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A FINANCIAL CRISIS PROBABILITY MEASUREMENT MODEL IN THE CONTEXT OF DIGITAL TRANSFORMATION

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Abstract. In recent decades, the structure of international exchange has undergone significant changes, and the role of various services is increasing, the range of which is expanding under the influence of the scientific and technological revolution. At the same time, the regimes of international trade in services, as well as approaches to its national and multilateral regulation, are becoming more complex. Digitalisation has become one of the main characteristics of development. The digital transformation of international trade is shaping the new "digital reality" of the industry. The statistics of the official regulators of international trade confirm these changes. The paper analyses the dynamics of changes in international trade in services in the context of the global crisis and the impact of digitalisation on it. The interdependence of countries in the conditions of increased economy and new models of international exchange of services are shown. The paper presents a quantitative assessment model of the level of systemic risk causing the financial crisis.

KEYWORDS: DIGITAL TRANSFORMATION, GLOBAL CRISIS, INTERNATIONAL TRADE, MEASURE, MACROECONOMIC.

INTRODUCTION

Among the characteristic features of the modern stage of the development of international trade are the scientific and technological revolution, the increasing internationalisation of production and marketing, and the increasing role of developing countries in international trade. However, some characteristics of the current stage are transformed, including under the influence of crises. At this stage, countries have the opportunity to easily join the world production process and achieve the growth of their national economy, concentrating on individual links of global value chains (hereinafter GVCs).

The crisis of 2008 showed the need to protect one's economy most clearly.

The pandemic has exacerbated problems in trade relations and increased the segmentation and polarisation of international trade. This could have negative consequences, including a further rollback of free trade principles and prioritisation of trade between countries based on bilateral trade agreements.

It should be noted that developed countries dominate the structure of international trade. Since 2000, the annual growth of world trade in goods and services has amounted to 7%. After the global economic and financial crisis, trade growth slowed to an average of 3%, and in 2019, growth in global trade in goods and services slowed sharply to a post-crisis low [UNCTAD, 2020].

A financial crisis can take many shapes and forms, but two broad types can be distinguished. Reinhart and Rogoff describe two types of crises: those classified using strictly quantitative definitions and those relying heavily on qualitative and judgmental analysis. The first group mainly includes currency and sudden stop crises, while the second group includes debt and banking crises [Reinhart & Rogoff, 2009: 4660472].

The paper provides the S^{RISK} indicator, which means

TABLE 1. Comparison of commercial services exports with goods exports in 2017–2021

SECTOR	2017	2018	2019	2020	2021
Products and commercial services, USD bln., including:	21,2	20,8	25,2	24,8	21,9
Services, billion USD	5.01	5.09	6.09	6.23	4.98
Share of services in the structure of world trade, %	23.6	24.5	24.2	25.1	22.7

SOURCE: WTO (2021). WTO Stats. – https://stats.wto.org (08.03.2022).

systemic risk and measures capital dollars, for the normal functioning of a financial firm if we have another financial crisis based on stock market data.

Based on Romer-Romer crisis severity measures, this model estimates the under-capitalisation level leading to a financial crisis. From this estimate, it is possible to calculate an S^{RISK} power that will keep this probability below 50% [Romer & Romer, 2017: 40-43].

RESEARCH METHODS

The work is based on a statistical base that describes the landscape of modern international trade, including the fundamental documents of the largest international organisations: the World Trade Organization (hereinafter WTO) and UNCTAD. The forecasts of the International Monetary Fund (hereinafter – IMF) are used as an auxiliary source [IMF, 2020].

The article is based on a structural analysis of international exchange flows of goods and services, describing cross-border trade in services in the context of digitalisation, as well as analysing the impact of digitisation and digital transformation on traditional costs.

RESULTS AND DISCUSSION

Trade in services is the most dynamically developing segment of international trade. According to the WTO classification, a service is an object of international trade, provided the service provider, and its buyer are residents of different states.

With increasing globalisation, there is a growing need to expand the scope of service trade. Developed countries are traditionally leaders in the service market. Currently, services are usually a science-intensive field that uses high IT and artificial intelligence technologies.

The value of world exports from 2000 to 2015 increased four times, and its share in the total world export of services increased from 30 to 35 [Shuyskiy, 2016: 44–55]. The dynamics of services exports on the WTO portal show how the total volume of exports has changed in terms of value from 2016 to 2021. With a constant increase to USD 6,228,674 million in 2019, this figure dropped to USD 4,985,329 million in 2021. (Table 1).

According to WTO data, in the first quarter of 2021, imports decreased by 5.2% and exports by 6.4% (*see Table 1.*).

The peak was observed in the second quarter of 2021, when the decrease of exports reached 21.3%, and imports – 20.8%7.

At the beginning of the pandemic, there was a sharp drop in demand in the service sector, followed by an equally sharp recovery in demand.

According to WTO data, the 2022 global PMI shows a strong recovery in goods trade at 54.9 value and weaker growth in services trade at 51.09 value. The forecast of WTO experts for the expected growth of world trade by 2022 was 7.2%, scenario" [wto, 2022].

In terms of losses in gross domestic product (hereinafter referred to as GDP), developed countries suffered the most during the pandemic due to the large share of the service sector in the country's economy. According to the International Monetary Fund, stable growth shows China: +1.9% in 2021, +8.2% in 2022. China is the only country that showed positive dynamics in 2021. China was ahead of India, +8.8%11 (*see Table 2.*).

TABLE 2. GDP Growth Forecasts

THE REGION, GROUP OF COUNTRIES	GDP CHANGE, %		
	2020	2021	2022
World output	2,8	-4,4	5,2
Developed economies	1,7	-5,8	3,9
USA	2,2	-4,3	3,1
Eurozone	1,3	-8,3	5,2
Germany	0,6	-6,0	4,2
France	1.5	-9.8	6.0
Italy	0.3	-10.6	5.2
Spain	2.0	-12.8	7.2
Japan	0.7	-5.3	2.3
UK	1.5	-9.8	5.9
Canada	1.7	-7.1	5.2
Other advanced economies	1.7	-3.8	3.6
Emerging markets in Asia	5.5	-1.7	8.0
China	6.1	-1.9	8.2
India	4.2	-10.3	8.8
ASIAN	4.9	-3.4	6.2
Emerging markets in Europe	2.1	-4.6	3.9
Russia	1,3	-4,1	2,8

SOURCE: IMF (2022). Growth Projections Table.: https://www.imf.org/en/Publications/WEO/Issues/2022/09/30/world-economic-outlook-october-2022

An analysis of the effects of the crisis in different periods shows that international trade shows a greater recession than economic activity. Due to a decrease in global GDP by 4.4%, according to the International Monetary Fund, the decline in trade in goods is reduced by 9.2% (according to the WTO – forecasts for 2020) [IMF, 2020:204]. In most countries, GDP growth slowed in the first quarter of 2021 and remained sluggish in the second and third quarters of 2021, driven by new waves of infections and the resulting new restrictions [WTO, 2021:39].

Based on CPB World Trade Monitor data for 2021, the depth of the decline in global exports However, the analysis shows that the data are fundamentally different in structure and duration; the decline occurred due to greater failures in developed countries than in developing ones [Zaytsev, 2020:12].

Today it is clear that digitisation has become a new stage of economic development. The rapid increase in digital transactions in world trade confirms this. The main result of the digital transformation of international trade is the emergence of new markets, goods, services and business models based on the latest technologies. The line between product and service is increasingly blurred in the digital age.

The transformation of digital international trade is accompanied by the large-scale development of e-commerce, increasing trade turnover in information and communication services, and the development of digital platforms.

IT technologies and artificial intelligence development received a strong impetus during the pandemic. The economic vulnerability of developing countries has increased due to massive digitisation and unequal access to digital resources and infrastructure in developed and developing countries. However, the rapid spread of digital technologies is one of the most important long-term changes that will determine states' political and economic development in the coming decades.

In the context of digitalisation, world trade is becoming more elastic, flexible and mobile, and GVCs are changing under the influence of new trends. Thus,

production increased focus on automation and digitalisation. In particular, digitalisation will increase the transparency of suppliers, services and transactions, as well as help to increase the export of services and the development of trade, including through electronic commerce.

By creating conditions for the global trading system, digital transformation also presents certain threats. A growing differentiation between countries in the degree of their involvement in world trade is clearly visible. In addition to the new opportunities that digital commerce opens up, competition in providing services is increasing. Currently, the largest digital platforms are created in the USA and China. Accordingly, most states have economic ties with China and the United States. Rising barriers to digital trade reinforce stratification and growing inequality [Xiaolan, 2020: 157–166].

The pandemic has paralysed international trade, shutting down economic activity worldwide, including the manufacturing hub of the global economy, China and other Asian countries. These processes have demonstrated the need for greater diffusion and sharing of transformative, productive capacity within and across countries. Increasing involvement in international trade in services makes it possible to mitigate the effects of crises in the supply of raw materials and production of goods. The real impact of the crisis on output can be calculated using different models. For a large cross-section of countries and a long period, Claessens et al. Traditional business cycle methodology was used to identify recessions [Claessens, et al, 2009].

On this basis, Laven and Valens estimate that the cumulative cost of banking crises is, on average, about 23% of GDP over the first four years. The median output loss for advanced countries is now around 33%, higher than emerging markets at 26%. Crises are generally associated with significant declines in a wide range of macroeconomic aggregates [Laeven, & Valencia, 2013: 221].

The risk of a financial crisis in a country depends on the total capital deficit of the financial sector in that country. The risk of any country depends on the S^{RISK} of the rest of the world. Thus, a country that relaxes its regulation or fails to capitalise on its institutions adequately will increase the risk of financial crises in other countries.

EXCESSIVE CREDIT GROWTH

It is widely believed that financial crises are caused by excessive credit growth. The normal functioning of a financial firm requires that its market capitalisation ratio be higher than its prudent capital ratio.

Under some mild assumptions, the S^{RISK} formula was financially adapted by Englea and Ruanb:

$$S_t^{RISK}=kDebt_r-(1-k)Equity_t\exp(\Omega_t\log(1-\theta)).$$

Where is the beta coefficient from the dynamic conditional beta (DCB) model [Engle, 2016: 643-667] that augments the standard market model with asynchronous trading, time-varying correlation, and asymmetric volatility. k is set at 8%, corresponding to the typical leverage ratio of well-managed financial firms during quiet periods. [Englea & Ruanb, 2019: 607].

The global model reflects an important global phenomenon in which the rest of the world strongly influences the risk of a crisis in one country.

According to Adrian et al., the conditional value at risk (CoVaR) measure is an alternative market measure closely related to S^{RISK}. The main difference is that S^{RISK} also depends on the firm's volatility, whereas CoVaR does not due to differences in conditioning. In addition, S^{RISK} depends on size and leverage [Adrian & Brunnermeier, 2016: 1705-1741].

There are several other crisis chronologies. But the Romer-Romer methodology, which derives a continuous measure of credit delay from real-time narrative reports, is suitable for this purpose.

CONCLUSION

In the digital economy, the degree of economic interdependence of countries is much higher. "Rules" are needed to ensure access to markets in the context of digitisation and their openness.

Digitalization has significantly changed the structure and characteristics of international service trade at the current stage. In 2020, a sharp decline in the volume of trade in services was noticeable in the structure of international trade. In 2021, as the economy recovers, the service trade volume begins to increase. At the same time, the increase in the rate of trade in services

in the context of digital transformation made it possible to alleviate the economic crisis.

Many theories have been developed about the causes of crises. The paper evaluates a systemic risk model designed to show both the probability of a crisis and the distance between current measures of systemic risk and a level that is half the probability of a crisis.

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