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STRESS RESISTANCE OF COMMERCIAL BANKS IN TURKEY AND KAZAKHSTAN

The stress resistance of banks is important for the entire financial system of the country, since the banking sector is the most important segment of the economy. Banks accumulate free resources and ensure the movement of money for the needs of the economy.

Stress testing is one of the methods for assessing the stability of banks to various stressful situations in the financial market.

In the economic literature, this aspect has been given enough attention, but to a greater extent with respect to certain types of risks. Studies have approached the issue of assessing the stress resistance of banks in different ways. Some considered the problem through the prism of assessing the probability of bankruptcy, others used an assessment of the dependence of banks' profitability on various factors. Most of the authors used regression, cluster, discriminant analysis and various stress testing methods.

In this study, both classical methods are used – collection, synthesis, analysis, generalization, processing and visualization of data – and methods of stress testing and scenario modeling. Data collection was carried out on the basis of data from the Bloomberg information database for banks in Turkey and Kazakhstan. Unfortunately, not all commercial banks in Turkey and Kazakhstan managed to collect data for 2020-2022. At the same time, this article uses a scenario stress testing method based on the Bloomberg method.

The analysis made it possible to determine that Turkish banks are more sensitive to crises, especially for such banks as Turkiye Sinai Kalkinma Bankasi and Sekerbank Turk AS, for which the values are always significantly higher than the median. Banks of Kazakhstan are more resistant to crises and less responsive to market changes, except for Kaspi.KZ JSC, whose performance is close to that of Turkish banks.

Key words: Stress testing, banking, stress resistance, Bloomberg method, forecasting.

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Түркия мен Қазақстанның коммерциялық банктерінің стресске төзімділігі

Банктердің стресске төзімділігін зерттеу елдің бүкіл қаржы жүйесі үшін маңызды, өйткені банк секторы экономиканың маңызды сегменті болып табылады. Стресс-тестілеу банктердің қаржы нарығындағы әртүрлі стресстік жағдайларға төзімділігін бағалау әдістерінің бірі болып табылады.

Зерттеудің негізгі мақсаты-Блумберг даму сценарийлеріне қатысты олардың стресс-тестілеуін жүргізу арқылы банктердің стресске төзімділігіне салыстырмалы талдау жүргізу.

Зерттеудің ғылыми және практикалық маңызы бар. Ғылыми тұрғыдан алғанда, стресс-тестілеуді бағалау призмасы арқылы банктердің стресске төзімділігін бағалау тәсілі қарастырылған. Практикалық бағытта маңыздылығы Түркия мен Қазақстан банктерінің әлемдік экономикадағы түрлі күйзелістерге тұрақтылығын салыстыруда көрініс тапты.

Бұл зерттеуде жүктемені тестілеу және сценарийлік модельдеу әдістері қолданылады. Деректерді жинау Түркия және Қазақстан банктері бойынша Bloomberg ақпараттық базасының

деректері негізінде жүзеге асырылды. Өкінішке орай, Түркия мен Қазақстанның барлық коммерциялық банктері 2020-2022 жылдардағы деректерді жинай алмады.

Талдау түрік банктерінің дағдарыстарға сезімтал екенін анықтады. Қазақстан банктері АҚ-ны қоспағанда, дағдарыстарға неғұрлым төзімді және нарықтық өзгерістерге онша сезімтал емес «Kaspi.KZ», оның көрсеткіштері түрік банктерінің көрсеткіштеріне жақын.

Зерттеу банктердің әлемдік стресстік жағдайларға төзімділігін әртүрлі елдердің банк жүйелерінің стресске төзімділік деңгейін салыстыруға мүмкіндік беретін сценарийлік модельдеу арқылы бағалауға болады деген қорытынды жасауға мүмкіндік береді.

Түркия мен қазақстан банктерін салыстыру кейіннен тиісті елдің банк секторының тұрақтылығын арттыруға әсер ететін факторларды анықтауға мүмкіндік береді.

Түйін сөздер: стресс тестілеу, банкинг, стресске төзімділік, Bloomberg, болжау.

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Стрессоустойчивость коммерческих банков Турции и Казахстана

Исследование стрессоустойчивости банков важна для всей финансовой системы страны, так как банковский сектор является важнейшим сегментом экономики. Стресс-тестирование является одним из методов оценки устойчивости банков к различным стрессовым ситуациям на финансовом рынке.

Основная цель исследования заключается в проведении сравнительного анализа стрессоустойчивости банков посредством проведения их стресс-тестирования в отношении сценариев развития по Блумбергу.

Исследование имеет как научную, так и практическую значимость. В научном плане рассмотрен подход к оценке стрессоустойчивости банков через призму оценки стресс-тестирования. В практическом направлении значимость отражена в сравнении устойчивости банков Турции и Казахстана к различным стрессам в мировой экономике.

В данном исследовании используются методы нагрузочного тестирования и сценарного моделирования. Сбор данных осуществлялся на основе данных информационной базы Bloomberg по банкам Турции и Казахстана. К сожалению, не всем коммерческим банкам Турции и Казахстана удалось собрать данные за 2020-2022 годы.

Анализ позволил определить, что турецкие банки более чувствительны к кризисам. Банки Казахстана более устойчивы к кризисам и менее чувствительны к рыночным изменениям, за исключением АО «Kaspi.KZ», показатели которого близки к показателям турецких банков.

Исследование позволяет сделать выводы о том, что устойчивость банков к мировым стрессовым ситуациям может быть оценена помощью сценарного моделирования, что позволяет сравнивать уровень стрессоустойчивости банковских систем различных стран.

Проведенное сравнение банков Турции и Казахстана позволит в последующем выявить факторы, влияющие на повышение устойчивости банковского сектора соответствующей страны.

Ключевые слова: стресс-тестирование, банкинг, стрессоустойчивость, Bloomberg, прогнозирование.

Introduction

The banking sector is a key link in the financial system. Consequently, the effectiveness of the activities and stress resistance of banks determines the level of development of the financial market and the economy as a whole. Since banks fully service the entire money circulation of the country and serve as liquidity providers, they are subject to many risks, both systemic and non-market. In particular, banks face interest rate,

market, credit, currency off-balance sheet risks, liquidity risks, technological and operational risks, country risks, and many others. At the same time, to increase revenues, banks increase their risks. Given the strong linkage to the macroeconomy, banks are easily exposed to any major shocks and crises in the economy and financial system. Moreover, given the role of banks in the financial system, they are subject to regulation. State regulatory authorities require the implementation of relevant regulatory indicators to cover the risks

arising from the implementation of various bank operations.

The stress resistance of banks is important for the entire financial system of the country since the banking sector is the most important segment of the economy. Banks accumulate free resources and ensure the movement of money for the needs of the economy.

Stress testing is one of the methods for assessing the stability of banks in various stressful situations in the financial market.

In the economic literature, this aspect has been given enough attention, but to a greater extent concerning certain types of risks. Studies have approached the issue of assessing the stress resistance of banks in different ways. Some considered the problem through the prism of assessing the probability of bankruptcy; others used an assessment of the dependence of banks' profitability on various factors. Most of the authors used regression, cluster, discriminant analysis, and various stress testing methods.

In this study, both classical methods are used – collection, synthesis, analysis, generalization, processing, and visualization of data – and methods of stress testing and scenario modeling. Data collection was carried out based on data from the Bloomberg information database for banks in Turkey and Kazakhstan. Unfortunately, not all commercial banks in Turkey and Kazakhstan managed to collect data for 2020-2022. At the same time, this article uses a scenario stress testing method based on the Bloomberg method. The data is similarly taken to Bloomberg for 11 banks in Turkey and 5 banks in Kazakhstan. The choice was made for the largest banks in Turkey and Kazakhstan in terms of capitalization and due to the availability of data for stress testing.

The stress resistance of banks, therefore, plays a significant role in determining the level of development of the banking system as a whole. This factor can be assessed by various methods, from econometric to statistical forecasting.

It should be noted that banks are not compared with each other in terms of stress testing, but a comparison is made of how stress-resistant banks of countries are in general with the corresponding stress scenarios. Therefore, comparing banks with each other as such is inappropriate in this case. The authors conclude the possibility of using Bloomberg scenario modeling to assess the level of stress resistance of banks in countries as a whole, and not among themselves.

Literature review

Much attention has been paid to this aspect in the economic literature. Studies have approached the issue of assessing the stress resistance of banks in different ways. Some considered the problem through the prism of assessing the probability of bankruptcy, others used an assessment of the dependence of banks' profitability on various factors. Most of the authors used regression, cluster, discriminant analysis, and various stress testing methods. In particular, Boyacıoğlu, Kara, and Baykan considered simultaneously the methods of logistic regression, k-means cluster analysis, support vector machine (SVM), and neural network (NN) to estimate the probability of Turkish bank failures (21 bankrupt banks, 44 active banks) for 1997-2003 (Boyacıoğlu, M.A., 2009). Thus, the authors showed the possibility of predicting the default of banks, and therefore their stress resistance to external conditions. At the same time, the methods used by them showed 91% accuracy in the results.

Similar methods were used by Ecer and Erdogan in 2013 to assess how likely banks are to become bankrupt under the influence of external and internal factors (Ecer, F.2013, Erdogan, Birsen Eygi. 2013). Also, Mayes and Stremmel (2012) used discriminant analysis to predict the default probabilities of 16,188 US banks from 1992 to 2012. Iturriaga and Sanz (2016) and Cleary and Hebb (2019) also used NN and SVM analysis of bank stress testing.

Since the global financial crisis and pandemic, central banks around the world have increasingly focused on stress testing banks to assess their ability to withstand shocks. At the same time, stress testing began to be considered as one of the methods for assessing the probability of default of banks and risks. Indeed, the risks, default, and stress resistance of banks should be considered in a single context as a whole, since, for example, risks provoke the likelihood of bankruptcy, which in turn indicates the ability of the bank to withstand stresses and shocks in the financial market and the economy as a whole. Stress testing is seen as a modeling technique and crisis management tool used by banks, supervisors, and central banks to ensure financial stability. Stress testing is neither an independent tool nor an early warning mechanism, but it is indispensable in macroeconomic tools as an additional method of analysis, for example, to VaR (Taskinsoy, 2019).

However, some scientific studies show that despite the use of advanced statistical and computational methods that reflect the stress

resistance of banks, given the complex nature of banking, the ability of statistical methods to predict bank failures is limited (Liu, Li Xian, 2021). And the models based on machine learning that are becoming more popular and convenient (Periklis Gogas, 2018).

In recent years, network financial models have been increasingly used for stress testing and the financial stability of banks. In particular, Battiston et al. considered turning points in the financial system, such as contagion, feedback, resilience, etc., as elements of models that improve the monitoring and management of highly interconnected economic and financial systems, allowing foreseeing possible crises and managing them S. Battiston (2016), and also considered network modeling as a basic model, including for stress testing (Stefano Battiston, 2018). Going forward, the authors explored for the first time the relationship between climate policy shocks and market conditions, as well as the operational framework for climate stress testing from this perspective. To this end, they combined the climate stress test system with the NEVA network financial asset assessment system, which made it possible to obtain certain analytical results on the relationship between climate change risk, climate policy shocks, and market conditions (Barucca, 2020).

J. Cetina et al. performed a comprehensive stress test analysis (CCAR) using the credit default swap (CDS) markets for six American bank holding companies (BHC)—Bank of America Corp., Citigroup Inc., Goldman Sachs Group, Inc., JP Morgan Chase & Co., Morgan Stanley, and Wells Fargo & Co. to assess the stress resistance of these bank holdings to global market shocks. They combined information from the Depository and Clearing Corporations (DTCC) with Federal Reserve stress scenarios depending on various factors, including the influence of the bank's counterparties. The authors emphasize that the concentration of counterparty risks in the US banking system increased between 2013 and 2015, reflecting the importance of stress testing effects (Jill Cetina, 2018).

The study by Alan Roncoroni et al. is also related to the directions of stress testing, which has become one of the main tools of financial authorities to assess the resilience of the financial system to scenarios with low frequency but high returns, as well as to make macroprudential policy decisions (Alan Roncoroni, 2021).

A study by Marcia Millon et al. showed that banks that conduct stress testing increase capital

adequacy ratios, reduce dividends, and can manage financial performance and invest in political spending significantly more than banks that do not conduct stress tests (Marcia Millon Cornett, 2020)

Many authors use the stress testing technique to assess various categories of bank risks. In particular, E. G. Tolkacheva's (2019) work suggests scenario analysis options for determining the bank's possible losses in the process of managing credit and interest rate risks, as well as liquidity risk. Stress testing made it possible to assess the bank's resistance to the impact of adverse, but possible events and conditions, as well as to anticipate negative scenarios for the development of the external environment and minimize its impact (Tolkacheva, Ye.G, 2019).

Similarly, the application of stress testing scenario analysis to credit risk modeling is well represented in the economic literature. In particular, Louzis D.P. et al. analyzed the influence of various factors on non-performing loans (NPLs) in the Greek banking sector and the stress resistance of banks to the influence of macroeconomic variables (GDP, unemployment, interest rates, public debt) and the quality of bank loan management (Louzis D.P., 2012). The article by Vazquez F. et al. considers a macro model of credit risk stress testing for the banking sector based on scenario analysis. The results showed that banks that are more exposed to highly procyclical types of credit and sectors of the economy are more prone to a sharp deterioration in the quality of their loan portfolios during periods of economic downturns (Vazquez F., 2012).

Stress scenarios are a key aspect when conducting stress testing using the scenario analysis method since the final results of the stress test largely depend on the stress scenario (in addition to the methodology). Therefore, the development of stress scenarios has received great attention both from the scientific community and from the supervisory authorities that implement stress testing (Bidzhoyan D.S., 2019).

Thus, stress testing methods are used quite widely and mainly for risk assessment or macroprudential regulation of banks. At the same time, stress testing directly reflects the degree of resilience of banks to various kinds of crises that are possible in the global economy.

Materials and methods

In this study, both classical methods are used – collection, synthesis, analysis, generalization,

processing and visualization of data – and methods of stress testing and scenario modeling. Data collection was carried out on the basis of data from the Bloomberg information database for banks in Turkey and Kazakhstan. Unfortunately, not all commercial banks in Turkey and Kazakhstan managed to collect data for 2020-2022.

Stress testing is considered as a distribution of risk parameters in a modulated scenario. Since stress testing, for example, unlike the Value at risk (VaR) methods, does not involve an assessment of the likelihood of changes in risk factors, it is necessary to choose realistic scenarios based on probable events. Provisions for the number of losses received with the help of stress tests are also not assumed, since the probability of the selected scenario occurring within the framework of this method is not calculated.

We have used a multifactorial method of stress testing, which involves monitoring an object when several factors change at once.

The principle of the analysis is to track the behavior of the total income of a hypothetical portfolio of the banks under consideration in the event of appropriate stress scenarios.

Accordingly, the total return of the hypothetical portfolio under the stress test can be written as:

$$\hat{y}_{t+1} = B(\hat{x}_{f_{\text{stress}}}),$$

где y_{t+1} – return value of a hypothetical portfolio

$\hat{x}_{f_{\text{stress}}}$ – these are the risk factor values from $f_{\text{stress}}(x_t)$, and the distribution of returns as $g_{\text{stress}}(y_{t+1})$.

Stress testing scenarios are based on historical data, that is, on real events that have happened in the past. It is assumed that the risk factors will change in the same way as it happened in the past. Stress testing scenarios are not forecasts and are used to assess the stability of banks in extreme conditions (stress situations).

To accurately apply the Bloomberg methodology, the calculations were carried out in the Bloomberg terminal itself, which made it possible to use data with an accuracy of up to thousandths and taking into account the availability of relevant data.

Since the methodology allows using scenario modeling to test banks with respect to their resistance to various stress scenarios, designated in the world economy as crises, the following research hypothesis can be defined.

H1: The application of scenario modeling to the assessment of banks in Turkey and Kazakhstan

will allow us to assess how resilient a particular bank is in relation to crises. Consequently, the analysis will determine the level of stress resistance of banks.

If this method allows us to assess the stress resistance of banks, then perhaps a comparative analysis in the future will reveal the factors that have a direct impact on the level of resistance of banks in a given country to crises in the financial sector.

The study will be carried out in several stages. At the first stage, the data necessary for the application of scenario modeling were collected. At the second stage, stress scenarios were identified for the analysis of banks. At the third stage, through the application of the stress testing methodology, an assessment was made of the stability of banks to the indicated stress situations.

Results and discussion

As mentioned earlier, 11 banks in Turkey and 5 banks in Kazakhstan were selected. The banks were selected in terms of the largest in terms of capitalization, as well as taking into account the availability of data for calculations.

The calculations were made directly at the Bloomberg terminal.

This model considers the following scenarios presented in Bloomberg:

1. Equity Markets Rebound Great Recession in 2009
2. Greece Financial Crisis – 2015
3. Libya Oil Shock – Feb 2011
4. Russian Financial Crisis – 2008
5. Oil prices Drop – May 2010
6. Japan Earthquake in March 2011
7. Debt Ceiling Crisis & Downgrade in 2011
8. Equities are down 10%
9. EUR up 10% vs. USD
10. Lehman Default – 2008
11. EUR down 10% vs. USD
12. Equities up 10%

The influence of the considered stress scenarios on total income in terms of absolute value, share in the total portfolio income and stressed market value will also allow us to assess the stress resistance of the banks themselves to the occurrence of certain crises in the economy.

11 banks in Turkey and 5 banks in Kazakhstan were selected for the study.

Table 1 – Stress testing scenarios for banks

Bank name	Country	P/E	EPS T12M
QNB Finansbank AS	Turkey	14,42	3,81
Türkiye İş Bankası AS	Turkey	2,92	4,44
Türkiye Garanti Bankası	Turkey	2,98	10,13
Akbank T.A.S.	Turkey	2,37	8,27
Yapı ve Kredi Bankası AS	Turkey	2,57	4,60
Hacı Ömer Sabancı Holding AS	Turkey	2,76	15,88
Türkiye Vakıflar Bankası T.A.O.	Turkey	4,03	2,98
Türkiye Sınai Kalkınma Bankası	Turkey	4,25	1,05
Albaraka Türk Katılım Bankası	Turkey	5,78	0,59
ICBC Turkey Bank AS	Turkey	6,81	1,47
Sekerbank Türk AS	Turkey	3,91	0,79
Bank CenterCredit JSC	Kazakhstan	1,0	635,35
First Heartland Jusan Bank JSC	Kazakhstan	3,44	400,66
ForteBank JSC	Kazakhstan	4,43	1,02
Halyk Savings Bank of Kazakhstan	Kazakhstan	2,55	50,88
Kaspi.KZ JSC	Kazakhstan	11,89	2,77

Note: Compiled by the authors based on Bloomberg data

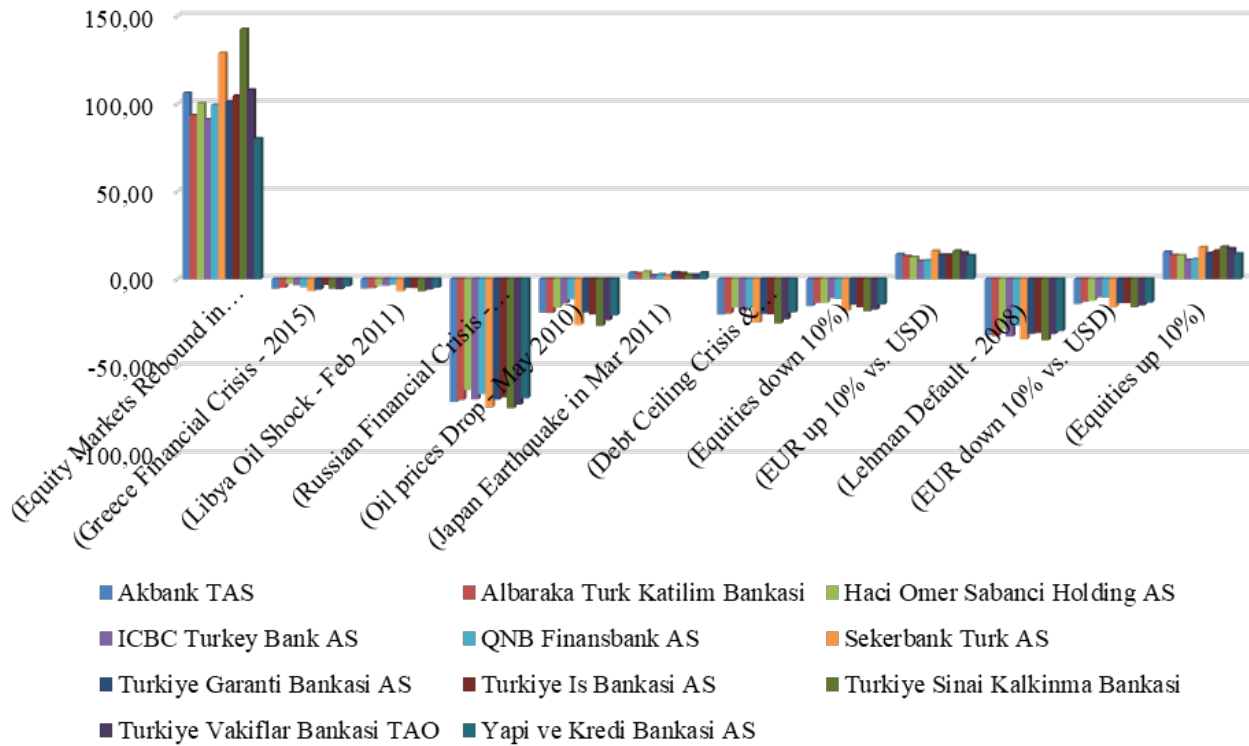
So, the analysis showed the following results of the scenarios of banks in Turkey and Kazakhstan. The columns reflected in the diagrams illustrate the degree of stress resistance of the respective bank concerning the situations according to the specified stress scenarios. The higher the volatility of the received data, gives the less stress-resistant the bank. Sharp changes in indicators in the direction of plus or minus demonstrate a strong connection between the bank's shares and the market (Figure 1).

The results obtained also reflect the degree of response to the respective scenario. As can be seen from Figure 1, with the exception of the first scenario (Equity Markets Rebound Great Recession in 2009), Turkish banks react almost identically to the occurrence of stressful situations in the financial market. At the same time, such banks as Türkiye Sınai Kalkınma Bankası and Sekerbank Türk AS are the most stress-resistant banks, since their reactions to the occurrence of scenario situations are the most violent.

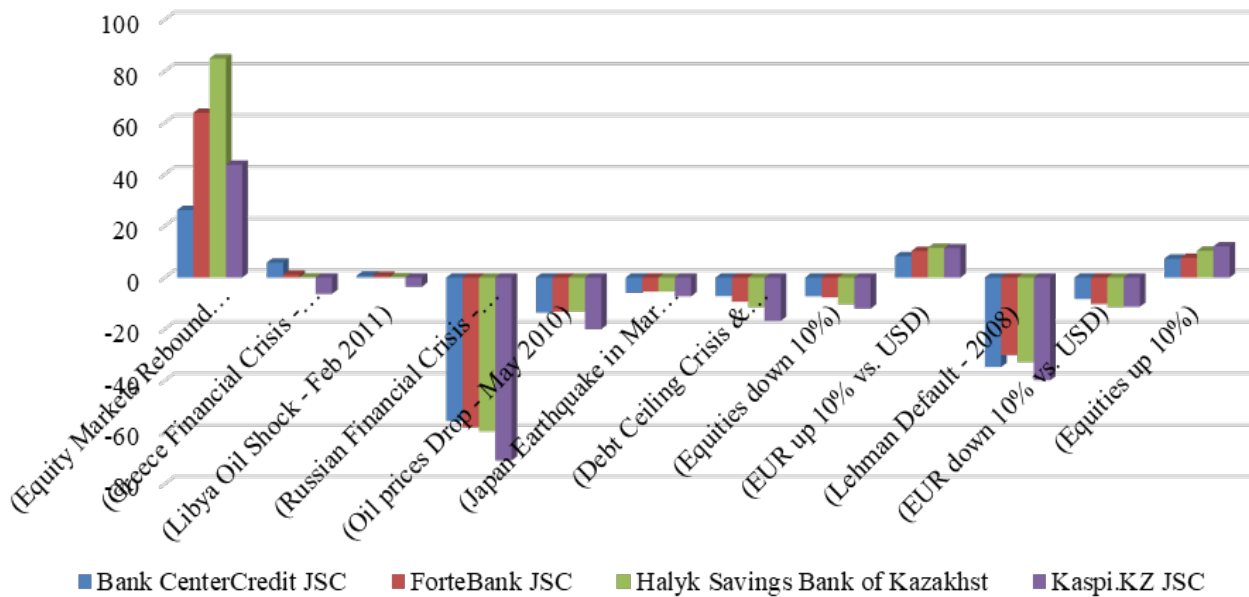
Therefore, if the shares of these banks are included in the portfolio, if a situation occurs on the

market similar to the recovery after the largest fall in the stock markets in the entire history of the exchange trading of the "Great Recession" of 2007–2009, if the share of total income in % of the market value according to Türkiye Sınai Kalkınma Bankası will be 142.34%, and Sekerbank Türk AS – 128.75%. Yapı ve Kredi Bankası AS has the lowest reaction – 80.04%. The Great Recession was characterized by an increase in the number of delinquent mortgages in the United States, which led to an increase in floating interest rates, more than 50 banks declared bankruptcy, stock prices fell by 45-50%, and stock indices collapsed by 30-60%.

As for the banks of Kazakhstan, it can be noted that the most volatile reaction is observed in Halyk Savings Bank of Kazakhstan and ForteBank JSC, whose share of total income in % of the market value in the case of the first scenario was 84.88% and 63.85%, respectively. Compared to Turkish banks, the reaction of Kazakhstani banks is not significant and even lower than the performance of all other Turkish banks to the Equity Markets Rebound of the Great Recession in the 2009 scenario.



Turkey



Kazakhstan

Figure 1 – Stress testing scenarios for banks in Turkey and Kazakhstan, the share of total income in % of market value
 Note: based on Bloomberg data

The reaction to the following two scenarios of Greece Financial Crisis – 2015 and Libya Oil Shock – Feb 2011 among Turkish banks is almost unanimous – the indicators of the share of total income in % of the market value are in the range of -3.69% to -6.76%. That is, Turkish banks will react negatively to the occurrence of situations in the financial market similar to the scenario of Greece Financial Crisis – 2015. At the same time, the highest reaction is again from Sekerbank Turk AS – minus 6.76%.

As you know, in 2015 Greece defaulted on its debt. She missed a payment of 1.6 billion euros to the International Monetary Fund (IMF). The Great Recession weakened Greece's already paltry tax revenue, leading to a widening deficit. In 2010, US financial rating agencies assigned Greek bonds a "junk" rating. As capital began to dry up, Greece faced a liquidity crunch, forcing the government to seek bailout funds, which they ended up receiving on harsh terms.

The austerity measures have led to a humanitarian crisis: the number of homeless people has increased, the number of suicides has reached a record level, and the health of the population has deteriorated significantly. The country's unemployment rate rose from a record high of 28% in 2014 to 13.2% in 2021. GDP was negative.

Description of the following scenario. By 2011, oil production in Libya was 1.5 million barrels per day. Of these, 1.26 million barrels were exported, mainly to Italy, Spain, Greece and Latin American countries. Oil refining capacity reached 348 thousand barrels per day. During the civil war (2011) and foreign military intervention, direct damage from military operations was caused mainly to oil refineries and port facilities in the area of Raslanuf – Marsa el Brega. The country's oil industry was negatively affected by the departure of foreign specialists, violations of the rules for the technical operation of oil facilities, untimely repairs and lack of spare parts. As a result, oil production fell by a third from pre-crisis levels and oil production continued to decline (Yevseyev V.V, 2020).

An interesting fact is that Turkish banks react to the Libya Oil Shock – Feb 2011 scenario in the same way as they did to the Greece Financial Crisis – 2015 scenario. 95%, that is, similarly negative. Banks Turkiye Is Bankasi AS showed the greatest reaction – minus 6.95% and Sekerbank Turk AS – minus 6.87%.

As for the banks of Kazakhstan, it is interesting that, apart from Kaspi.KZ JSC, other banks react

positively to scenarios 2 and 3. The share of total income in % of the market value when shares of these banks are included in the hypothetical portfolio will be: for Bank CenterCredit JSC – 5, 74%, ForteBank JSC – 1.1%, Halyk Savings Bank of Kazakhstan – 0.08% and only Kaspi.KZ JSC – minus 6.38%. The reaction of Kazakh banks to the Libya Oil Shock – Feb 2011 scenario is similar: Bank CenterCredit JSC – 0.73%, ForteBank JSC – 0.63%, Halyk Savings Bank of Kazakhstan – 0.08% and only Kaspi.KZ JSC – minus 3.63%.

Similarly, the banks of Turkey and Kazakhstan react to scenario 4 – Russian Financial Crisis – 2008 – negatively. The Great Recession in Russia was the 2008-2009 crisis in the Russian financial markets, as well as an economic downturn exacerbated by political fears after the war with Georgia and a sharp drop in the price of Urals heavy oil, which lost more than 70% of its value from a record high of 147 US dollars. At the end of 2008, during the beginning of the crisis, Russian markets plummeted, and the value of Russian shares was more than 1 trillion US dollars. From July 2008 to January 2009, Russia's international reserves fell by 210 billion US dollars as the central bank adopted a gradual devaluation policy to combat the sharp depreciation of the ruble. The ruble has weakened by 35% against the dollar since the beginning of the crisis in August to January 2009 (International Monetary Fund Retrieved, 2010).

Again, the strongest reaction observed in the banks Turkiye Sinai Kalkinma Bankasi will be minus 73.66%, and in Sekerbank Turk AS – minus 73.11% of the share of total income in percent of the market value. For Kazakh banks, the highest volatility is characteristic of Kaspi.KZ JSC – minus 70.98%. For other banks under consideration, Bank CenterCredit JSC – minus 55.63%, ForteBank JSC – minus 58.13%, Halyk Savings Bank of Kazakhstan – minus 59.64%. That is, it can be noted that the bank Kaspi.KZ JSC behaves in the same way as Turkish banks. Other banks in Kazakhstan are less responsive to crises.

In the next scenario (Oil prices Drop – May 2010), banks in Turkey and Kazakhstan react almost identically. This scenario was characterized by the following. In 2010, crude oil prices fell below 100 US dollars a barrel for the first time in nearly two months, reflecting growing investor fears that a US recession could dampen oil demand. The price of West Texas Intermediate oil fell by as much as 10%, Brent oil fell by more than 10%. Wholesale gas futures also fell, down nearly 10% on the day at the

close, or 36 cents a gallon. Growing concerns about the likelihood of a recession were the main reason for the latest sell-off in oil and gasoline futures (Oil drops below, 2022).

It can be noted that Turkish banks show lower values, especially Türkiye Sınai Kalkınma Bankası will be minus 25.96%, and for Sekerbank Turk AS – minus 26.65% of the share of total income in percent of the market value. Among the banks of Kazakhstan, Kaspi.KZ JSC stood out again – minus 20.0%.

But on Japan Earthquake in Mar 2011, the banks of Turkey and Kazakhstan react in oppositely. If the banks of Kazakhstan show a negative reaction, then the banks of Turkey, although not significant, but positive. In particular, Bank CenterCredit JSC – minus 5.95%, ForteBank JSC – minus 5.43%, Halyk Savings Bank of Kazakhstan – minus 5.46% and Kaspi.KZ JSC – minus 7.29%. For Turkish banks within 1.98% to 3.69%.

Against the Debt Ceiling Crisis & Downgrade in 2011 scenario, the US debt ceiling crisis in 2011 was relative to the maximum amount of borrowing allowed by the federal government, Turkish banks again react more volatily. The scenario is characterized by a federal budget deficit of 458.6 trillion US dollars in 2008, which widens to 1.4 trillion US dollars the following year as the government spends heavily on stimulus. As a result, the ceiling on debt borrowing was raised to 2.4 trillion US dollars. By January 2012, the US debt ceiling was raised to 16.4 trillion US dollars. As a result, Standard and Poor's downgraded the US long-term credit rating from AAA to AA+, although the US did not default (The Debt Limit Since 2011).

Turkish banks perceive conditions similar to scenario 7 more strongly. Thus, Türkiye Sınai Kalkınma Bankası was minus 25.27%, and Sekerbank Turk AS – minus 24.81%, Türkiye Vakıflar Bankası TAO – minus 22.97% of the share of total income in % of the market value. The reaction of banks in Kazakhstan is similarly less. For example, Bank CenterCredit JSC – minus 7.28%, ForteBank JSC – minus 9.36%, Halyk Savings Bank of Kazakhstan – minus 11.49% and Kaspi.KZ JSC – minus 16.83%.

In the event of a situation similar to the Lehman Default – 2008 scenario, the banks of Turkey and Kazakhstan reacted almost identically. Lehman Brothers Holdings Inc was the fourth largest investment bank in the United States and its bankruptcy set off the global financial crisis. Lehman

invested heavily in risky mortgages just as home prices began to fall. In 2006, he invested heavily in high-risk real estate and subprime mortgages. The bank took on too much risk, not being able to get cash quickly (Marcin Kacperczyk, 2010).

The values of indicators of the share of total income in % of the market value are almost the same. Thus, the strongest reaction again at Türkiye Sınai Kalkınma Bankası amounted to minus 34.82%, and for Sekerbank Turk AS – minus 34.33%. As for the banks of Kazakhstan, the strongest reactions are observed in Bank CenterCredit JSC – minus 34.71% and Kaspi.KZ JSC – minus 39.83%. For other banks in Turkey and Kazakhstan, the values fluctuate by 29-32%.

For other scenarios – growth and fall of shares by more than 10% and growth and fall of the euro against the dollar by more than 10%, Turkish banks are more sensitive than banks in Kazakhstan. Thus, the indicators of the share of total income in % of the market value for Turkish banks vary within $\pm 11-15\%$, except for Türkiye Sınai Kalkınma Bankası $\pm 18.25\%$, and for Sekerbank Turk AS $\pm 18.04\%$. For the banks of Kazakhstan, the indicators vary within $\pm 7-9\%$, except for Halyk Savings Bank of Kazakhstan – minus 10.33% and Kaspi.KZ JSC – minus 12.04%.

Conclusion

In general, if, for example, one analyzes a portfolio and its response to stress scenarios, then the stressed market value shows the new market value of the risk of the portfolio, taking into account any gain or loss based on the original market value of risk. But in this case, since the goal is to assess the stress resistance of banks, only the degree of volatility and response to the emergence of crises in the market, similar to the scenarios under consideration, was considered.

The assessment of the share of total income in percent of the market value under various stress testing scenarios made it possible to determine that Turkish banks are more sensitive to the occurrence of crises, especially for such banks as Türkiye Sınai Kalkınma Bankası and Sekerbank Turk AS, for which the values are always significantly higher than the median. Banks in Kazakhstan are more resistant to crises and less responsive to market changes. However, as the analysis showed, in addition to Kaspi.KZ JSC, other banks react positively to scenarios 2 and 3. The share of total income in % of the market value when the shares of these banks

are included in the hypothetical portfolio will be: for Bank CenterCredit JSC – 5.74%, ForteBank JSC – 1.1%, Halyk Savings Bank of Kazakhstan – 0.08% and only Kaspi.KZ JSC – minus 6.38%. The reaction of Kazakh banks to the Libya Oil Shock – Feb 2011 scenario is similar: Bank CenterCredit JSC – 0.73%, ForteBank JSC – 0.63%, Halyk Savings Bank of Kazakhstan – 0.08% and only Kaspi.KZ JSC – minus 3.63%.

The banks of the two countries react most strongly to such scenarios as Equity Markets Rebound Great Recession in 2009 and Russian Financial Crisis – 2008. At the same time, the reaction of Turkish banks is more significant in absolutely all scenarios. This allows us to talk about the greater sensitivity of Turkish banks to stressful situations in the market,

the greater dependence of the shares of these banks on the market.

It should be noted that banks are not compared with each other in terms of stress testing, but a comparison is made of how stress-resistant banks of countries are in general in relation to the corresponding stress scenarios. Therefore, comparing banks with each other as such is inappropriate in this case. The authors concluded that the possibility of using Bloomberg scenario modeling to assess the level of stress resistance of banks in countries as a whole, and not among themselves.

Thus, the analysis showed that Turkish banks are more volatile to market changes compared to Kazakh banks. We can say that they are less stress-resistant to market crises and changes.

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