	46.1	18.3	86
2014	51.6	11.1	0.7	50.9	10.3	102
2015	55.5	–	1.0	54.5	–	91
2016	59.0	6.3	0.8	58.2	–	117
2017	58.6	–	0.2	58.4	0.3	105

Source: Heilongjiang Statistical Yearbook (2018.2017.2016). Heilongjiang Bureau of Statistics. <http://www.hlj.stats.gov.cn/tjsj/tjnj/>.

Table 9

The statistics of HLJ Province's direct investment in foreign countries in 2006–2018

billion dollars

Direct investment in foreign countries			Direct investment in Russia			
Year	Total volume	Year-on-year growth, %	Year	Total volume	Year-on-year growth, %	Accounted for HLJ's total invest volume, %
2006	1.2	5.1	2006	1.2	37.2	97.6
2007	1.6	34.2	2007	1.2	3.4	75.2
2008	2.8	72.9	2008	2.0	67.2	72.8
2009	7.6	170.9	2009	7.4	263.2	97.6
2010	8.3	8.9	2010	4.5	-39.1	54.5
2011	5.9	-29.1	2011	3.7	-17.7	63.3
2012	7.3	24.1	2012	4.3	15.4	58.8
2013	10.8	48.1	2013	7.2	67.8	66.6
2014	19.4	80.2	2014	14.7	105	75.8
2015	69.0	414.4	2015	41.8	182	60.6
2016	52.5	-31.3	2016	30.2	-27.8	57.5
2017	/	/	2017	/	/	/
2018	24.6	18.5	2018	5.8	-33.4	23.7

Source: Cao Xiaodong, et al., 2018, pp. 17–20.

Progress in Financial Services

Heilongjiang Province has accelerated the promotion of RMB cross-border settlement business and has made certain progress in the areas of facilitation and corporate financing channels. At the beginning of 2015, the Heihe and Suifenhe Customs officially opened the cross-border customs clearance business of Rubles. Compared with the customs clearance method of the previous ruble air transport from Harbin to Beijing and the customs declaration to Beijing, the efficiency and cost improved significantly. In November 2015, Heilongjiang Province launched the “Internet + Inclusive Finance” action plan to expand the payment and settlement channels in Heilongjiang further, and provide support for the development of cross-border e-commerce (Xiong Juan & Su Zheqiong, 2018, pp. 48–51). At the end of 2015, the Harbin Central Sub-branch of the People's Bank of China formulated and planned to build a regional financial service center for Harbin to Russia, focusing on accelerating the layout

of foreign-related financial settlement centers, establishing a sound cross-border investment and financing mechanism, accelerating the development of ruble cash business, setting up a cross-border e-commerce payment platform, accelerating the development of offshore financial services, and the development of a diversified financial support service system, which could promote the further improvement of efficiency and level of foreign trade². In January 2016, the first-level foreign exchange branch of Industrial and Commercial Bank of China, Harbin Ronghui Branch, successfully settled in Harbin High-tech Zone and held a signing ceremony with Harbin Scientific and Technological Valley International Purchasing Service Center to build an international financial settlement centre. The International Financial Settlement Center focuses on the Russian-speaking CIS countries in Europe and Asia and integrates do-

² People's Republic of China Ministry of Commerce. <http://www.mofcom.gov.cn/article/resume/n/201512/20151201221033.shtml>.

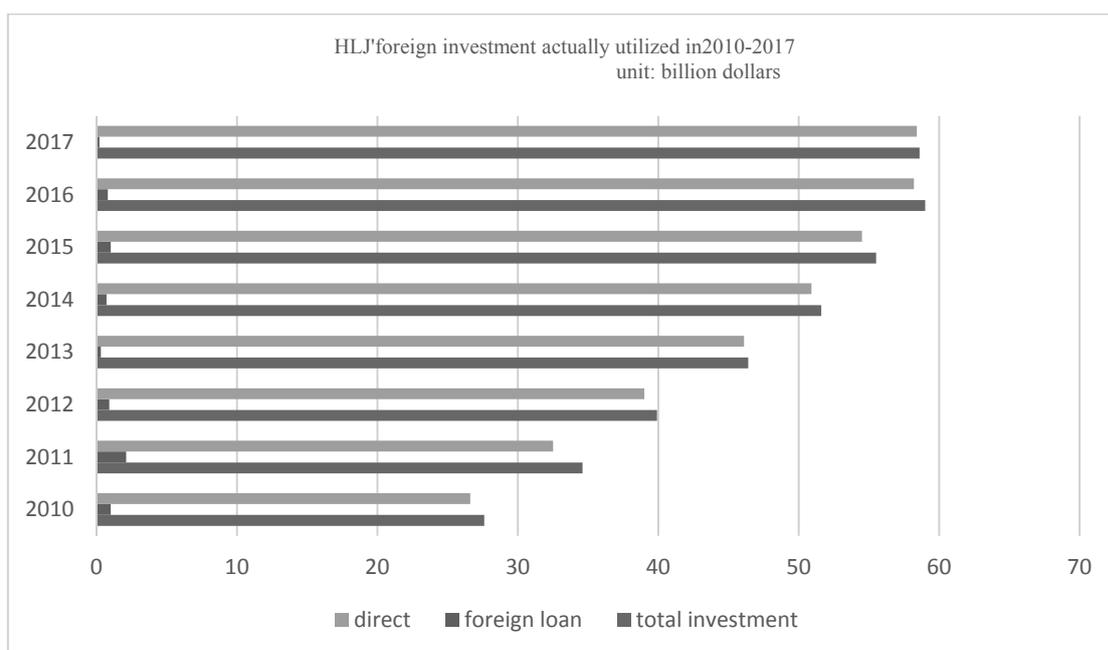


Fig 3. HLJ's foreign investment actually utilised in 2010–2017 in billion dollars.

Source: Heilongjiang Statistical Yearbook (2018.2017.2016). Heilongjiang Bureau of Statistics. <http://www.hlj.stats.gov.cn/tjsj/tjnj/>

mestic and international high-quality financial service resources to provide professional international financial services. Also, Heilongjiang Province has also actively played the advantage of Harbin Bank's ruble market maker, promoted the construction of cross-border e-commerce online payment and settlement platform between China and Russia, and strove to build a regional financial service centre for Russia and Northeast Asia. At the same time, Cross-border RMB business maintained growth. In 2016, the actual revenue and expenditure were 31.18 billion yuan (the US \$ 4.65 billion). The two banks and the Russian bank signed a cross-border RMB financing agreement of 23.5 billion yuan (the US \$ 3.5 billion) and realised capital of 8.5 billion yuan (the US \$ 1.3 billion). The scale of the external loan under the overseas guarantee in business gradually increased. As of the end of December 2016, the loan balance under Heilongjiang Province's overseas guarantees was US\$ 0.133 billion, a year-on-year increase of 1.23 times. Relying on the Bank of China and Harbin Bank, the establishment of a cross-border e-commerce payment platform between China and Russia has solved the bottleneck problem of long-term domestic exchange of Russian e-commerce companies and high online payment costs (Dong Weijun, 2017, pp. 16–18).

V. Closer People-to-people Ties

Vision and Action pointed out that the common ground is the social foundation of the Belt and Road Initiative. Heilongjiang Province actively inherits and promotes the spirit of friendly cooperation between the Silk Road, and extensively carries out cultural exchanges, academic exchanges, talent exchanges and cooperation, media cooperation, youth and women's exchanges, volunteer services, etc., laying a solid foundation for public opinion in deepening bilateral and multilateral cooperation, so as to build a community of interests that is culturally inclusive with neighboring countries.

Exchanges and Cooperation of Education, Science and Technology

In 2018, the Belt and Road Initiative spread to 70 countries around the world³. Heilongjiang Province universities, with their geographical advantages, have successively carried out Sino-foreign cooperation with colleges and universities in neighbouring countries and the United Kingdom and the United States. As of March 2018, 27 colleges and universities in Heilongjiang Province (24 public and three private) have conducted academic education in China and abroad in 9 countries including the United Kingdom, the United

³ National Information Center One Belt One Road. Big Data Center the Commercial Press. 2018.8.

Table 10
The HLJ Province's establishment of Confucius Institutes overseas

Year	Chinese	Foreign	Place	Memo
2004.11	Harbin Normal University	Seoul Confucius Institute	Seoul, Korea	The first Confucius Institute
2006.12	Heilongjiang University	Far Eastern National University (Far East Federal University)	Vladivostok, Russia	The first Confucius Institute in Russia
2007.05	Heihe College	Blagoveshchensk National University	Blagoveshchensk, Russia	
2007.11	Harbin Normal University	Daejin University	Gyeonggi-do, South Korea	
2008.02	Heilongjiang University of Chinese Medicine Harbin Normal University	London South Bank University	London, the United Kingdom	The First Confucius Institute of Traditional Chinese Medicine
2010.10	Harbin Normal University	Amur National Humanities Normal University	Kombay City, Khabarovsk Krai	
2012.09	Harbin Engineering University	Southern National Normal University	Ukraine	

Source: the author.

States, Russia, Australia, Canada, Ireland, Finland, South Korea and South Africa. A total of 178 undergraduate and above projects were held; among them, 85 projects were cooperated with 29 universities in Russia, accounting for 47.8 per cent of the total number of projects. And according to the Ministry of Education's 2015 study report in China of foreign students, Heilongjiang Province received foreign students up to 12085, of whom 30 per cent are Russian students, ranking first in the country (Meng Fanhong, 2018, pp. 75–77). At the same time, Heilongjiang Province has established 7 Confucius Institutes overseas to promote the overseas promotion of Heilongjiang Culture (table 10). Therefore, the smooth development of Chinese and foreign school-running projects is also a mechanism and model for Heilongjiang Province and relevant countries to explore educational cooperation and exchanges and to promote the breadth and depth of educational cooperation and exchanges. As an important window and node city to the north, Heilongjiang Province has always played a leading role in the scientific and technological cooperation with Russia. It has built cooperation projects such as Harbin Institute of Technology Sino-Russian Exchange of talents and

Scientific Research Cooperation Bases, and platforms for scientific and technological exchanges between Heilongjiang Sino-Russian Ship and Marine Technology Cooperation. At the same time, Harbin Science and Technology Innovation City, located in Harbin New District, at present, have signed 235 projects settled in 160 units, including 13 institutions in 9 countries covering the United States, Russia, Britain, and New Zealand and so on, which has gathered many high-end scientific and technological innovation resources, "The Northern Valley of Wisdom" and is also releasing huge scientific and technological potential for the economic construction of Heilongjiang Province and Harbin.

Development of Tourism Industry

In recent years, the tourism growth of Heilongjiang Province has continued to improve. Based on the unique advantages of the original ecological environment, the tourism industry has been vigorously developed, and "clear waters and green mountains are invaluable assets". In 2017, the province received a total of 164 million tourists and total tourism revenue of 190.9 billion yuan. The number of tourists and the total income of tourism were both higher than the national aver-

Table 11

The Statistics of HLJ Province's foreign inbound tourists by Northeast Asia relevant countries in 2013–2017

persons

Country	2013	%	2014	%	2015	%	2016	%	2017	%
Total	1450170		1322891		786811		908707		984643	
Russia	972879	67.1	919053	69.5	609696	77.5	741779	81.6	824367	83.7
South Korea	185742	12.8	178980	13.5	122871	15.6	111199	12.2	82424	8.4
Japan	23879	1.6	21536	1.6	23314	3.0	22918	2.5	28427	2.9
Mongolia	550	/	304	/	148	/	197	/	250	/
Singapore	12880		7839		2139		3090		6531	

Source: Heilongjiang Statistical Yearbook (2018). Heilongjiang Bureau of Statistics. <http://www.hlj.stats.gov.cn/tjsj/tjnj/>.

age⁴. In 2018, the province received a total of 182 million domestic and foreign tourists, an increase of 10.98 per cent over the same period of last year, receiving tourism income of 224.402 billion yuan (the US \$ 33.43 billion), an increase of 17.55 per cent (Table 10).

Conclusion

In September 2018, General Secretary Xi Jinping went to the northeast to inspect and make an important speech at the in-depth promotion of the Northeast Revitalization Symposium. It is necessary to deeply integrate the Belt and Road Initiative and build an open and cooperative highland, which is bound to specify a direction for Heilongjiang Province's better participation in the Belt and Road Initiative. At the same time, Heilongjiang Province should explore a cross-border cooperation path suitable for the provincial conditions and the national conditions of neighbouring countries, and deepen all-round exchanges and cooperation with the Belt and Road countries.

Heilongjiang Province should accelerate the construction of all-around infrastructure, speed up the construction of major international passages along the border, and promote trade and investment liberalisation and facilitation. The first is to rely on key development of open pilot areas, border economic ports, cross-border economic cooperation zones and other key areas along the border, and enhance the construction of key interconnection projects such as facilities in border ports, cross-border railway and port

expressways, etc.; the second is to continue to expand overseas routes with the Belt and Road countries and strengthen the functions of international aviation hubs; the third is to make efforts to promote the construction of free trade zones, dock high-standard international economic and trade rules, and build trade rules on land with the Belt and Road countries, based on the construction of China-European trains; the fourth is to actively develop cross-border trade, cross-border tourism, cross-border processing, cross-border finance, cross-border e-commerce, cross-border logistics and other industries.

Heilongjiang Province should improve the cultural exchange mechanism with the Belt and Road countries, encourage local cultural exchanges, and further expand domestic and international influence. The first is to explore the establishment of funds for education cooperation and think tank exchanges with the Belt and Road countries and support the joint development of international exchanges in related fields; the second is to encourage universities to explore cooperative education mode with the Belt and Road countries, continue to strengthen national language capacity building, establish a talent training base, and make up for the talent gap in humanities communication; the third is to give play to the advantages of cultural resources in various regions, and jointly create special tourism products with the Belt and Road countries to promote the transformation and upgrading of tourism; the fourth is to hold activities such as international exposition and cultural festivals to promote humanities exchanges, strengthen international communication capacity and information communication, and enhance the influence of local publicity and exchange.

⁴ Heilongjiang Provincial Culture and Tourism Office. <http://www.hljtour.gov.cn/lyzx/2018/content-6282.html>

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Участие провинции Хэйлунцзян в проекте «Один пояс и один путь»

Сонг Линлин

Аннотация. Провинция Хэйлунцзян, являясь одной из девяти пограничных провинций страны, имеет почти 3000-километровую китайско-российскую границу и 25 национальных первоклассных портов. В течение последних пяти лет провинция Хэйлунцзян, находясь в удобном географическом положении в центре Северо-Восточной Азии, активно продвигает Национальную стратегию по реализации инициативы «Один пояс и один путь» (BRI), углубляет открытое сотрудничество со странами Северо-Восточной Азии. Власти провинции сосредоточены на развитии экономического сотрудничества и торговли с Россией, создавая новую модель открытости для внешнего мира. В статье подробно анализируются результаты деятельности провинции Хэйлунцзян по реализации инициативы «Один пояс и один путь» в рамках строительства «пяти звеньев», а именно: координация политики, подключение инфраструктуры, беспрепятственная торговля, финансовая интеграция и более тесные связи между людьми.

Ключевые слова: Инициатива «Один пояс и один путь»; провинция Хэйлунцзян; региональное сотрудничество в Северо-Восточной Азии; Россия; координация политики; связность инфраструктуры; беспрепятственная торговля; финансовая интеграция; более тесные связи между людьми

The Role of Financial Globalization in the Propagation of the World Financial Crisis

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Abstract

This article is specifically devoted to financial globalisation and financial crises in the early 21st century. Obviously, it is a topic everyone is interested in after the global financial crisis of 2008–2010, the worst global financial crisis since the Great Depression. Its effects are still felt across the world today. Both industrial and emerging countries still suffer from high unemployment. In some of them, GDP has not yet reached pre-crisis levels. And this global crisis – if it were not enough – was followed very quickly by the Eurozone's sovereign debt crisis, which even though Ireland and now just recently Portugal have returned to private borrowing markets, is not resolved at all and is pretty much in remission but could come back. Lately, there have been concerns about emerging markets, including the BRICS, starting in 2016. There are various tremors in the emerging markets, capital outflows and currency depreciation. So, all over the world, one can see events that potentially cause questions about financial stability, which is an especially acute issue to look at.

Keywords: financial globalisation, world financial crisis, the BRICS, international monetary system.

JEL Classification: F37

1. Introduction

This article is focused mainly on the four questions:

- What is the financial crisis?
- Why do they matter?
- Is the recent experience very unusual in a broad sweep of history?
- Is there a unique role for financial globalisation in the process?

Most of the discussion in the US around the global financial crisis did not heavily emphasise the universal aspects, but for those of economists who work in the field of international economics and international finance, those loomed very largely. This chapter brings those aspects into the discussion. And finally, do the countries of the world do anything to reduce financial crisis risk? Can the governments do anything to reduce financial crisis risk? And what are the key takeaways on that important set of policy questions?

First of all, what is a *financial crisis*? It is hard to define it unambiguously, in a way that will make everybody feel confident about its meaning, partly because they can originate in various parts of the financial system as the chapter proceeds to discuss. And they can also be a matter of degree.

What the policymakers mostly fear are what economists call *systemic crises*, really *large-scale crises that call into question the stability of the entire system*. For example, if someone has a student loan, and the student defaults on it, that is not a crisis. It may be a crisis for that student alone, but it is not the crisis for the economy. On the other hand, if 40% of students default on their loans, that starts to be a crisis because the lenders who have lent to them get into trouble, and therefore the lenders who have lent to them potentially might go bankrupt as well.

So, in general, *a financial crisis is a situation, in which a significant fraction of private*

actors (who can be households, firms or banks, or even some public actors who can be local governments or the national government) **fail to appeal financial commitments with disruptive effects on the general economy.** Looking at the 2008–2009 global financial crisis, it broke out when households a little bit earlier had started **defaulting on mortgages calling into question the solvency of the holders of these mortgages**, who, as it turned out, were scattered worldwide, which is where the international aspect came in (Afontsev, 2009).

One fundamental point to make about **big systemic crises is that they are associated with declines in aggregate output.** And just for the past 22 years, economists list some of the broader crises that have occurred, and one can see pretty clearly that in various regions of the world there are effects of it. Sometimes one sees direct impacts; sometimes, one sees spill-overs. And one should mention for interpreting this; it is true for all advanced economies that are included in the zero-zone, which can be shown separately along with the emerging and developing countries. So, one of the essential crises preceding the global financial crisis of 2008–2010 was the **European monetary system crisis of the early 1990s**, which centred around the origins of the euro seven years later; the Asian crisis of 1997–1998 had a big effect on emerging markets, and the dot-com crash in the early 2000s which was very clearly in evidence of high-tech companies' crisis (Andronova, 2012).

The global crisis is enormous in its effects. It is self-evident, and then the euro crisis, which like many crises can be seen most clearly with its effects in the euro area, but arguably their spill-overs to developing the world as well became greater over this period as countries became more highly linked not only by trade but importantly given financial markets.

In fact, the above events are all different sorts of crises with their very different effects. **The recent crisis was marked by a lot of banking distress.** And so, **banking crises** are one prominent form of crisis. Banks have short-term liabilities but tend to hold longer-term assets or more illiquid assets. They provide liquidity to depositors and other short-term creditors. But if all of those depositors or creditors demand repayments at once, the bank is going to have a lot of trouble

meeting those obligations. When this happens on a large scale, banking crises arise.

Governments sometimes default on their debt obligations. Most recently one saw a very well publicised **technical default** by Greece in the Eurozone, but other countries default all the time, particularly in the developing and emerging world, and, of course, even in the US (Arner, Taylor, 2009).

There has been a lot of discussion in the economics of a default surrounding the extension of the US debt limit. So, **default is an essential category of a crisis.** And another one that is less familiar for people who only look domestically is the **currency crisis.** Countries sometimes fix exchange rates because they want the exchange rate not to be bouncing around for various reasons. And in this sort of situation, a government can come under pressure when markets doubt its commitment because by fixing the exchange rate the government is providing basically a one-way bet to markets who think that the exchange rate will move in the other direction (Beder, 2009).

In fact, these are the three main crisis categories that have been studied in international finance, but one can also think these significant areas of **transmission mechanisms for other crises or amplification mechanisms**, problems can arise with mortgages as in the recent US experience with **sovereign debt**, and then it may get propagated through other markets.

Going back, the EMS crisis was a currency crisis. The Asian crisis involved elements of currency, banking and sovereign-debt issues. **The dot-com crash is impressive because it wiped out holders of overpriced equities.** But because they were not highly levered, it did not propagate to banks in the United States. However, in some emerging markets, it was associated with a lot of corporate defaults which put some pressure on banks (Chen, Milesi-Ferretti, Tressel, 2012).

The global crisis was basically a banking crisis, not much in the way of a currency crisis, and the euro crisis has everything in it. It has a sovereign debt aspect. It has a banking aspect and even a currencies aspect in the sense that **markets began to doubt whether the countries that were in the Eurozone would be able to stay within the Eurozone and might not have to exit and adopt new currencies.**

2. Contagion Effects of the Global Financial Crisis

There are two themes that this article is going to talk about to just put the crises in context how economists like to think about them. And the two crises, the two concepts of the crises are **interconnection and expectations**. So, when one wants to think about the vulnerability of an economy to a crisis, the first thing one wants to think about is how interconnected financial markets are because there can be essential **domino effects**. As in the example with student loans, if one student does not repay his/her debts, anyone who is relying on their cash to come in so that they can repay their debts, may themselves be forced to default, triggering a whole cascade of defaults in the system. And this is the kind of systemic effect that central bankers and finance ministers fear (Chorey, Babb, 2009).

The problems are especially severe when there is a lot of complexity and a lot of interconnection among institutions. And one of the issues that economists have turned to study recently is **networks or financial networks**, which may help explain how interconnected financial institutions are, and how one can use those interconnections to measure **vulnerability**. It is likely to be a significant research area going forward.

But banking crises are not events that happen in a vacuum anymore, in a sense that governments feel a responsibility to step in and do something.

In 1907, the US had a significant crisis. The US had no central bank, and it was private institutions led by J.P. Morgan, who himself stepped in to stem the situation, so this led directly to the founding of the Fed.

But nowadays, the government is going to step in with all sorts of monetary and fiscal tools when a banking crisis arises. The problem is that the government's interventions can put the government itself into a precarious financial situation. And in the euro crisis, one saw this in several countries.

For example, Spanish banks got into trouble. The Spanish government incurred debts in supporting them. Suddenly, the Spanish government had a high debt-to-GDP ratio. Ireland's case was even more dramatic. Ireland entered the global crisis with a debt-to-GDP ratio of around 20%.

They came out of recession at the time of the euro crisis with a debt-to-GDP ratio of 1. And it is because they had been supporting banks by issuing government debt.

Of course, when all of these **network effects** were being realised, and as a systemic crisis, there was a lot of **imperfect information**. Nobody knows what is on the balance of the key actors, or who are exposed to their potential defaults. And so, the causes were what economists call **contagion**. Of course, doctors also use the concept of contagion, and that is very similar.

So, the second key issue is **expectations**. If we think about expectations evolving during crises, the most important question is about the ways policy can manage expectations. To some degree, there is clearly a psychological element in crises. People talk about panics. People talk about fear. Some economists have done research on these issues during crises. But if one takes a pure rational perspective, there is the possibility of multiple equilibria setting off crises (Dorrucci, McKay, 2011).

What is meant by **multiple equilibria**? Again, one should think of the case of a bank. The bank has

- illiquid assets;
- very liquid liabilities;
- usually, the bank relies on a steady inflow and outflow of deposits;
- so that it never has to pay off too many depositors at once,
- that works effectively;
- and the bank makes profits.

But suppose there is some bad news about the bank. It may not even be such terrible news, but markets get the idea, and the depositors get the idea that the bank is weak and that maybe it is insolvent, or possibly its assets cannot cover its liabilities. Then those depositors may or may not ask for a repayment. And if that happens all at once, the bank is going to fail.

Many mechanisms have been put in place to try to deal with this problem. The most effective has been **deposit insurance, which was put in place in the US after the beginnings of the Great Depression when many banks failed**. But banks increasingly rely on **wholesale lenders**, i.e. large lenders who are not protected under the umbrella of deposit insurance. Those people can also cause a run on a bank.

And so, this is something that one saw in great abundance during the global financial crisis of 2008–2010. Sovereign debt can have similar dynamics if everyone in the marketplace decides that Italy, say, is insolvent, then they will charge it higher interest rates, and it may indeed become unable to pay its bills.

On the other hand, Italy, with a debt-to-GDP ratio of 100 per cent, and paying interest rates of 3 per cent on that debt, got a 3 or 4 per cent of GDP a year. That is a manageable fiscal problem, provided one can collect taxes, which is not easy in Italy and even harder in some other European countries (Elyanov, 2009).

But in principle, one can see how that GDP ratio may influence the markets. The markets will suddenly say they need 10 per cent debt service, because Italy may default. So, the country has a real problem.

3. Crises Types

There are many varieties of crises, and they interact, and that can make them even more systemic. The crises have been around for a long time. They did not start in 2007. They did not begin in 1992. There is one example. One of the earliest **sovereign debt crises** involved an actual sovereign, Edward III who had the idea of invading France to regain lands that he believed rightfully belonged to him, except they did not have the money to do this, because Britain was somewhat advanced in its sense that the sovereign could not just tax people in an unlimited way. They had had the **Magna Carta**, etc. So, Edward hit on the idea of borrowing from Italian bankers, the idea being that once he had regained all these rich lands in France, he would repay them. His invasion did not go well, and he ended up defaulting which bankrupted the Italian lenders and set off a **credit crisis in the Mediterranean**.

The US states defaulted on foreign debt earlier in the 19th century. The big global crisis in 1890, the Baring crisis began with loans to Argentina, mostly by England. The US panic of 1907, which was already mentioned, 1929 Crash, etc. The entire globe operated under the **system of fixed exchange rates** up until the early 1970s, when they collapsed in a series of very dramatic speculative attacks (Griesgraber, 2009).

The 1980s were dominated by a **debt crisis in developing countries**, which led to a decade of

lost growth in Latin America. And there were lots of near misses also. If you follow this stuff, long-term capital in 1998 was a near miss. And even the **developing country debt crisis in the 1980s** could have been a much larger crisis because many US banks had lent heavily to countries that were in danger of default. And had they defaulted, it could have wiped out the equity of these banks (Helleiner, 2009).

Here are some very rough numbers just to give an idea of magnitudes. A group of economists did a recent tabulation, going from 1973 to 2006 only, and they counted 127 currency crises, 62 banking crises and 74 default crises in 79 countries. The definitions of these are open to discussion, but the order of magnitudes is pretty accurate. And of course, after 2006 and only up until 2010, not including the Eurozone events, they saw further six external default episodes, nine currency crises and 21 banking crises. And those were mostly advanced countries.

In fact, it is very striking to look at the sort of the **incidence frequency of on-going banking crises**. Since 1970 — and some data were put together at the IMF — there were many advanced-country banking crises. And what one sees very clearly here is that the global crisis was indeed a massive banking crisis in the advanced countries, and these countries figured out how to do with **financial regulation**. There are powerful institutions to do this. Emerging markets have **poor governance**, and that is why they have so many banking crises. And of course, there had been events in the advanced countries and the richer countries, but they were comparatively rare. But advanced-country banks are of going down in droves. The euro crisis is also included here by the way, but the euro crisis is pretty much driven by a lot of the same elements that drove the global financial crisis, so not surprising that it continues (Jordà, Schularick, Taylor, 2011).

If crises had been for a long time, and if now they have moved big time to the richer countries, it raises the question, how they changed in some way, so what some reasons are for this. And now, if one looks at precursors of crisis in their aftermaths, statistically, one of the striking things is that qualitatively at least they are very similar to advanced countries and emerging-market countries. The causes and effects seem not to be very different. There can be quantita-

tive differences, and each crisis is a specific event (Kemenyuk, 2009).

One can find some broader regularities, but they play out in their own ways. Often crises come as twins, i.e. banking and currency or banking and sovereign debt, or even as triplets — all three, and indeed that has been true in the euro area where the first act was a banking crisis. But two **robust predictors** were the rapid growth of credit in the economy and bank credit and a rise in what international economists call **the real exchange rate**, which is the competitiveness of one economy compared to other economies. And to give an idea of what a domestic credit data would look like for the euro crisis, they are domestic credit as a ratio of GDP. And, it is pretty dramatic, particularly in Portugal, Spain and Ireland. Though if one looks at Germany, domestic credit since the start of the euro which was January 1999 is pretty much flat, leading up to the crisis. Greece was down, and there was a significant increase in domestic credit. So, this idea that if there is a lot of lending going on, and if it is proliferating that one should worry, maybe banks are moving along the **extensive margin of quality**. It seems to be a compelling issue in the data (Kose, Prasad, Rogoff, Wie, 2009).

4. Financial Globalisation Effects

So, this brings the reader to **financial globalisation** and the role that it may play in crises. Financial globalisation at some level, is a two-edged sword. It is a form of trade between countries, and it is known from fundamental economics that there can be gains from trade. And similarly, there are significant theoretical benefits of globalised finance that are quite analogous to the gains from the international trade of textiles, wine and commodities. There are two main **categories of financial trade**:

- trade over time, when a country with needs capital beyond its income may borrow from countries that have needs that are less than their income and pay back later;
- also, there are countries trading across what economists call in a jargon **uncertain states of nature**.

Basically, one does not know what event is going to happen in the future, but companies want to hedge their risks against these events. For example, someone is going to sell a security

that pays if they have a bad outcome, and one is going to sell security under which they pay if one has a bad outcome. One, straightforward way of thinking about the **diversification** is in terms of **equity markets** (Lane, Milesi-Ferretti, 2011).

For example, one country has a stock market; and a second country has a stock market. If both these countries swap shares so that now someone is holding half of the other's shares and half of their shares, and the others are doing the same, then they have diversified their risks, and they have managed to find an allocation that they both prefer because their risks are lower. So, this diversification, or insurance as a form of trade against states of nature.

One is going to pay the insurance company in the US where a house does not burn down, but when the house burns down, they will pay the holder. So, this is indeed important. But the shortcoming of this sort of trade is that one cannot be sure that when the time comes for contractual payments to be made, but they actually will be made.

In another example lends lent to Greece. They sell a bond. They are supposed to pay back. What happens if they default or someone made contact with a bank that that is going to cover foreign exchange risk by buying a currency that one will have on a future date, and selling a currency that one needs on the future date? What if that bank is now going bankrupt on that date? How does one protect themselves against that? So, again, there is this **risk of default** in financial markets, and that makes them less straight-forward in a way than the traditional markets in which one looks at the gains from trade. How can one measure financial trade?

Standard measure economists use to measure trade overtime is **the current-account balance**, and the definition of the current account balance is a **country's income less its expenditure**. There should be an accounting identity because the balance of payments has to balance. So, if companies are spending more than their income they have to be settling that by selling some assets, i.e. by borrowing that effectively (Pisani-Ferry, Sapir, 2010).

The current account balance is also the **net amount lent abroad**, i.e. the balance of financial flows with the net purchase of the net flows with a net purchase of the foreign assets. So, this

is one measure of financial trade, i.e. of trade overtime. And if one looks at the data, it is quite striking what happened after, say, the early 1990s and the mid-1990s, which is the sheer size in dollar terms of current-account imbalances which rose in a way that had not been seen ever before in the post-war years (Reinhart, Rogoff, 2011).

One should break here the developed countries out, i.e. mostly the US deficit. But the developing countries that are oil exporters and developing countries that are not-oil-exporters. So, China is in the latter category. Saudi Arabia is in the former category. And a huge deficit which was opened up for the advanced countries balanced pretty much by surplus for developing countries in general. The US deficit reached about 700 billion dollars or about 6% of the US GDP. So, this is one measure economists can look at.

Some economists can say that was a big change leading up to the global crisis. But there is even a bigger change out there in the international data on external debts and assets which is not these flows of lending, but the actual growth positions.

So, suppose, there is a country that is running a current-account deficit, and it needs to borrow a dollar from foreigners. One way it can do that is to sell foreigners a one-dollar bond, which commits the country to pay them back a dollar with interest at some point in the future. But there are countless other ways of financing the same flow. For example, one could borrow two dollars and lend them one dollar. Or one could borrow a hundred dollars and lend them 99 dollars. And any of these transactions still has a net borrowing by the country of one dollar.

However, there are large **gross transactions** that go in the other direction. And if one looks at the data, the level of these gross transactions has been growing and has led to **gross asset positions** that are very large relative to countries' outputs.

Basically, countries have a substantial amount of **foreign assets**, i.e. of foreign debts. The difference between those is the **net foreign debt**, or **the net foreign assets**, i.e. the rate of change which is related to the current account, but these gross positions indeed are prominent. And one can get some idea from these data about gross positions of high-income and emerging markets as measured as the **average of foreign assets and liabilities divided by GDP**. And for the high-

income countries, one can see these numbers getting very big, and they are undoubtedly growing for the emerging countries, too.

These figures conceal a lot of heterogeneity. If one looks at a country like Switzerland, its foreign assets and liabilities are in the order of 8–9 times GDP. For the US, one is looking at numbers like 1.4, 1.3, which are big, since the US GDP is a significant number. So, there are all these gross positions out there. And when one needs to ask how to explain this, it is hard to think about them in terms of diversification of equity markets, because if that were the case, then the **US would basically sell off like three quarters of its stock market to the rest of the world, and buy the global portfolio of equities**. And, so, the US would have an external debt or external liability to GDP ratio of 0.75, and instead, it is twice that high. And if one looks at tiny countries like Switzerland, the Netherlands, the UK when economists say tiny, they mean, they are not really tiny, but they are tiny relative to their **external portfolios** (Yefremenko, 2007).

The problem is that many of these assets are **debt-like instruments which involve counterparty risks, i.e. the risks of default**, and it is hard to know what is driving this **proliferation of gross positions**. Some of these are totally harmless. It so happens, for example, that a lot of mutual funds are located in Ireland for tax reasons. And money comes, and that swells the liabilities of the Irish state, and money goes out as the funds are invested abroad. And that swells the assets. It is not a big deal because it has to do nothing with the Irish economy. But in other cases, there is less of a benignant interpretation, or there is a **financial stability risk**.

So, there was a massive trade in the late 2000s where US money mutual funds lent to the European banks who invested in the US **sub-prime assets**. And this ended up leading for the problems both for the money market funds and for the European banks. If companies put their money in the Cayman Islands and re-lend, and the Cayman Islands Bank re-lends it, that is something socially beneficial, or they are just exploiting a desire for secrecy that business can get in the Cayman Islands. There may be things that are positively not beneficial, such as tax evasion or tax avoidance.

Think about a Russian oligarch whose money round-trips through Cyprus because investments in Russia from Cyprus can qualify as **tax-preferred FDI**, has a lot of disrupting going on, and one does not know if that is helpful, or it is harmful, and what are the implications for financial stability? Well, at the national level, economists have adopted three basic approaches to **safeguarding financial stability**. One is **deposit insurance** that was already mentioned. Another is a **lender of last resort**, i.e. the central bank which is allowed to print money can always lend to a bank that is facing a depositor run, which is not justified by any fundamentals, and the doctrine of the last resort has been around for quite a long time, and most central banks play this role. The Fed did it large-scale obviously in the global crisis and the ECB in the Eurozone crisis. And the third sort of prone of this approach is that one needs to regulate, supervise and resolve **insolvent banks** as a way of ensuring financial stability.

Of course, these three things are very much interconnected. And if there is deposit insurance, and if there is a lender of last resort, financial institutions and depositors may take bigger risks. It is what economists call **moral hazard**. And so regulation is meant to try to deal with those risks and make sure that moral hazard does not undermine the system and does not create enormous costs for taxpayers.

So, one should keep these three approaches in mind, when one asks about a global context. In the global context, the three approaches become problematic in various ways. The discussions get pretty technical pretty quickly, but to list a few of the issues that arise. One is **regulatory arbitrage**. If countries have open capital markets, their banks and others can shift activities to **lightly regulated venues**, and this compounds **financial fragility**. It undermines what national regulators are trying to do. It is also true these days that banks trade in multiple currencies. So, if there is a French bank, it is likely to have a lot of liabilities in dollars and a lot of assets in dollars. And one might say, that the bank is hedged, but it is actually in a precarious situation, even if it is not explicitly facing currency risk because it is likely to be the case that its dollar liabilities are short-term and its dollar assets are less liquid.

And so, a hypothetical French bank still needs the lender of last resort. But the European Central Bank cannot print those dollars that the French bank might need. So, what happens then? In the open economy, banks can become really big. All one has to do is borrow and lend. And a bank has a big balance sheet. **But when banks become very big compared to the size of their national economies, it becomes harder for the government to credibly backstop them in various ways that governments do backstop the banking system.**

For example, in Spain, **Banco Santander has a balance sheet that is bigger than all of Spain's GDP**. Spain is fiscally challenged at the moment. So, what do markets think about Santander's credibility in paying its debts? It is a significant problem in the Eurozone now because, in a **supposedly integrated financial market**, lenders identify financial institutions by nationality and look to the **financial health** of the governments who are their protectors, and it leads to **segmentation of markets**.

Another issue is to resolve or to wind down big complex global banks. One of the biggest problems in the global financial system, not just in the US, is the problem of **too big to fail**. Banks need to be able to fail. And for them to be able to fail and in an orderly way, one needs a whole body of regulations and procedures and needs to know a lot about them.

But when banks are global and complex, there are a lot of pieces, and what one government does to wind down the bank is going to have implications for foreign countries. So, to resolve these banks' problems, one needs international agreements and cooperation. **Too big to fail on the global stage is much worse than it is even domestically**. At the global level, the problem of financial instability is quite a big one. And a couple of the examples which were given, hopefully, indicate, **it did play a big role certainly if not in the genesis, but certainly in the propagation of the global financial crisis**.

5. Major Lessons to Be Learned from the World Financial Crisis

What have policymakers been doing and how effective has it been? What are the challenges? If one thinks about financial stability in the global context, then there are obviously two broad categories of measures one can think about. The first measure is that countries can

take by themselves. And the second is measures that need international cooperation. And either of these approaches is problematic, but for different reasons.

In the first case, if one has to deal with a government that is contemplating **unilateral action**, one first has to ask about the effectiveness because it may be that other governments are not doing the same thing, and they are just going to undermine what the former does. It is a very similar problem concerning regulating CO₂ emissions, for example, at the global level. If the US and Europe have strict regulations on emissions, that concerns them only, but what about the rest of the world that is not doing that? So, it is not very effective. It is similar to financial institutions. Only this time, it is called **financial pollution**.

And if there are just a couple of financial centres that are taking strong actions, a lot of financial activity will move elsewhere, but it will still affect any country when a crisis comes. In addition to that, when a government takes some action, it may have adverse effects on its neighbours. So, they are going to care about what the former does.

The second approach, which is international cooperation, is that it is really hard to create and police international agreements. There is a wonderful example of progress in this area in the World Trade Organization. But once someone gets to the financial sphere, **it becomes much harder to police, enforce and agree on what to do**. So, there are things that countries can do emerging countries as well as advanced countries.

First of all, **a country should not fix their country's exchange rate**. That generally comes to tiers. Very few examples of countries have been successfully able to do this over long periods.

Secondly, **a country should try to discourage its financial institutions from denominating debts in foreign currencies**, even if their books seem balanced, they may not be so. For example, a bank may borrow dollars and lend the dollars to a domestic corporation, but then if the corporation invests in non-dollars, it may end up going bust at which point it cannot pay the bank, and at which point the bank is stuck with dollar liabilities. So, the country should try to control that.

Thirdly, **a country should try for better internal regulation if it can**. So does the **Dodd-Frank**

Act in the US. **Developing countries have gone to self-insurance through international reserve holdings**. If South Korea, say, has banks that have a lot of dire dollar liabilities, and the central bank cannot print dollars to help its banks when they need them, maybe it is good enough if the country is holding billions of dollars in its reserves because then it can lend them to the banks. So, many emerging markets have taken this route. And perhaps the most controversial proposal is that, if one cannot cooperatively handle things with other countries in a rush to the world, then a government should use capital controls, close off its capital account and other use administrative measures.

So, this is a range of things countries can do by themselves and some of them are less controversial than others, capital control being probably the most contentious.

The other issue that has been incredibly important is the **Basel process**. There is a book that came out a few years ago by Charles Goodhart on the history of this. It is not for the faint-hearted, but it is the definitive history, and it only goes up until 1997. This process began in 1974, very organically where central bank technicians got together and said if they can talk to each other, maybe they can come up with common rules and exchange information in a way that will make their actions more effective. And the **Basel Accord** has been a huge success at some level, and it has got some more and more recognition and became more and more official.

The most recent wave of this is called **Basel III**, which has a lot of provisions. It is a very complex document. It includes **minimal levels of bank capital reserve requirements**. It has always been the main point of the Basel process. So, a bank has assets, and it has liabilities. One cannot start a bank without some cushion in case one has a negative shock to its assets. This cushion is the bank's equity capital. It is the amount that the bank can stand to lose before it becomes insolvent.

Basel III tries not only to enhance bank capital in quantity and quality but also to set up what they call **counter-cyclical capital buffers**. If one ever sees that domestic credit is growing quickly, a country can demand that banks supplement their capital. That is this counter-cyclical buffer.

So, Basel III is preceding this way. But it is not without critics, and one of the problems with Basel is that it has a very complicated **system of risk-wading of assets**. Banks are allowed to put aside less capital against assets that they deem are less risky. But the formula to calculate that is incredibly complex. It comes right out of the Basel III rule book from the Bank for International Settlements. And this **formula describes the bank capital charge against over-the-counter derivatives**.

There is a fierce dispute now going on between the US and the European Union about how to apply this to this formula for derivatives. Whenever things get this complex, one should know that one is going to have very well-paid analysts who are figuring out how to gain the system. And so, this is one of the problems.

Another beneficial innovation which was created after World War Two is the **International Monetary Fund (IMF)**, with nearly universal membership of 188 countries. And it lends to governments that lose financial market access, but it does so with conditions. Two main problems with the IMF are that its resources are quite limited. It has about less than a quarter of the resources that China has in its international reserves, for example. And also, the financial assistance it provides is really slow.

So, for example, the IMF started discussing what to do about Ukraine's finances in the first half of March 2015, and the money just became available, but unfortunately things have deteriorated in Ukraine to such an extent that the IMF is saying that actually if the government loses half the country it will need to rethink how much re-lending them. But this problem illustrates why the IMF is not the ideal tool for fighting crises.

Another important innovation is **central banks swap facilities** which were institutionalised among six big central banks during the global financial crisis. And under these facilities, if the European Central Bank needs dollars to act as a

lender of last resort, it gets them from the Fed. If the Swiss National Bank needs euros to act as a lender of last resort, it may get some from the ECB. So, this is a major innovation. It does not include emerging markets for now, although there are some such as Korea, which could easily qualify as such in the near future. So, there is some progress, but more is needed.

The IMF was supposed to have a **major reform** that was agreed back in 2009, and it has been totally blocked by the House of Representatives. The world needs more harmonisation of regulation, including higher capital requirements, globally. If one is going to think about capital controls, then it is probably better to have some sort of **system of agreements for how they get used, such as the World Trade Organization's safeguards for import controls**.

The countries of the world need to work hard on **tax evasion and money laundering**. That is also a major issue. And some economic researchers push the idea that one needs more data and better funding for research. So, that seems obvious, but not everyone agrees.

How to close down **systemically important institutions**? It is something that governments are talking about but even in Europe that has been a very controversial issue. And the Europeans just agreed on an EU mechanism for that. That was hard enough. And their experience illustrates why it is hard globally to come up with these sorts of agreements by them.

Ultimately, there are these two approaches, which is whether a country does it itself or has international agreements. And if one values international integration at the economic and financial level, the cooperative approach is going to be much better preserving that than allowing countries to retreat behind their own administrative walls. But economists fear if countries cannot cooperate more, one will get more fragmentation, rather than globalisation.

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Роль финансовой глобализации в распространении мирового финансового кризиса

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Аннотация. В статье анализируются причины распространения финансовых кризисов в начале XXI в., в том числе глобального финансового кризиса 2008–2010 гг., который являлся наиболее серьезным среди ряда мировых кризисов после Великой депрессии 1929–1933 гг. и влияние которого испытывают некоторые развитые и развивающиеся страны. В некоторых из них сохраняется высокая безработица, а ВВП не достигает докризисного уровня. Несмотря на оживление экономик Португалии и Ирландии, долговой кризис в зоне евро, еще не преодолен полностью, существует вероятность возобновления или углубления кризиса евро. Начиная с 2016 г. финансовые проблемы усугубились во многих развивающихся странах, включая страны БРИКС. Развивающиеся страны столкнулись с проблемами утечки капитала и девальвации валют. Анализируя вопросы финансовой глобализации и обеспечения финансовой стабильности, автор сопоставляет результаты своего исследования с выводами и предложениями российских и зарубежных ученых.

Ключевые слова: финансовая глобализация; мировой финансовый кризис; БРИКС; международная валютная система

World Construction Market

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Abstract

Construction sector involves a lot of counterparties and influence of the whole national economies. In one construction project (for example, business centre) involves a huge number of different companies – from extraction (elements for cement) to project management and design. And, as a consequence, the importance of the construction sector is not only related to its size but also its role in economic growth. There is evidence of the existence of a very strong relationship between construction activity and economic growth. Leaders of the global construction market – USA, China and the European Union. Partially, it depends on the national economy, but there is a list of additional points – management efficiency, construction technology, skills availability, and so on.

Keywords: construction, innovation, project management, global market.

Construction is an important part of the development and modernisation process. Increased spending in the construction sector does stimulate economic growth, like in any other sector. The construction sector deals mainly with the provision of capital infrastructure, which has an impact on economic growth. The delivery of such infrastructure creates significant employment opportunities for the population, which generates further investment in other sectors of the economy through the multiplier effect. [1] So, it means that construction has an indirect link with economic growth, but the construction sector (through government purchases) might be a solution for the financial crisis – a shining example of what – the Great Depression and large government purchases (investments in infrastructure).

Nowadays, this market is also supported by low interest rates. [2] Low rates stimulate construction spending across all segments with cheap mortgage rates supporting private new housing activity and governments' continued willingness to stimulate their economies through increased infrastructure spending (see Fig. 1).

The European economy has continued to move forward with what has become a more

broad-based and stronger economic expansion. Real GDP increased by 2.8 per cent in 2017 while investment in construction rose by 3.8 per cent in the EU-27 area. Investment in the euro area grew at its highest pace since 2007 and is showing signs of a broad-based pick-up across countries. The Investment Plan for Europe (“the Juncker Plan”) is also expected to continue supporting investment while rising incomes bode well for construction investment. The purpose of “the Juncker Plan” – maintain and increase the level of investments in the EU. The Investment Plan for Europe has three objectives: to remove obstacles to investment, to provide visibility and technical assistance to investment projects and to make smarter use of financial resources. This program has a lot of advantage for different counterparties. Fraport project in Greece, which has the aim to upgrade 14 regional airports. First of all, Greece will get a new infrastructure. It helps increase the tourism sector and infrastructure convenience for citizens. Secondly, national companies earn some profits from this project and, through the effect of multiples, it will motivate other sectors of the economy. [3]

The US construction industry is among the world largest, with annual expenditures of over

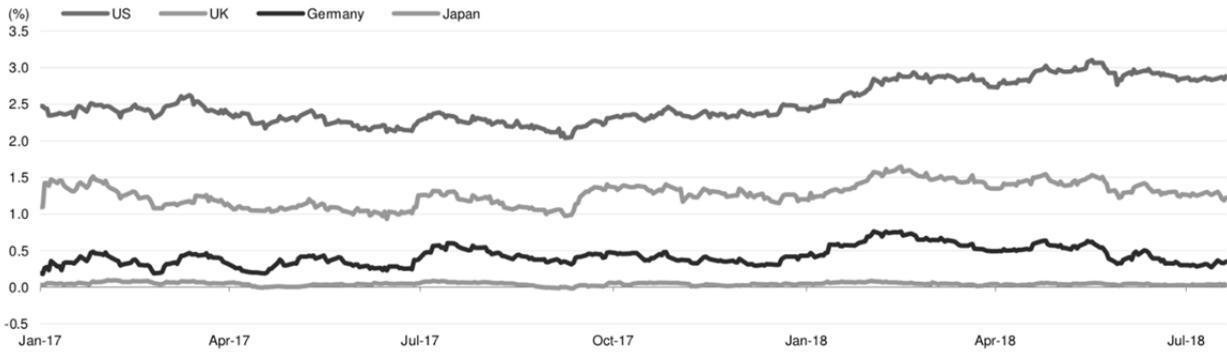


Fig. 1. Interest rates of 10-year government bonds.

Source: Bloomberg, 2019.

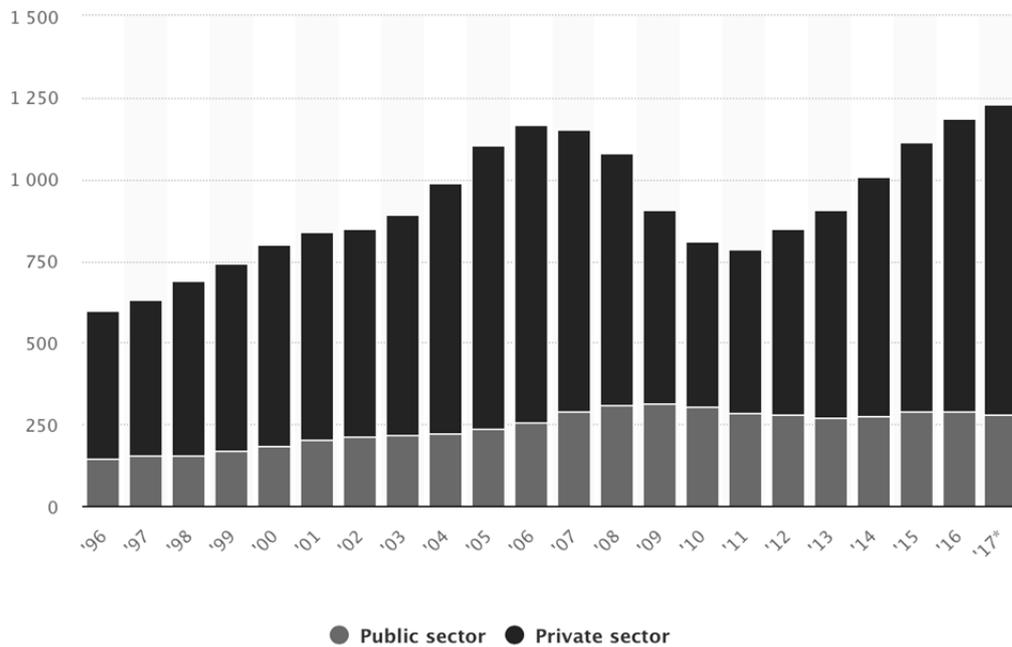


Fig. 2. Construction spending in the USA (in bln. dollar).

Source: Census Bureau, 2017.

\$ 1,231 bln. in 2017. These expenditures are distributed between the public and private sectors. Private sector — \$ 951 bln. and public — \$ 280 bln. Construction projects are taking place all over the country, making the industry’s outlook a positive one (see Fig. 2).

2017 saw construction spending hit an all-time high in the United States and the consensus from several industry experts and consultants is that the momentum will carry through in 2018. However, ever since the construction industry began recovering from the Great Recession, it has wrestled with issues around labour shortages. Given the recent reduction in the corporate tax rate, a key development that remains to be seen is if construction firms will invest savings

into creating additional training programs to facilitate more workers entering the industry or by increasing wages to attract further workers.

The tariffs of 25 per cent on steel imports and 10 per cent on aluminium imports will take effect on the whole USA economy. The Trump administration will place quotas or volume limits on other countries such as South Korea, Argentina, Australia and Brazil instead of tariffs, he said. The price of steel and aluminium products will go up, so profit margins of construction companies will be squeezed. Also, project costs will rise as rebar, and steel beams for bridges or multistory structures become more expensive. And steel and aluminium components used by heavy equipment manufacturers will see prices

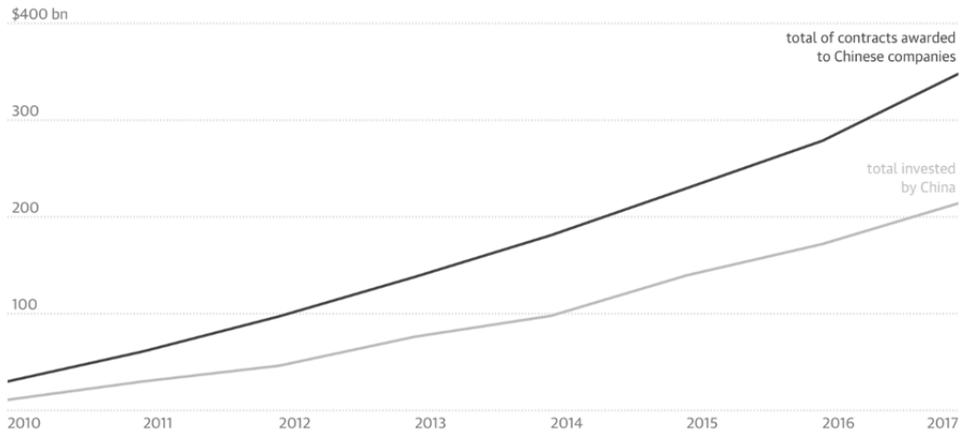


Fig. 3. Chinese investments in "one belt, one road" project.

Source: National Bureau of Statistics of China, 2018.

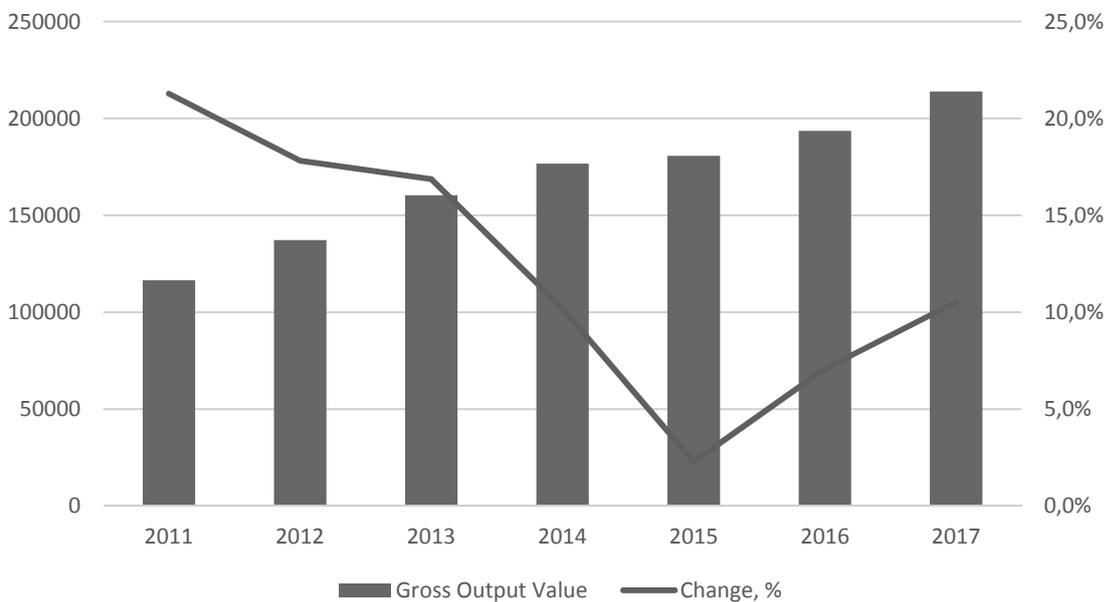


Fig. 4. The gross output value of construction in China (in 100 mln. yuan).

Source: National Bureau of Statistics of China, 2018.

increases, so machines an aggregate will cost more to produce, a cost these manufacturers may pass along to customers.

Chinese region is also interesting to global construction market observation. China is pushing ahead with major infrastructure investments along the route of the old Silk Road. It is driving construction as well as providing a stimulus to some of China's sluggish state-owned enterprises, setting China on a growth path that is stronger for longer. This new mega project called "one belt, one road" stretches from China to Europe. It is a heavy construction and engineering feat with highways, high-speed rail, logistics and technology. Its impact on construction is equivalent to another Chi-

nese economy at the start of its rapid expansion. [4]

Over the five years since President Xi Jinping announced his grand plan to connect Asia, Africa and Europe, the initiative has morphed into a broad catchphrase to describe almost all aspects of Chinese engagement abroad. Belt and road is a "21st-century silk road" confusingly made up of a "belt" of overland corridors and a maritime "road" of shipping lanes. From South-east Asia to Eastern Europe and Africa, belt and road include 71 countries that account for half the world's population and a quarter of global GDP.

The belt and road initiative is expected to cost more than \$ 1 tr, although there are different es-

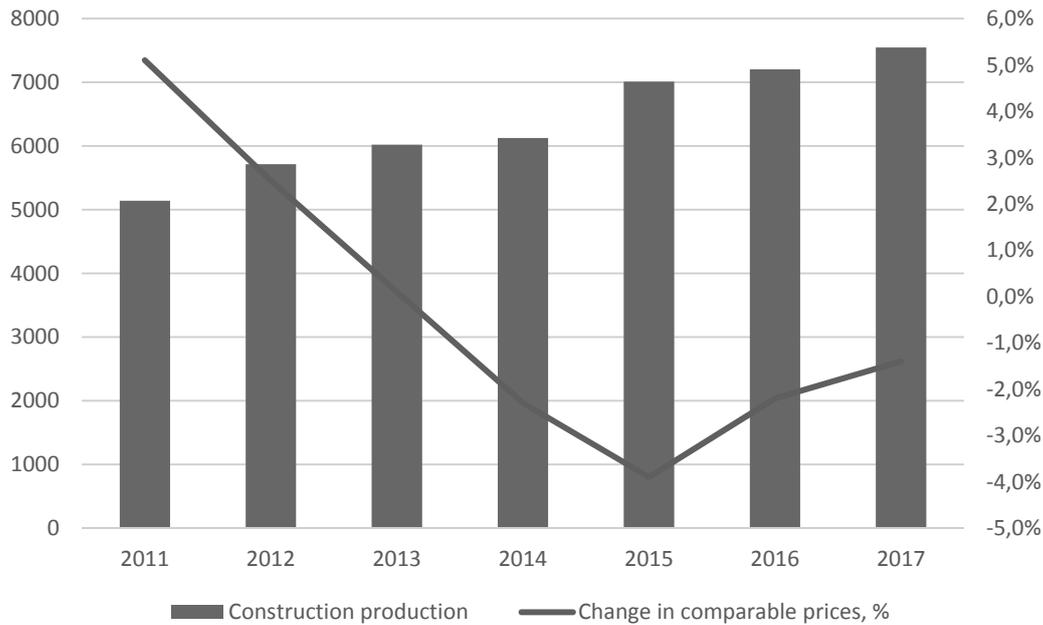


Fig. 5. Construction production in Russia (in bln. rub.).

Source: Rosstat, 2018.

estimates as to how much money has been spent to date. According to one analysis, China has invested more than \$ 210 bln., the majority in Asia. But China's efforts abroad don't stop there. Belt and Road also mean that Chinese firms are engaging in construction work across the globe on an unparalleled scale. Chinese companies have secured more than \$ 340 bln. in construction contracts along the belt and road (see Fig. 3).

China's construction industry has seen rapid expansion since the country began to implement the reform and opening-up policy in 1978, data showed. The value-added output of the sector reached 5.57 tr yuan in 2017, compared with only about 13,9 bln. yuan in 1978. The average annual growth rate was 16.6 per cent. The value-added output of the industry accounted for 3.8 per cent of the country's GDP in 1978, while the proportion rose to 6.7 per cent in 2017. The companies contributed significantly to the country's infrastructure expansion. In 1978, China only had 52,000 km of railways in operation, while the length increased to 127,000 km by the end of 2017, including 25,000 kilometres of high-speed railways. As we said above, infrastructure projects, such as "One Belt, One Road" helps the Chinese construction sector maintain high and stable growth.

As for the Gross output value of construction production, there are also great results during

2011–2017. Value is increased by 183 per cent% in this period; it is about 10.7 per cent of annual average growth. Fig. 4 shows that changes in gross value year-to-year were almost double-digit each year. And gross output value in 2017 was higher than 20 tr yuan.

The future development of the construction sector might also be bright — the reason for that — plenty of infrastructure projects in China. For instance, the south-north water transfer project will try to solve the problem of water availability in the north of China. China has funded construction of three huge canals, each more than 600 miles long and carrying water to the north from China's three largest rivers. The project has a 48-year construction schedule. When completed, it will supply 44.8 billion cubic meters of water each year. Also, the Chinese government invested in infrastructure upgrades, such as Beijing airport expansion. The airport's first phase was completed in time for the 2008 Olympic Games. Further expansion is scheduled for completion by 2025.

The last, but not the least market for review is the Russian construction market. The construction industry in Russia is experiencing particular difficulties in the current economic situation. There are increased demand for resources, increased construction costs, as well as reduced demand. Even though the peak of the

crisis passed in 2016, its negative consequences have remained at the moment.

From 2014 to 2018, there was a trend towards a decline in the real incomes of the population. Under these conditions, developers are forced to focus their efforts on completing started projects.

According to Rosstat, construction production in actual prices increased by 47 per cent in 2011–2017, it is 6.6 per cent annual average growth. But after 2014, there is a decrease in production in comparable prices year-to-year (see Fig. 5). And 2017 also showed a decrease with the value of –1.4 per cent to the previous year. [5]

To sum up, the construction sector is a large item in the world economy and GDP. Above we reviewed main markets and each region has pe-

culiarities. Each region has specific trends and risks, but there are some common – shortage of skilled labour, for example. And in short-term companies have to unity. Only a world union can solve this problem. Of course, this problem can't be solved in one or two years, but gradual steps and planned investments might overcome the situation. Also, nowadays, there are sixth Kondratieff waves. We can't say exactly when it begins, but new waves can give new strong positive trend for the construction market. The wave might bring new technologies for intensive growth. The main aim of construction companies – feel the current market situation and investment in insight. Insight department can be a real force for future growth and competitive advantage.

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Мировой строительный рынок

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Аннотация. Цель статьи – оценить прочность и эффективность связи между динамикой строительной деятельности и экономическим ростом. Будучи основным инвестиционным сектором, строительство может потенциально положительно воздействовать на экономический рост даже в коротком промежутке времени. Автор показал, что успехи лидеров мирового строительного рынка – США, Китая и Евросоюза, несмотря на национальные особенности их экономик, обусловлены, прежде всего, высокой эффективностью управления, применяемыми современными технологиями строительства и инновационными строительными материалами.

Ключевые слова: строительство; инновация; управление проектом; мировой строительный рынок

Perspective Cryptocurrency Projects Supported by China

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Abstract

In this article are discussed the most perspective cryptocurrency and blockchain projects that China is investing in. After the regulations regarding cryptocurrencies that is put forth by China, the Chinese government decided to create several financial bodies to regulate and develop the cryptocurrency. Despite the strict regulation of cryptocurrencies, China has been significantly investing in blockchain projects. China has developed the Digital Currency Research Institute (DCRI) of the People's Bank of China – a research body under the aegis of PBOC that focuses on the research and development of digital currencies and blockchain-related technologies. China actively supports more than 40 platforms, mostly in such fields as AI, Deep Learning and Software. The Chinese government has shown a positive attitude towards blockchain technology. Blockchain and cryptocurrency come hand-in-hand (except a private chain where a token is unnecessary). In the nearest future, China plans to introduce a blockchain to the most different spheres. For this purpose, there will even double the volume of investment to 3 billion dollars, since the second quarter of 2018. “This technology can transform many spheres of our life. As soon as in the country pursue powerful technological policy, it is sure that even more companies will begin to work in the field of the blockchain” – the partner of the international consulting company PwC in Shanghai Chong Chong Yin commented to journalists.

Keywords: cryptocurrency; regulations; finance; China; bitcoin; artificial intelligence; blockchain; FinTech; token
JEL classification G19, G29

Due to the technical and regulatory issues about the development of a state digital currency, China has developed the Digital Currency Research Institute (DCRI) of the People's Bank of China – a research body under the aegis of PBOC that focuses on the research and development of digital currencies and blockchain-related technologies. Also, it was included in the 13th Five Year Plan. The Chinese central bank had established a research institute for the development of Digital Currency/Electronic Payment (DC/EP) with the approval of the State Council.

As of December 2018, DCRI had applied for a total of 63 digital currency patents, including 57 in 2017 and six in 2018.[1]

Despite being one of the most outspoken critics of Bitcoin, it is interesting to observe that the Chinese Government plans to embrace digital curren-

cies based on blockchain technology, which is the basis of Bitcoin. Through the new research centre, the blockchain-based digital Yuan prototype will be tested before its official release to the public. The recent development is hardly the first significant step by the PBOC's Digital Currency Research Lab as it recently established a subsidiary called the Shenzhen FinTech Limited in another province called the Guangdong Province. Here, I present the five most undervalued coins that are supported by China.

ELASTOS (ELA) — China's Internet 3.0

The Elastos sets the task to process the concept of the use of the Internet and to unite its functionality with digital developments. The priority is put on the optimisation of the use of computing power, smart contracts and the decentralised

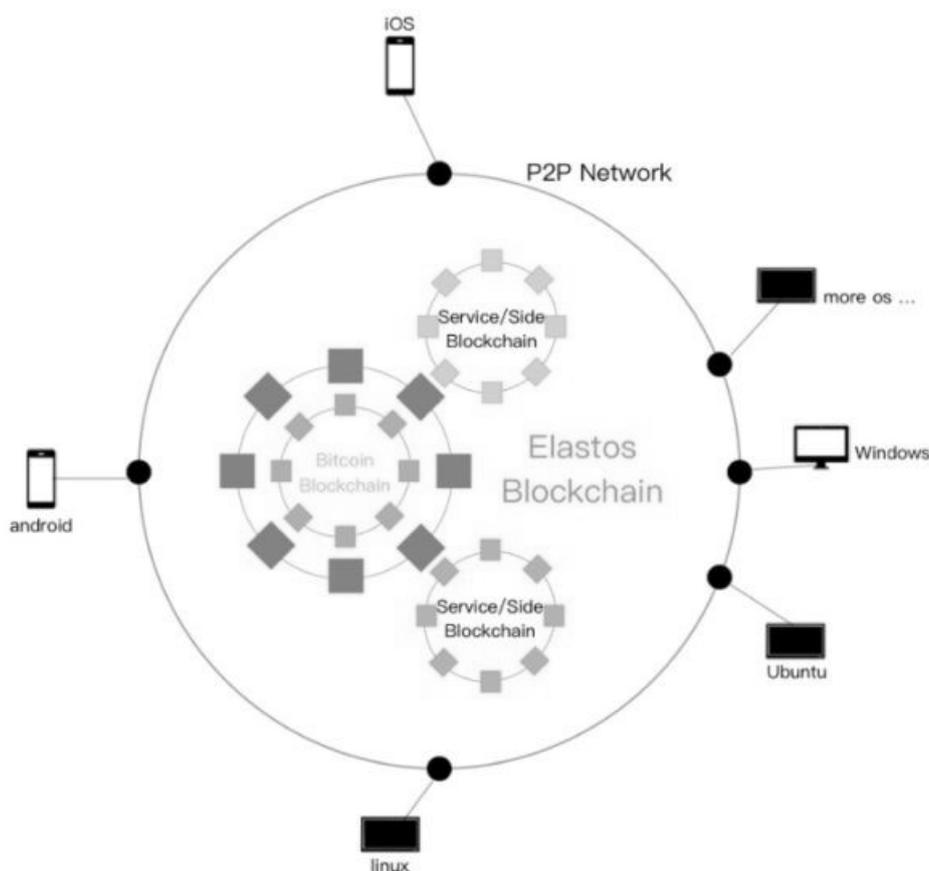


Fig. 1. Elastos Network system.

Source: coincost.net, 2019.

applications and also the safety of all infrastructure for users.

First of all, Elastos is a new and safe Internet with no ads. Moreover, it is a platform to build DApps on. They're striving to solve the scalability issue by allowing other cryptocurrencies to run off of them on a sidechain.[2]

It is an "open source" project which got investments from more than 200 million yuan from the large companies (for example Foxconn Group). Elastos is devoted to the creation of absolutely new virtual digital intellectual, economic zone based on the traditional base of the Internet.

Structure of Blockchain Elastos is as follows:

The united production with Bitcoin. Safety and reliability provided using the computing power of Bitcoin. Such an idea of mining is less resource-intensive and provides more flexible solutions for different needs

The blockchain of Elastos provides applications with reliable communication between with each other and Elastos network (Fig. 1).

ELA Tokens are a part of Elastos system. So, this system allows creating own token or using ELA for

transactions. Any token made on Elastos will be obliged to lock 2–5 per cent of the total supply in ELA. It is very promising, considering such future DApps as Zapyra with 400 million users, and Huawei, Alibaba, and, of course, future partners.[2] Users can use ELA tokens for registration in Elastos ID and use Elastos ID for the purchase of DApps, rent of cloud storage, and it is more than other digital services and products. As for 4th March 2019, the price for 1 ELA is \$ 3.25 (Fig. 2). The market capitalisation is 47 million dollars.

Elastos is the biggest decentralised platform on the creation and management of decentralised applications (DApps). As this platform was created in China, so the command from Beijing bears responsibility for the development of a blockchain. The command from Shanghai is occupied with the development of OS (Elastos runtime), including support of the interface for communication with third-party applications.

Simply saying, it is similar to Windows. However, the difference between Elastos and Windows is that Elastos "open source" the project. Elastos is based on a blockchain that does it to the reliable and decen-

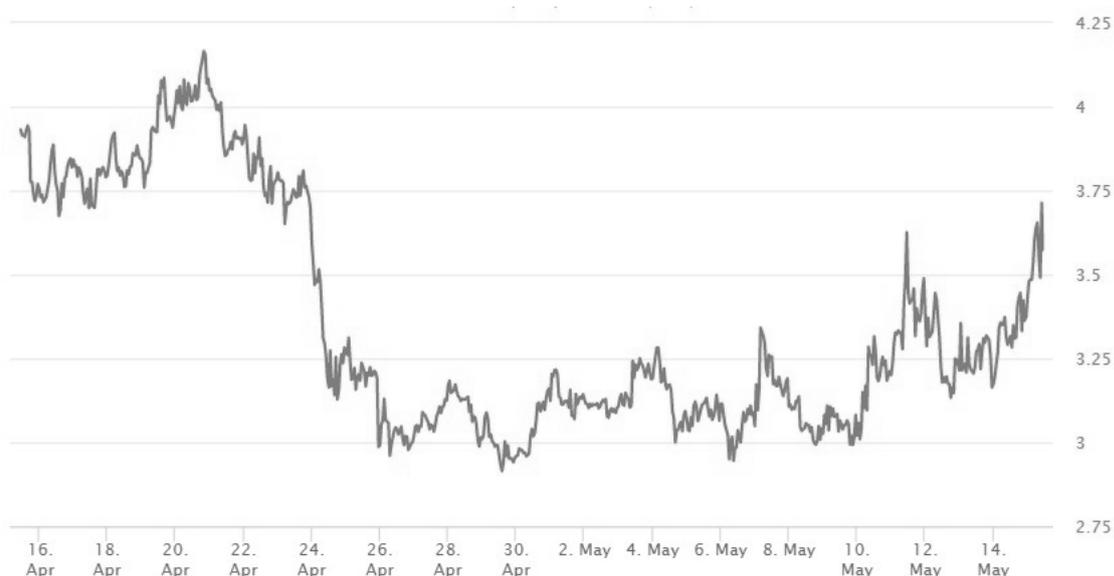


Fig. 2. Price of ELA to USD.

Source: coinmarketcap.com, 2019.

tralised OC, and Windows represents the traditional operating system — closed and centralised. To sum up, the central vision of Elastos is that it is intended to become the carrier which can carry out a set of the decentralised applications of big scale.

MATRIX AI (MAN) — Codeless Chinese Cryptocurrency

Matrix AI (MAN) is aiming to create a platform where you can create DApps and other cryptocurrencies through natural language programming.

It uses artificial intelligence and deep learning that learns over time how to auto-code for users. What this does is it brings the ability to create DApps and smart contracts to the masses. MATRIX AI Network was created to make blockchains quicker, safer, more flexible and more intellectual.[3]

MATRIX AI Network solves key problems which face the development of a blockchain and cryptocurrencies, there are:

- The slow speed of transaction;
- Programming of a barrier in smart contracts;
- Lack of safety in smart contracts;

Shortcomings of management and updating of blockchains.

In 2018 MATRIX AI Network declared that it is the only blockchain project providing a strategic partnership with the Chinese initiative of One Belt One Road (OBOR) for one trillion dollars, which spans multiple continents and aims to enhance the trust and efficiency of trade between different economies — it is a perfect match for blockchain technology.

“MATRIX brings good news to all the supporters of MATRIX and the Belt and Road initiative; we are proud to officially announce that have signed a strategic cooperation agreement with the state-owned Belt and Road Development Centre, to become the only blockchain partner of the centre.” — Owen Tao, CEO.[4]

The MATRIX AI network assists in training and consulting in the areas connected with artificial intelligence and a blockchain and acts as the main applied platform for the centre. Besides, all contracts OBOR connected with a blockchain will pass through MATRIX AI network.

In May 2018 MATRIX AI Network announced the second partnership connected with OBOR, this time with the International company of digital assets (IDA) — the company on digitisation and tracking of assets which generally specialises in the OBOR enterprises. Today IDA owns assets for the sum about 3 billion US dollars in the form of natural resources. The partnership between IDA and MATRIX AI Network will allow digitisation further these natural resources using a blockchain of MATRIX AI Network. It will allow tracing more easily and effectively assets and also an opportunity quicker and more simply to transfer cost. IDA will also be one of the first applications of DApps started in MATRIX AI blockchain.

From 1,000,000,000 tokens of MAN, it was sold 150,000,000 within the initial sale of tokens. The remained 850,000,000 tokens are reserved for the following purposes. It is an internal token using

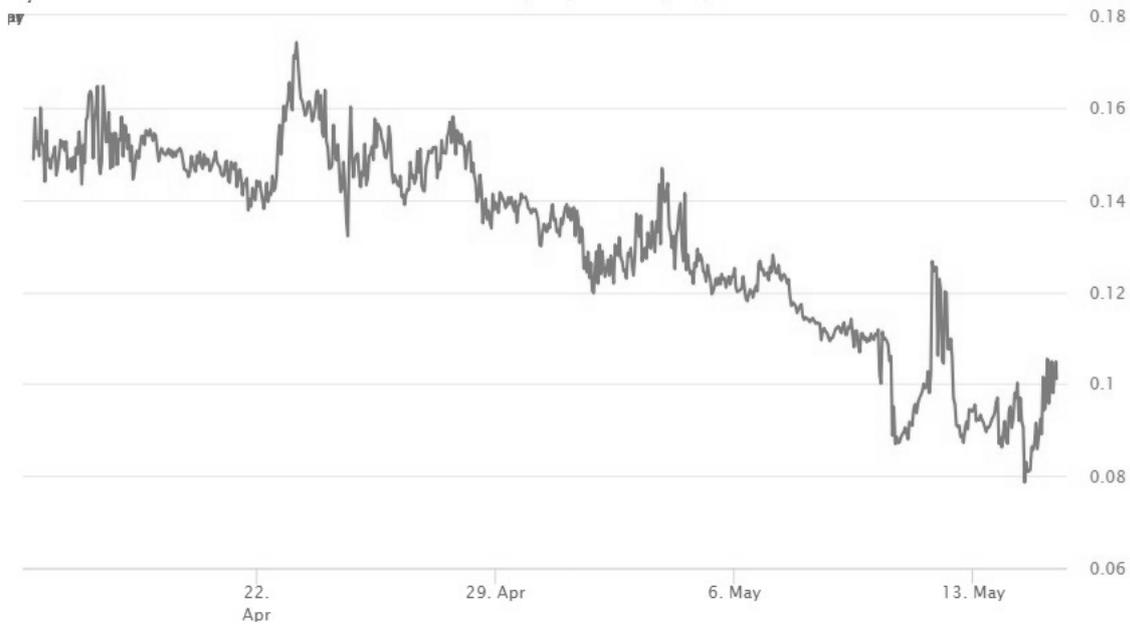


Fig. 3. Matrix AI Network Chart.

Source: coinmarketcap.com, 2019.

which miners will be rewarded and also paid the cost of the use of the platform for the creation of smart contracts. Also, it is possible to invest in tokens of MAN and for earnings due to the growth of their cost.

As at the initial stage the blockchain is not developed yet, Ethereum's blockchain is used, that is MAN standard ERC 20 tokens. In the future, after input of the blockchain tokens will be reissued and its holders will be able to exchange old coins for new in a proportion 1 to 1. The issue is limited to 1 billion tokens of MAN. From this quantity within ICO are realised 150 million tokens, and 400 million are reserved for compensation of miners. A part of the rest will be sent to the reserve fund. Still, a quantity is distributed between the team of the project, advisers and partners.

According to Fig. 3, capitalisation of the project makes \$ 79.143 million that puts it on the 105th place in the overall rating. The course makes \$ 0.527619 for one token of MAN today.

To sum up, it is hard to say whether this project will be successful or not, while there is not still full start. However, it shows yet good prospects for the future.

HIGH PERFORMANCE BLOCKCHAIN (HPB) — Software and Hardware Blockchain Solution Out East

High Performance Blockchain (HPB) aims to be the fastest and most scalable platform for large institutions. Their goal is to run 1,000,000 trans-

actions per second (TPS). Transactions per second are essential because of supply and demand.

If you can only run, let's say five transactions per second, then when the network becomes popular and widely-used, if there is even a small amount, like 100 transactions per second, then the network fees become massive, as everyone is fighting for their transaction to go through.

It is the first blockchain to include the hardware component implementation. Thus, it is much faster than its competitors in this regard, positioning themselves to take on large Chinese companies like Alibaba and Tencent where there are millions of transactions a minute, High Performance Blockchain is setting itself up for a massive valuation.[5]

Implementation of High Performance Blockchain will allow to go beyond digital money and to transfer all document flow of the world to a blockchain. For implementation of this task, developers segmented the project hardware and program:

- The hardware TOE card is connected to the network;

- The updated architecture of a blockchain which will be connected as standard API is started;

- The new algorithm is synchronised with the old network and increases its productivity.

As a result, the consumer has a high-performance system of a blockchain capable of working with any databases and of carrying out one million transactions per second.



Fig. 4. High Performance Blockchain Chart.

Source: coinmarketcap.com, 2019.

On January 09, 2018 HPB token got on the Bibox crypto exchange. The base price for a coin was \$ 2.96. In total developers plan to produce 100 million HPB from which on February 15, 2018, in turn only 22 million. Unit price — \$ 5.98. Total capitalisation — 133 million US dollars. As of May 2019, price is 0.31 (Fig. 4).

To sum up, High Performance Blockchain is perspective technology, which will be interesting to all active blockchain projects. Special attention to it will be paid by the large corporations working with huge volumes of valuable information and needing its safe moving to different points of the world. The full version of the platform will appear not earlier than the end of 2019. By this moment, the High Performance Blockchain team plans to get sufficient financing and universal support. It will allow to bring at the beginning of 2020 a product to the world market and to start its further improvements.

THEKEY (TKY) — Chinese Government-Backed Identification System

THEKEY (TKY) wants to be the world's identity verification tool for citizen identity. And right now, it is on its way there. It is because it already partnered with the Chinese government to do precisely this. Put the prospective use case of this coin into perspective. It is already partnered with China — which is populated with over 1.3 billion people. If this takes off in China, then the sky is truly the limit for this coin.

China alone would put this coin's market capitalisation into the tens of billions. There are many, many years before this coin can get to full adoption, but by only taking a fraction of its potential market, this coin could genuinely explode.

Also, Developers closely cooperate with the NEO project, quite a perspective cryptocurrency.

The operability of the digital economy in many respects depends on whether users quickly will be able and with the minimum efforts to undergo verification, that is the identification of the personality. According to developers, any of the existing systems of identification does not provide the due level of reliability and speed of work.

The scheme looks like:

A particular parameter, for example, the fingerprint of the user or any other unique parameter allowing to select the person and to identify it is loaded into the database;

In need of verification, this parameter acted again and compared to what is stored in the base. As data fits, verification is considered successful.

Such an approach is accompanied by several problems, such as:

Identification is made only on 1, or maximum two parameters that cannot provide the due level of reliability;

Data of the client are repeatedly duplicated when using different services. There is no uniform base in which information would be stored;

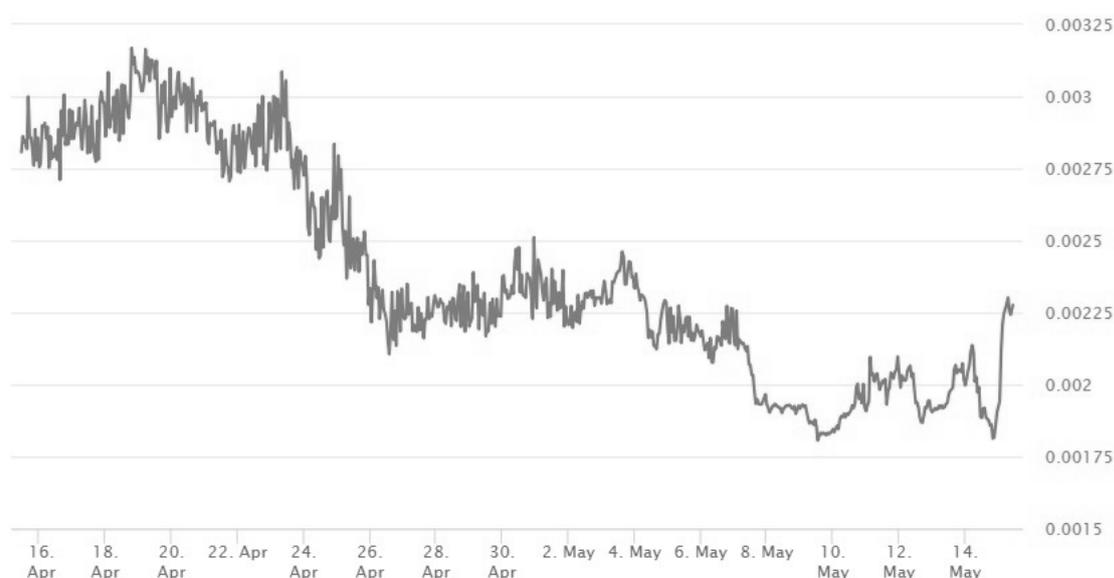


Fig. 5. THEKEY Chart.

Source: coinmarket.cap, 2019.

Even when using two-factor authentication (for example, the input of the password receiving SMS on the phone) there is a risk that malefactors will take control of them. That is the way of data storage has to be protected for 100 per cent of theft.

In THEKEY, all these problems are solved. Due to the use of a blockchain, it is impossible to steal or forge data. Here are solutions made by the platform:

There is realized multistage check at the identification of the personality. For example, besides a fingerprint also is assessed the activity of the person recently, the scheme of his movement;

Authors refused the centralised way of data storage. Instead of this DMI (dynamic multidimensional identification of the personality), it will be integrated into information centres of authorities;

The blockchain allows not worrying data will be stolen. It is impossible that they are stored not in one centre and on a set of the personal computer and if necessary, can be easily restored.

It is an internal currency of the project; it will be used for calculations between participants of the THEKEY project. It can be earned and at late stages of development of the project to use as a way of gaining access to the different products connected with identification. The THEKEY platform will use TKY tokens for the encouragement of validators and suppliers of data which will allow increasing the accuracy of work of a system.

TKY can be used as a natural object for investments. Entry into the exchanges already took place. Also, it can be used for cross-border payments; it

can be divided. The general issue is equal to 10 billion TKY; the number of tokens will never exceed this size.

According to May 2019, capitalisation of the project makes \$ 58,187 million. Cost of one token of TKY is \$ 0.00221 (Fig. 5).

To sum up, identification of users is really promising market. Practically every person on the planet needs/will need services of this sort. So, the idea of the THEKEY project unambiguously working. The fact that the idea already began to be realised adds confidence in the project. In China, in several municipalities of operating time of THEKEY are used, and it gives quite a good effect.

DEEPBRAIN CHAIN (DBC) – AI-Powered Chinese Blockchain

DeepBrain Chain (DBC) aims to provide a low-cost, decentralised solution to the expensive AI-computing problem that exists today. Artificial intelligence is one of the biggest buzzwords in tech today. This is because people understand that it is this, along with blockchain technology, are the future.[6] The problem with artificial intelligence, though, is that it is costly to compute. It is estimated that out of all AI start-ups funding, 30 per cent of it goes to their AI computing costs. DeepBrain Chain aims to lower the costs by an average of 70 per cent. It will drastically decrease the barrier of entry for AI start-ups, and help push the world faster and further into the future.

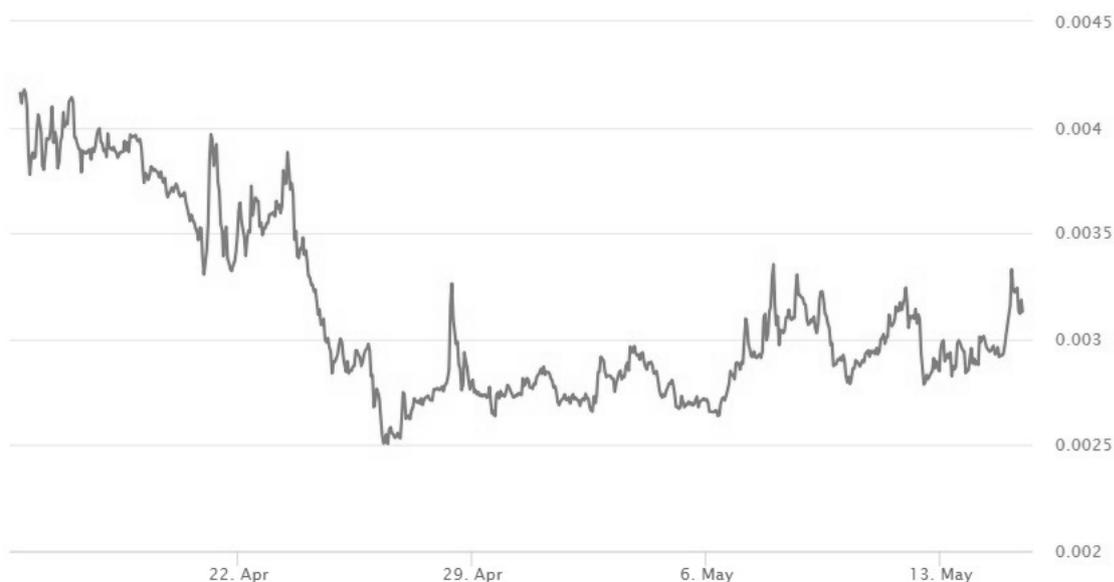


Fig. 6. DeepBrain Chain Chart.

Source: coinmarket.cap.

Also, there exists a library of semantics DeepBrain: library which supports applications for voice interaction (similarly to Amazon's Alexa). The library of semantics DeepBrain can be also used for the creation of third-party applications for which voice, graphic, text and other entrances are required.

Using technology Blockchain, DeepBrain Chain seeks to provide the inexpensive, private, flexible, safe and decentralised computing platform for artificial intelligence for products of artificial intelligence.

The group of founders is convinced that DeepBrain Chain already showed a precedent in the existing market, has the potential for scaling in the huge market and will be able gradually to grow around the primary activity on joint storage and the mechanism of the computing power of production.

Each DBC token corresponds to a calculated value of service. It means that the token is tied to the actual cost, and if DeepBrain Chain can advance this ambitious project, investors will be able to see quite essential dividends.

If DeepBrain Chain can prove as the pioneer in AI space on a basis a blockchain, it will have an essential basis in the potentially trillionth industry. Experts predict that the role of artificial intelligence will continue to grow with the advent of the AI new applications.

Nowadays, the AI industry costs about 20 billion dollars a year, and most of the expenses are spent on processing of calculations.[7] It where DeepBrain Chain fits as it uses a blockchain for cost reduction and increases in the speed of transactions.

DeepBrain Chain offers:

Low cost: DeepBrain Chain is directed to the depreciation of hardware input as the payment for GAS, which is required for each enterprise is, much less than an internal payment;

Optimisation: DeepBrain Chain is optimised on the graphics processor CUDA now and is going to be connected to the existing main system of deep learning, such as TensorFlow, Caffe, CNTK;

Highly competitive: DeepBrain Chain uses the unique technology of balancing of loading, each container of a node can interact with each other for sharing of pressure;

Confidentiality: in using the intellectual contract, the blockchain technology allows to divide the property rights into granting and the rights of use;

Flexible calculations: Frequency during peak hours can be in 10 times more in comparison with, not peak hours. DeepBrain Chain can be configured automatically by fast replication on several single nodes in rush hours.

AI on a blockchain is what else should be studied; only a few projects work now in this space. Therefore, DeepBrain Chain can get advantage before the first movement with a very smaller competition with which it is necessary to deal at the moment.

According to the graph, in May 2019, the cost of DBC token 0.02752 USD (Fig. 6). And market capitalization 11,793,168 USD.

To sum up, DeepBrain Chain is a promising project. The most important DeepBrain Chain element

consists that it is unique and not just tries to make what was already made by others. The working product and the existing clients do it even more attractive. Being constructed on NEO, the Chinese competitor of Ethereum, DeepBrain Child, will probably draw a lot of attention in the next months.

These are examples of several projects that are seemed to be perspective in future. Of course, it is difficult to say which one would succeed. However,

China is investing in lots of other projects that are in different fields. So, all question in that, how competently developers will organise advances of the idea and whether they will be able to realise all planned steps in 2020. The future of the projects seems quite good. Towards the end of 2019, it will become finally clear whether these projects will be able to make a revolutionary step, or it will be limited only to the market of China.

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Перспективные криптовалютные проекты, поддерживаемые Китаем

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Аннотация. В статье рассматриваются наиболее перспективные криптовалютные и блокчейн-проекты, в которые инвестирует Китай. После пересмотра правил, установленных Китаем в отношении криптовалют, китайское правительство решило создать несколько финансовых органов для регулирования и развития криптовалюты. Однако, наряду со строгим регулированием криптовалют, Китай инвестирует значительные средства в блокчейн-проекты, в развитие Исследовательского института цифровой валюты Народного банка Китая, деятельность которого сосредоточена на исследованиях и разработках цифровых валют и технологий, связанных с блокчейном. Китай активно поддерживает более 40 платформ, в том числе в сфере создания искусственного интеллекта, глубинного обучения и программного обеспечения. В ближайшее время Китай планирует внедрить блокчейн в самые разные сферы экономики, увеличив объем инвестиций в его развитие до 3 млрд долл. «Эта технология может трансформировать многие сферы нашей жизни. Если в стране проводить мощную технологическую политику, я уверен, что еще больше компаний начнут работать в области блокчейна» — сказал журналистам партнер международной консалтинговой компании PwC в Шанхае Чунг Чонг Инь.

Ключевые слова: криптовалюта; регулирование; финансы; Китай; биткоин; искусственный интеллект; блокчейн; финтех; токен

Prospects and Risks of the Development of Japanese Cryptocurrency (monacoin)

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Abstract

In this article, the prospects and risks of the development of the Japanese cryptocurrencies are discussed. Japan has the most progressive regulating climate in the world for cryptocurrencies. The land of the rising sun is the homeland of a large base of investors of cryptocurrency and users. In 2018 Japan was the second or third largest economy in the world for bitcoin. Averages of the Japanese yen of 11 per cent of the global trading volume for BTC, keeping it a nostril in a nostril with South Korean won for global trade domination after the USA dollar. For the country only 127 million people of 11 per cent of the global trading volume – influence is more than usual size per capita on the crypto industry.

Keywords: prospects; risks of development; investors; economy; cryptocurrency

JEL classification G19, G29

From very early on, Japan has been a crypto hub. Japanese citizens were among the first to start mining and using Bitcoin, even at the beginning when it had very little real-world value. MtGox, the world's biggest crypto exchange at the time, was a Japanese company. Millions of Bitcoin transactions flowed through Japan.

Some of the world's biggest crypto celebrities lived in Japan. Roger Ver proselytised Bitcoin heavily in Tokyo and around the country during the first few years of Bitcoin's existence, even giving away free Bitcoins so people could play with them and learn how to use them. Ver was the one who convinced Mark Karpeles to purchase MtGox from programmer Jed McCaleb in 2011 and operate it as a Japanese corporation.

MtGox is the worst hack of a cryptocurrency exchange ever. It was a huge setback for the cryptocurrency community who had staked so much of its reputation on the security and immutability of blockchain-backed cash. The problem, however, was MtGox's security was not up to the task of keeping attackers out.

As a result, the attackers gained access to the private keys of millions of hot wallets on the exchange. They also gained access to many of MtGox's funds.

The MtGox team tried to recover the funds but was unsuccessful. After the loss of so many company funds, the exchange became insolvent. Within a few weeks, the largest crypto exchange in the world had become insolvent. MtGox filed for bankruptcy, Karpeles went to jail for falsifying records during the ordeal, and trust in cryptocurrency fell to an all-time low.

Japanese investors were stunned, especially those who used MtGox as their primary exchange. It would have been reasonable to expect the Japanese government to shut down other exchanges and tighten regulations to protect consumers. However, that's not what they did. A lot of credit should go to Japanese regulators during this period. They didn't let MtGox's mistakes cripple the overall cryptocurrency community in Japan. Instead, they imposed reasonable measures to formalise and monitor cryptocurrency investments to protect consumers.



Fig. 1. Schedules of the rate of MtGox exchange.

Source: bitcoinwiki.com.

Table 1

Rating of the Japanese cryptocurrency exchanges

Name of the platform	Date of opening	Interface language	Trading volume (24 hours)	Trading volume (30 days)
Bitbank	23.06.2015	Japanese	\$ 33,492,137	\$ 917,217,670
Zaif Exchange	28.05.2014	Japanese, English	\$ 9,187,000	
CoinCheck	17.07.2014	Japanese, English	\$ 12,168,240	
Quoine	13.01.2014	Japanese, English, Indonesian	\$ 170,612,690	
Fisco Cryptocurrency	29.06.2016	Japanese	\$ 3,689	
Btc Box	13.02.2014	Japanese, Chinese, English	\$ 9,706,680	\$ 272,946,008
GMO-Z.com Coin	October 2016	Japanese, Russian		
Campfire Corporation	n.d.	Japanese		

Source: Author's compilation.

After the recent Coincheck hack, for instance, the Association was quick to implement its own new rules and regulations in response. The new rules set a maximum cap on the percentage of user funds that can stay in hot exchange wallets. Anything over the threshold of 20 per cent would need to automatically and autonomously move to cold storage for security purposes. Via this self-regulating body, exchanges can make rules that work for them while still keeping government regulators satisfied.

For a long time, the FSA has been concerned over organised crime and other criminals us-

ing digital currencies to launder money, especially privacy coins. That's one of the primary reasons the Payment Services Act requires all cryptocurrency exchanges in Japan to now be duly licensed with the FSA before they can do business. The FSA wants to track know your customer data and impose anti-money laundering measures.

Several organised crime groups used Monero, ZCash, and Dash to launder money earlier this year, even with AML policies in place at Japanese exchanges. As a result, the FSA announced on June 18 that there would be an

outright ban on privacy coin trading in the country moving forward. In the wake of this new ruling, Japanese exchanges have pulled Monero, Dask, Reputation, and ZCash from their trading platforms. Even though Dash and ZCash offer optional privacy that only a minority of user utilises, Japanese regulators have still insisted on removing the coins.

Let's consider in more detail the most popular exchanges, their merits and demerits. The Coincheck theft prompted heavier oversight.

The FSA began conducting on-the-spot inspections for all quasi-operators to look for security gaps, and in March 2018, the FSA sent out punishment notices to seven exchanges, even requiring two to halt operations for 30 days.

According to Asia News Network, the FSA is grappling with how to handle its quasi-operators. Shutting unqualified operators down too quickly could cause customer backlash, but, at the same time, the FSA needs to make sure the proper security checks are in place.

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Перспективы и риски развития японской криптовалюты (монакоин)

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Аннотация. В статье анализируются перспективы и риски развития криптовалюты в Японии, где сформирован самый прогрессивный регулирующий климат в этой области и где существует крупная база инвесторов в криптовалюты и пользователей. Однако ряд скандалов, сопровождающих деятельность обменных платформ, прежде всего банкротство самой большой площадки MtGox, подорвало доверие инвесторов и пользователей. В результате, потеряв почти монопольную позицию, рынок криптовалют в Японии в 2018 г. занимал попеременно 2 и 3-е места по объему транзакций, уступая китайскому и южнокорейскому.

Ключевые слова: перспективы; риски развития; инвесторы; экономика; криптовалюта

Prospects for the Development of Cryptocurrency Regulation in Singapore

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Abstract

In this article are discussed the main prospects of development of cryptocurrency in Singapore, as it is widespread and used all over the world. The article covers the main points for the regulation of the cryptocurrency. There is a wide range of cryptocurrency trading platforms, and most of them are located in different countries, which leads to significant differences in terms of regulation by the authorities and, accordingly, different rules for users and companies. Several exchanges allow trading derivatives. A more detailed review would give a correct impression of the current situation in the world in terms of regulation of cryptocurrencies and future trends. Cryptocurrencies continue their development; the number of users of cyber money is steadily growing. The popularity of bitcoin has generated the creation of other cryptocurrencies that are developing along with bitcoin, but their popularity and capabilities are much less. In some countries, including Russia, the government started warning people that investing in "cash" equivalents could lead to losses in case if there is a collapse of cryptocurrency (bitcoin).

Keywords: cryptocurrency; regulations; finance; Singapore; bitcoin; derivatives; blockchain; trade; government
JEL classification G 19, G29

Singapore expresses one of the most controversial views on the legal regulation of cryptocurrencies. Singapore is a city-state with a form of government in the form of a parliamentary Republic. Officially, the country has a multi-party system, but in fact, opposition parties are practically not represented in Parliament. However, government policy is fairly transparent, and corruption is virtually non-existent. The country has one of the lowest crime rates in the world. The population of the country is about 5.5 million people. The national currency is the Singapore dollar.

Until 2014, bitcoin had no official status in Singapore. However, later, there was a need to regulate the turnover due to the increase in the percentage of capitalisation of the cryptocurrency. The tax authorities have developed a complex system of identification of digital

currency in a wide range of different financial transactions.

- Companies engaged in the exchange (purchase and sale) of bitcoins are required to pay a tax of 7 per cent of the profits received when performing these operations. A similar tax rate is applied to the taxation of profit in the sale of goods and services. Thus, like most Western countries, the Republic of Singapore equated cryptocurrency to property obligations.

- Long-term investment in BTC is not taxed, that equates to the transaction data to the investment in the capital. Thus, BTC is equivalent to currency, but the official status of the bitcoin received. It provokes the legally suspended state of the cryptocurrency and the inability to fully apply the current financial legislation of Singapore.



Fig. 1. Diagram FTSE ST Catalyst Index Volatility (Singapore).

Source: FTSE Group, Singapore Exchange.

- When paying for goods and services by Singapore citizens, a tax similar to the one described in the first paragraph in the amount of 7 per cent is charged, that is, bitcoin can again be considered only as property obligations. Thus, it is not about paying for goods and services in the conventional sense of the word, but about barter. The seven per cent tax rule does not apply to non-residents of the country. In October 2017, the Minister of the economy and social policy Tarman Shanmugaratnam, who is also the Chairman of the financial regulator of Singapore, made an official statement that the cryptocurrency is not a legitimate means of payment, but a means of exchange.

- Payment for virtual goods and services (games, applications, etc.) is not taxed at 7 per cent.

- With the release of ICO in token of the digital type with the assignment of the status of the securities regulation of their circulation shall be in accordance with the applicable laws of Singapore in respect of securities. For holders of digital securities who are individuals and whose activities are not related to profit from the purchase/sale of securities, there is no tax, including the single sale of this type of asset. However, legal entities and

individuals, whose activities are related to the purchase/sale of securities for profit, are subject to income tax in the amount of 17 per cent of the income received.

In March 2014, the government of Singapore delegated to the monetary authority of the country to provide measures of control over virtual currencies in connection with the anonymity of the latter and the possibility of using them for money laundering and for sponsoring terrorism or other illegal activities. Companies that exchange digital currencies for real currencies must ensure the identification of users and are obliged to transfer information to law enforcement agencies in the event of a suspicious transaction.

In December 2017, the Deputy Prime Minister for economy and social policy Tarman Shanmugaratnam expressed an opinion that fully describes the regulation of digital currencies and expresses the attitude to the problems on the part of the government of Singapore: “the State does not directly regulate cryptocurrencies but deals with the legitimate coordination of the activities of ISO, that is, companies engaged in the production, storage, purchase and sale of cryptocurrencies.”

At the end of 2017–the beginning of 2018, several ISO companies based in Singapore

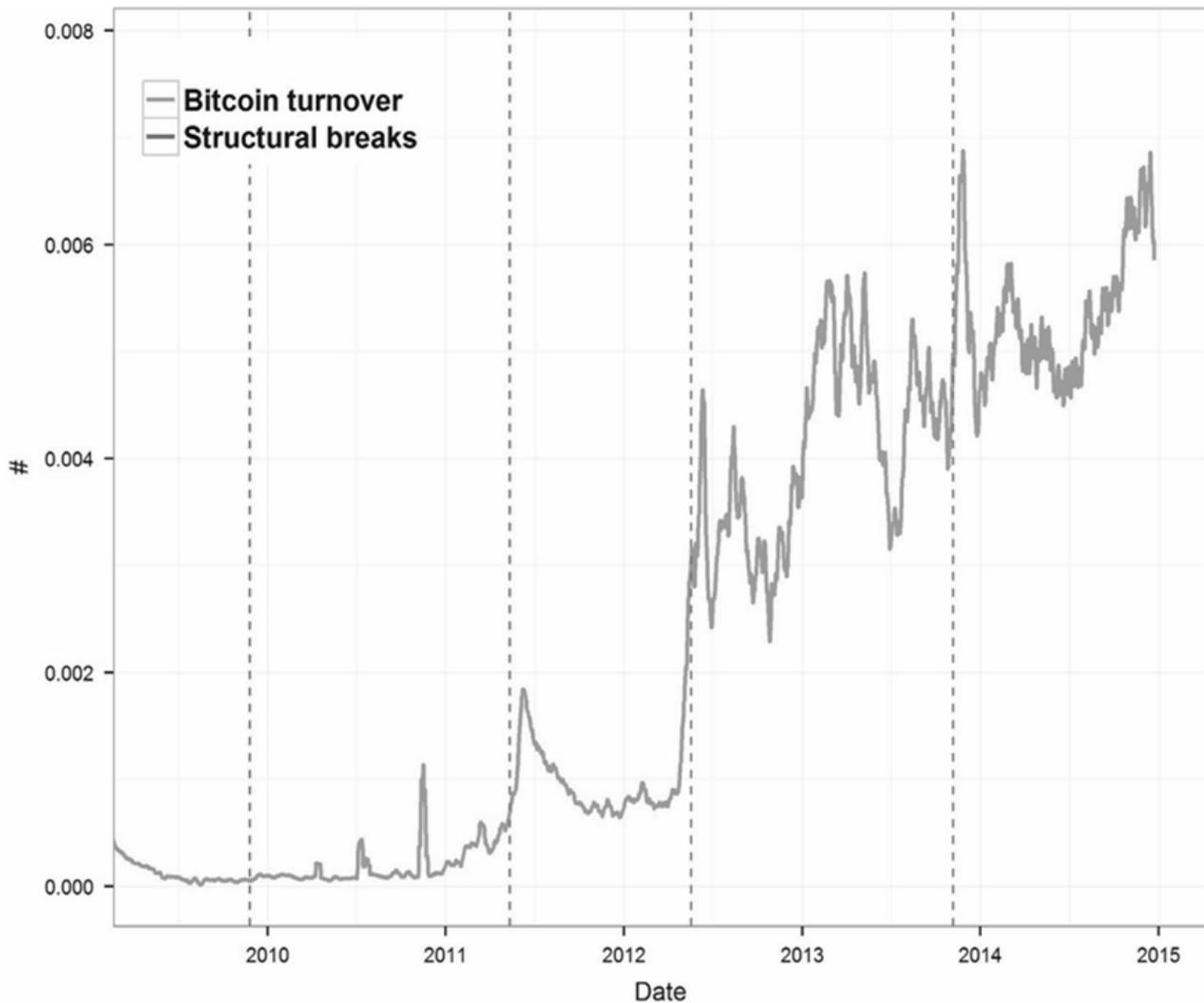


Fig. 2. Crypto-Turnover ratio.

Source: Singapore Department of Statistics.

were frozen accounts in local banks, due to the uncertain legal status of digital currencies or non-compliance with legislation on securities turnover, to which several tokens were equated.

As of May 2018, there were no significant changes in this issue. On the territory of Singapore today there are a little more than 20 points of physical trade in which payment for goods and services can be made using BTC. An interesting fact is that against the background of these events in Singapore, however, actively introduced physical cold wallets (plastic card with a microchip) with an account in BTC (the amount of the account is fixed in accordance with the specified nominal value of Satoshi at the time of sale). Today, wallets with a nominal value of 0.01 BTC and 0.05 BTC are

available for sale. The cost in us dollars as for April 29, 2018, was 96 and 480 dollar respectively.

Digital currencies recognised as legal tender with monetary unit status are not currently available in Singapore. The only cryptocurrency in respect of which official statements are made, which significantly increases the status of trust in it, is bitcoin, which acts in the form of property obligations or securities. There were no statements from the government of Singapore regarding other types of digital currencies. However, the head of the MAS Tharman Shanmugaratnam in their official public statements referred to the possibility of the emergence of new tokens, in respect of which would also apply to legislative rules are identical to regulations on bitcoins.

The monetary authority of Singapore (MAS), which serves as the Central Bank, has introduced updated rules for enterprises attracting financing through initial coin offerings (ICO). Initially, MAS MADE changes to the existing rules of ICO regulation adopted by the office last year. The changes concerned the legal regime for payments and clarified the Central Bank's position on how intermediaries should comply with the anti-money laundering (AML) and anti-terrorist financing standards. By intermediaries, we mean any individuals and legal entities involved in the ICO: from those who issue tokens to those who provide financial advice.

According to the MAS RULES, issuers of tokens distributed within the ICO must have a license for services in the capital markets, financial consultants — a license of a financial adviser, and platforms for trading digital assets — a license for operations with securities. The changes to the rules state that all these intermediaries are required to take action to identify, assess and understand the risks associated with money laundering and the financing of terrorism. Also, all participants must develop and implement meet the requirements of MAS procedures for the verification and control of customer transactions, based on records of their transactions.

According to the rules, even if the token is not a security, all actions with it should be carried out in accordance with AML-procedures. If you suspect a terrorist connection, such enterprises will engage the office of security and intelligence agencies of Singapore and the relevant division of the United Nations (UN). Also, in November, MAS presented a new bill on payment services (PSB), which included cryptocurrencies. They are now subject to the General rules for domestic and international remittances. Also, PSB is mentioned in the updated provision of ICO.

It is worth noting that in October, MAS told about the intention to ensure that banks in Singapore began to provide services to companies whose activities are related to cryptocurrencies. According to the representatives of the Department, it is necessary for the development of the financial and technological industry in the state.

According to the information collected by CB Insights, Funderbeam and Crunchbase, 57 per cent of ICO funding are now concentrated in 5 countries: the US, Switzerland, Singapore, Canada and the UK. ICO funding has also increased over the past year by almost 47 times (according to Coinschedule from 70 million to 3.3 billion). According to the analytical company Blockchain Elementus, Singapore attracts more and more blockchain startups, and in August 2018, for the first time bypassed the US in terms of the number of ICOS held in its jurisdiction.

The gradual strengthening of control in the States leads to the fact that young crypto companies are looking for more favourable conditions for launching projects. Although it is impossible to say for sure, whether this trend will continue in the future, the government of Singapore has begun to restructure the legislative framework for the full regulation of the ICO market.

Elementus analysts estimate that the market of primary placements at the beginning of September attracted about \$ 28.4 billion. It also claims that, despite the General crisis of the crypto market, the ICO market is now at a level comparable to last year. In August last year and this year, an almost equal amount of investment (\$ 1.4 billion) was attracted. From February to August this year, \$ 15.9 billion was collected, despite the bearish trend.

The company notes the growing competition among startups and a more selective approach from all groups of investors. It led to a decrease in the share of projects that were able to raise more than \$ 100 thousand, from 84 per cent to 22 per cent.

There are different prospects of cryptocurrency regulation in Singapore. For instance, the use of a cryptocurrency company in Singapore to enter the ICO is considered to be the best option, since it is quite easy to conduct business in the country. This city-state is one of the few that has friendly legislation in relation to cryptocurrency activities. In Singapore, you can develop almost any projects related to innovation, as well as startups related to the technology of blockchain, cryptocurrencies, ICO.

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Перспективы развития регулирования криптовалюты в Сингапуре

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Аннотация. В статье делается попытка определить перспективы развития криптовалюты в Сингапуре, учитывая широкое распространение и использование криптовалют во всем мире. Автор рассмотрел порядок и методы государственного регулирования рынка криптовалют, дал характеристику некоторым криптовалютным торговым платформам, большинство из которых расположены в разных странах, что приводит к существенным различиям в плане регулирования со стороны властей и, соответственно, разным правилам для пользователей и компаний. Обобщены принципы работы бирж, где разрешено торговать деривативами. Оценивая развитие и рост рынка криптовалют, количество пользователей киберденьгами, автор отмечает, что популярность биткоина породила создание других криптовалют, которые развиваются наряду с ним, но их возможности существенно ограничены. В некоторых странах, в том числе и в России, власти предупреждают людей, что инвестирование в «денежные» эквиваленты может привести к убыткам в случае краха криптовалюты.

Ключевые слова: криптовалюта; регулирование; финансы; Сингапур; биткоин; деривативы; блокчейн; торговля; правительство

Modern Trends in Innovative Construction Projects

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Abstract

The construction sector is extremely conservative. However, nowadays, no one sphere of economic activity can exist without any changes or innovations. There are a lot of different perspective technologies and materials for construction. It is possible to say that the main aim of the innovations construction sector is working faster, cheaper and better. Each company should be interested in the faster construction process, because of decreasing payback period and lowering risks, associated with almost every project. Also, companies should be interested in a better quality of houses and other buildings, for it gives a lot of benefits – higher demand, a better reputation and so on.

Keywords: global innovations; investment; construction projects; construction technology
JEL classification L74, O31

It can be distinguished two types of technologies, which influence on the construction market. First of all, global innovations, such as the internet, changed all spheres. Construction process became much faster due to quick communication through the Internet. Future development of this innovation may be the Internet of Things (IoT). IoT might revolutionise construction sector once again. Secondly, it can provide specific technologies for sector. For example, the better quality of cement. These technologies help to get better quality at lower costs. [1]

There is a list of technologies:

- Self-healing concrete;
- Transparent aluminium;
- 3D printing construction;
- Internet of things;
- Robotics and swarm robotics;
- Building Information Modelling.

The first technology is self-healing concrete. Concrete is the most commonly used human-made material on earth. It is a relevant construction material used extensively in buildings, bridges, roads and dams. Concrete is a com-

posite material, consisting mainly of Portland cement, water and aggregate (gravel, sand or rock). When these materials are mixed, they form a workable paste, which then gradually hardens over time. The main reason for usage:

- Cheap material with relatively long life;
- It is strong in compression;
- Very pliable substance before it hardens.

Millions of dollars are invested in maintaining, fixing and restoring roads, buildings, tunnels and bridges annually. It is because all concrete eventually cracks and needs to be restored. Self-healing concrete can change this situation and lower maintenance cost to almost zero.

Self-healing concrete is a product that will biologically produce limestone to heal cracks that appear on the surface of concrete structures. Specially selected types of the bacteria *Genus Bacillus*, along with a calcium-based nutrient known as calcium lactate, and nitrogen and phosphorus, are added to the ingredients of the concrete when it is being mixed. These self-healing agents can lie dormant within the concrete for up to 200 years.

However, when a concrete structure is damaged, and water starts to seep through the cracks that appear in the concrete, the spores of the bacteria germinate on contact with the water and nutrients. When activated, the bacteria start to feed on the calcium lactate. As the bacteria feed's oxygen is consumed and the soluble calcium lactate is converted to insoluble limestone. The limestone solidifies on the cracked surface, thereby sealing it up.

The other material, which can revolutionise the construction sector, is transparent aluminium. Nowadays, aluminium is widely used in construction. An enlargement of aluminium usage can be one of the drivers for its consumption. This metal is the second one after steel in the construction sector. Ceramic called aluminium oxynitride, composed of equal parts aluminium, oxygen, and nitrogen is known under the chemical formula ALON. [2]

Despite clearly not being a metal — and not a glass either; glasses are amorphous solids, while ceramics are crystalline — ALON and the other transparent ceramics that have been developed since have some amazing properties. ALON is marketed under the name ALON. Powdered ingredients are poured into a mould, compacted under tremendous pressure, and cooked at high temperatures for days. The resulting translucent material is ground and polished to transparency before use.

At the moment this material is used for military purposes — elements for sniper rifles, armour panels. On the downside, ALON is expensive — in the armoured glass market, it's about five times the price of traditional laminated glass. But it has so many benefits, not least of which is superior scratch resistance, that for some applications it's the material of choice.

In the case of a price decrease, transparent aluminium can be used in ordinary construction. For instance, it is interesting for typical business centres, which are covered with glass. It will decrease maintenance costs, and appearance will be better for a longer time. Also, it can be attractive for objects, such as an aquarium, because there is a lot of glass surfaces. And these surfaces may be damaged by visitors. Transparent aluminium might be a decision for this situation.

3D printing is a real trend in a lot of sectors. Nowadays, there are a lot of materials, which can be used in printing — more than five types of plastic and five types of metals (aluminium, titanium and other). Each 3D model begins from computer design, and only then special equipment (3D printer) brings the computer model to real life.

Printing in construction is a bright idea because it is much faster and cheaper than the standard process. Printers can make parts or the whole house. Partially printing is more suitable for bigger houses. But when the printer constructs the whole house, it is faster, but the house will be smaller. And it is not a future. Nowadays there are a lot of solutions on the market. [3].

It is possible to divide printers into three groups:

House 3D printer; there are printers, which everyone can be for personal usage. For instance, the price of Machines-3D is \$ 395,000.

Prototype; these printers are now in development or testing phase, but these models can go on sale shortly.

Service.

Also, some companies provide 3D construction printing as the service. Customers can rent printers or get ready constructions from the company.

The next technology — the Internet of Things or Io T. The IoT is a system of interrelated computing devices, mechanical and digital machines, objects, animals or people that are provided with unique identifiers and the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction. Simple example — coffee machine knows when you wake up and make coffee in time. [4] But IoT may change a lot of process in construction. There are several possible applications:

Real-time reporting; different department of construction companies can get data from building site in real-time. It can help in a lot of processes — from planning to operational micro-management. As a consequence, all processes will be more effective.

Continuous improvement; this point is close to the previous. A lot of new actual data help to improve different sides. Only through IoT

company can make some real predictions and adapt to new market situation.

Worker safety; one network on building site may prevent mortality through early warning. Also, wearable gadgets might check all health parameters and send notifications to medical service in emergency cases.

Automated Workflows.

Sensors and RFID tags on materials and equipment can help in proactive ordering materials and servicing equipment. When an employee checks out or ships material to a job site, he scans the item. The system detects low inventory and notifies an employee to place an order for more material. Similarly, sensors on equipment monitor usage levels to potential flag issues for preventive maintenance. These measures will lower the human factor and mortality at work.

But each technology has its weak links. In the case of IoT, weak points are linked with the transfer of a massive amount of data. First of all, it is difficult enough to construct the Internet and unity all things. And, of course, it's massive investments. Secondly, data have to be encrypted. But it is difficult to encrypt each piece of information. Otherwise, data can be stolen.

Robotization of various industries began a couple of years ago. And now a lot of manufactures works without colossal personnel. These factories need only a few operators that track all the operating parameters. And they can call specialists in the event of emergencies. On the other hand, the construction industry is one of the least automated industries that feature manual-intensive labour as a primary source of productivity. And it is possible to point out development and growth for the construction sector. But the main problem for robotics integration – construction demand a lot of different operations, which may differ from hour to hour. And robots cannot change the program so fast. It means that only several operations may be upgraded by robots.

There are a few types of robots:

3D robotics printers; this type of robots, we overviewed above in this part of work.

Masonry robots; it is one of the most perspective types. There are construction robots for brick-laying and masonry, and even robots

that lay an entire street at one time. These types of robots dramatically improve the speed and quality of construction work.

Demolition robots; it is a highly interesting type due to a new level of safety for building site crew. While they are slower than demolition crews, they're far safer and cheaper when it comes to demolishing concrete and structural components of a building at the end of its lifecycle.

Remote control (RC) and autonomous vehicles; it can be as gadgets for existing vehicles. For instance, special device can give remote control of bulldozer on the territories where the ground may fall. We suppose that this type of robots is the first step of building site automatization.

As for the swarm robotics, it's special branch of robotics. Swarm robotics is the use of numerous, autonomous robotics to accomplish a task. Robot swarms coordinate the behaviours of a large number of relatively simple robots in a decentralised manner. Researchers at Harvard's self-organising systems research group have built small construction robotics programmed to work together as a swarm. The four-wheeled robots can build brick-like walls by lifting each brick, climbing the wall and laying the brick in an open spot. They have sensors to detect the presence of other robots and rules for getting out of each other's way. Like termites, no one is "controlling" them, but they are programmed to build a specific design collectively. The other possible application of swarm robots is building maintenance. Swarm can inspect construction from time to time. It can help find small cracks before it will be a problem. And this swarm might do it without any additional tasks from personnel.

Robotics and swarm robotics also have some disadvantages. First of all, all innovations are required investments. And this innovation might be the most expensive from the list above because most of the projects are on the research phase. And no one knows which project will be commercially successful. Secondly, robotics can not only solve the problem of skill shortage, but it can increase unemployment. And it concerns not only the construction industry. Thirdly, robotics needs high-skilled professionals. We

suppose that the supply of this professional will be low in comparison with the high demand from a lot of construction companies.

To sum up, all innovation can revolutionise the construction sector. The construction sector of the future will combine different tech-

nologies to solve new market challenges. For instance, a 3D printer might use self-healing concrete. Or swarm robots can be programmed through the BIM system. There is a possible outcome that no one innovation will be implemented in the sector.

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Современные тенденции в инновационных строительных проектах

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Аннотация. В статье рассматриваются проблемы строительного сектора, который является чрезвычайно консервативным. Дана характеристика значимости влияния на экономику строительного сектора современных технологий и материалов. Исследованы особенности применения инноваций, позволяющих строить быстрее, дешевле и качественнее. Обобщены принципы и подходы строительных компаний к экономической обоснованности их применения в строительном процессе. Предложены рекомендации по повышению окупаемости и снижению рисков, связанных с каждым строительным проектом, а также обеспечению более высокого спроса, улучшению репутации строительной компании и повышению ее конкурентоспособности.

Ключевые слова: глобальные инновации; инвестиции; строительные проекты; строительная технология