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MASTER'S THESIS

«*Hedging risk in FINTECH credit markets*»

specialty - «Finance»

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Nur-Sultan, 20__

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Hedging risk in FINTECH credit markets

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Content

List of abbreviations

JSC – Joint Stock Company

AIFC - The Astana international financial center

BCPD - Bureau for Continuing Professional Development

MSCI Emerging Markets - stock index of developing countries: (Russia, India, Brazil, etc.);

NASDAQ - (an index of high-tech companies such as: Microsoft, Intel, Apple, Sun Microsystems, Yahoo, etc.)

RTS - reflects the market capitalization of the 50 largest Russian companies: public corporation Gazprom, public corporation Lukoil, etc.).

KASE – Kazakhstan Stock Exchange.

CLN - Loan-related Note

TRS - Total Return Swaps

CDS – Credit Default Swaps

ISDA - International Swap and Derivative Association.

DTCC - The Depositary Trust and Clearing Corporation

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Introduction

FINTECH companies as new players in the financial market began to compete with traditional banks at the of development of the world economy. In this regard, accounting for financial instruments and hedging their risks require high significance. In the context of increasing instability of the global financial market, against the background of the economic crisis, there is an urgent need to limit the increased financial risks. Therefore, in addition to existing risk insurance mechanisms, the use of a hedging mechanism using derivative financial instruments has become particularly relevant. The need to expand the range of risk management tools and the introduction into practice of professional participants in the Kazakhstan derivatives market, using the methods of scientific risk management, through hedging mechanisms determine the relevance of the topic of the dissertation research.

The purpose of the dissertation research is to determine methods and mechanisms for applying hedging in FINTECH markets. In accordance with this goal, the following tasks are formulated:

- identify methods for hedging financial instruments;

to be familiar with the key mechanisms of hedging in the markets FINTECH;

- reflect the financial effect of a credit hedge for the FINTECH sector in Kazakhstan;

- identify the main problems and advantages that will arise as a result of hedging a credit loan;

- formulate recommendations for hedging a credit loan for Kazakhstani FINTECH companies.

The object of the study is FINTECH companies in Kazakhstan, on the example of which the author reflects the financial effect of hedging financial derivatives.

The subject of research is the FINTECH market.

The research hypothesis is expected result is to provide recommendations on effective hedging of financial risks based on the experience of foreign and Kazakhstan companies.

Research methodology. The thesis analyzes the use of tools for hedging credit risk for fintech companies in Kazakhstan, for example selected one of the fintech company, such us JSC “Kaspi.kz” (“Kaspi.kz” or “the Company”). JSC “Kaspi.kz” the largest Payments, Marketplace and Fintech Ecosystem in Kazakhstan with a leading market share in each of its key products and services. The methods of hedging risks with futures, forwards, options contracts, as well as with credit default swaps are considered.

The main research methods:

1. At the first stage was a general overview of the FINTECH market in Kazakhstan was conducted, along with the drivers of the FINTECH

market and its segments. Analysis of the future Fintech ecosystem market.

2. At the second stage was a general description of financial instruments and their hedging for credit risk events. A credit default swap (CDS) was selected for analysis. Credit default swap is a derivative financial instrument that allows hedging credit risk on debt obligations.

3. The third stage was the practical application of credit derivatives in the FINTECH market. Using the example, were used hedging models of credit risk. Analysis prospects for the development of the derivatives market.

A set of measures were developed to improve the regulation of financial risk hedging operations in Kazakhstan.

The empirical basis of the dissertation research was used in the consolidated financial report JCS Kaspi.kz, forecasting the development of Fintech companies in Kazakhstan, foreign sources for calculations credit risk using fintech companies in Kazakhstan.

Literature Review. In preparing the master's thesis, various information sources of both Kazakhstan and foreign authors.

The initial writing of the master's thesis was driven by the rapid growth of the introduction and application of new technological solutions from traditional methods of making payments to using remote alternative methods. These new trends will be amended by the

Law of the Republic of Kazakhstan "On Payments and Payment Systems" adopted on July 26, 2016. In article from the National Bank of Kazakhstan "Review of the results of oversight (oversight) of payment systems and the development of the payment services" made an overview of changes in the payment market.

An international network of consulting and audit services companies like Ernst & Jung, Deloitte led a study on fintech markets in Kazakhstan.

For writing the second stage, the books of A. N. Burenin “Forwards, futures, options, exotic and weather derivatives”, Halla John served. K. “Options, Futures and Other Derivative Financial Instruments”, A. Feldman “Derivative Financial and Commodity Instruments” and Murphy J. “Technical Analysis of Futures Markets: Theory and Practice.”

The financial issues were addressed by the consolidated report of Kaspi.kz and also chose the methodology of the Hedging Credit: Equity Liquidity Matters by Sanjiv R. Das Santa Clara University and Paul Hanouna Villanova University.

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I. FINTECH market and its segments.

1.1. General characteristics of the FINTECH ecosystem

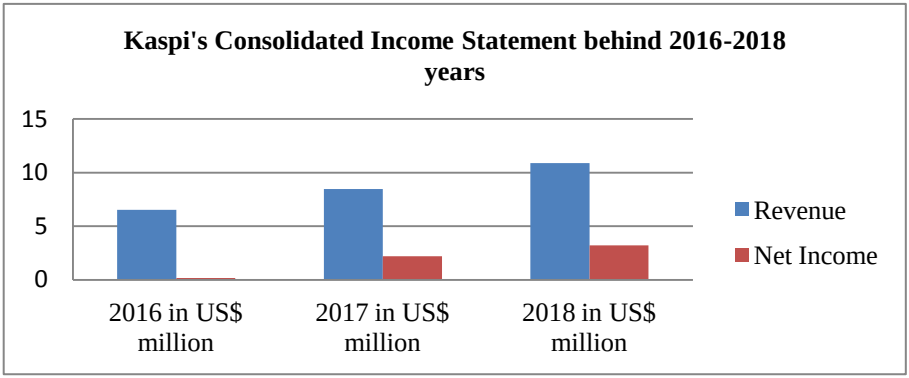
Modern technologies are increasingly used in everyday life and we can′t imagine life without the use of the Internet and mobile phones. In this regard, all financial needs of consumers are solved remotely. Today, government agencies, financial corporations and innovative companies around the world are paying more attention to FINTECH-solution projects. Annually, the world allocates about 25 billion US dollars to FINTECH projects [1]. The term "FINTECH" is a broad concept, such as FINTECH in the banking system, mobile transfer system, online lending, insurance, stock market and startup projects.

In Kazakhstan, such systems penetrate in areas such as online payments for services and goods, remote banking and online lending. In the payment services market, FINTECH companies process electronic payments. Currently, the National Bank of Kazakhstan has registered 45 payment organizations(Appendix 1), with turnover amounting to 538.3 billion tenge for 9 months of 2017[1].

We can note a number of banking services that offer their clients services for remote opening of Bank accounts, approving loans and making payments and transferring money online. One of these large

companies that provide such services Kaspi.kz. One of the most profitable companies in Kazakhstan.

Kaspi.kz combines three platforms: a marketplace, a FINTECH platform, and a payment system. Mobile app Kaspi.kz — one of the most popular in the country, it is used by 6 million people. We can should Kaspi′s Consolidated Income Statement behind 2016-2018 years. This data is shown below in the figure 1 [6].



Source: Kaspi.kz

Figure 1. Revenue and Net Income JSC Kaspi.kz

Today, there are 45 companies that use robotic technology to evaluate borrowers and issue loans. The main participants are Money Man, "Credit 24", "Zaimer", "Credit", "Honest word Kazakhstan". The total volume of issued online microloans "До зарплаты" (translated as «to paycheck»)) amounted to 8.9 billion tenge in 2016, the number of

loans issued – 239 thousand, coverage since the formation of the market – more than 350 thousand people. [1] Since October 2015, Kazakhstan has been operating the Kazakhstan FINTECH Association, which is aimed at coordinating the work of online lending companies [4].

Significant attention is also paid to the application of blockchain technology. For instance, the National Bank of the Republic of Kazakhstan is working on a project for the placement of government securities using blockchain [1].

Such areas of FINTECH solutions as big data, crowd funding, creating regulatory sandboxes, laboratories, and open platforms are also promising. The Astana international financial center (AIFC) and the Association of financiers of Kazakhstan conduct research and implementation of financial technologies. Separate organizations have created laboratories for testing FINTECH solutions.

The concept of "fintech ecosystem" is actively penetrating the Kazakhstan market. Today, the fintech market is associated with the concept of online lending and is filled with payment, transfer and electronic money services. There are several factors that stimulate the development of the financial technology market:

- firstly, today there is an increase in the demand for financial services not only for ordinary citizens, but also for business.

- secondly, it is in the interests of the regulator to form a unified national fintech ecosystem to increase the transparency of the country's business and economy.

- thirdly, due to the high dynamics of the development of the fintech industry, it is necessary to adapt to the demand of consumers.

Developing an innovative ecosystem can help avoid a future economic crisis. In this regard, the state opens technology parks and innovative hubs, allocates billions of dollars of investments to support projects. In Almaty and Nur-Sultan, the Alatau Park of Innovative Technologies, Tech Garden and Astana Hub were opened. These projects should provide IT startups with workplaces, financial and non-financial opportunities for training and investment search.

An independent study by Deloitte, brought out a portrait of the financial technology market in Kazakhstan in 2018. From these data it is shown that:

- The market for fintech in Kazakhstan is 17 billion tenge

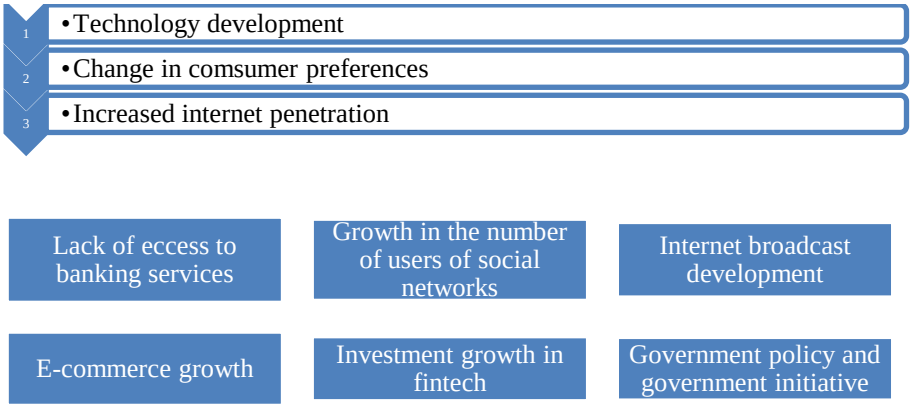
- The number of people employed in fintech is 1675 people

- The average age of fintech companies is 5 years

- The average number of employees in a fintech company is 42 people. [7]

1.2. Drivers for the development of fintech market and its segments.

The main drivers of the development of the fintech market are the growing penetration of the Internet, as well as technological progress and changing consumer preferences, which stimulate the technological transformation of financial services. Below is a figure 2, shows driver development.



Source: compiled by the author

Figure 2. Drivers to develop fintech market.

In connection with the development of the FINTECH market in Kazakhstan, the Astana International Financial Center (AIFK) was opened.

Astana International Financial Center (AIFC) is a new addition in Central Asia. AIFC offers a range of financial services, as well as new opportunities in the capital market, in asset management, banking, Islamic finance, insurance and financial technology. AIFC is one of the youngest large financial centers in the world, but despite this it has established itself as a pioneer in the field of Fintech. AIFC has launched a unique regulatory framework to test new Fintech businesses. This Fintech laboratory is the first of its kind in Central Asia. Since 2019, 25 Fintech firms have been included in the program. These companies are testing many new products, including cash services, digital banking and crowdfunding, new methods of working with digital assets such as electronic money and cryptocurrencies. The opportunities provided by AIFC have attracted companies both internationally and locally.

Below is the data of Kazakhstan FINTECH:

Talent:

- Many IT and finance graduates from international universities are involved in this laboratory.

- Bureau for Continuing Professional Development(BCPD): Talent Development Programs.

- Fintech Labs Launched in Collaboration with Local Universities and Corporations.

- Kazakhstan attracts talented people from the CIS.

Regulation:

- The structure of AIFC is in line with the latest industry achievements.

- AIFC has a structured approach to regulation in the field of Fintech technologies using an isolated environment in the field of Fintech technologies.

- The main regulator, the National Bank of Kazakhstan has its own regulatory sandbox Capital:

* Kazakhstan creates facilities for private equity and venture capital funds.

* Recently appeared local venture capital firms (Qaztech Ventures, BeInTech, BTS, Global Venture Alliance I2BF) and funds that increase the activity of angel investors (QazAngels).

- Kazakhstan provides access to traditional and innovative ways of financing and raising capital through regulatory support for crowdfunding.

- Tax incentives for effective capital raising

- Acceleration / incubation programs

Demand: local customers actively go online: statistics for 2014 - 2018 [Statistics of the National Bank of Kazakhstan]

- non-cash payments increased by 726%

- The increased number of Internet transactions by 2365%

- the volume of Internet payments increased by 7513% (from 5.3 billion to 405.5 billion tenge)

- Transactions of POS-terminals jumped by 1021%, while the volume grew by only 352%

Other Fintech drivers:

- State program on digitalization (Digital Kazakhstan)

- Due to the lack of innovation in local banks, there is a boom in the sphere of fintech tart.

- A number of state programs, such as “Nurly Zhol”

Increased E-Commerce Penetration:

- Customer demand for technical services.

- Pro-fintech government (fintech as a pillar) and rules.

- Venture capital, digital banking, payment services[18].

II. General characteristics of derivative financial instruments for credit risk.

2.1. Credit risk and credit derivatives.

Assessment and management of financial risks is the most important task of any company. The lack of financial risk management mechanisms leads to a loss of financial stability of the enterprise and in many cases to bankruptcy. Since the topic of this research paper is hedging credit risk, let's talk about loans first.

A loan is an agreement in which one party receives something valuable and agrees to pay for the goods or service later.

Credit risk is the likelihood that the borrower will not repay the loan in accordance with the terms of the loan agreement. The risk may arise as a result of:

• Increased probability of default on a financial liability.

• default on a financial probaliability.

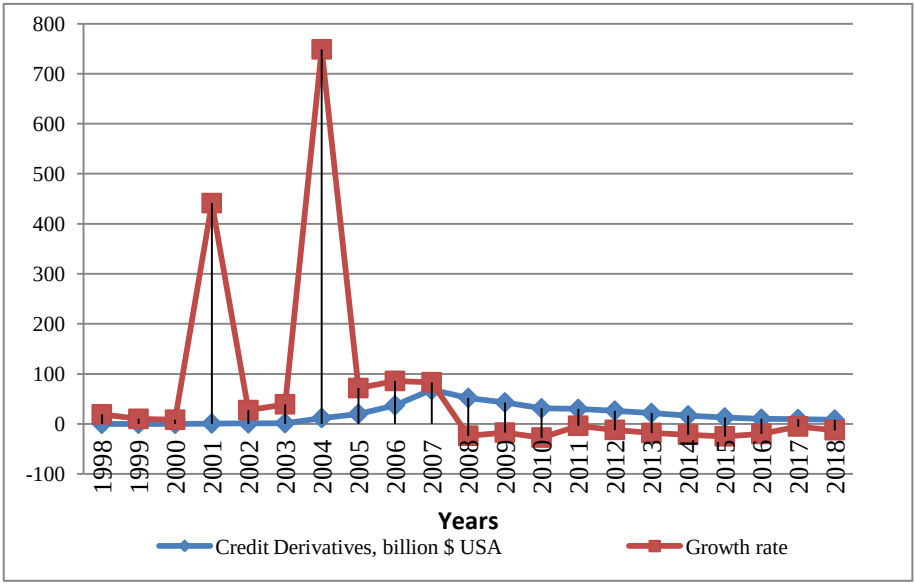
• More serious losses than expected due to lower than expected recovery during default.

• By default, when paying for goods or services that have already been provided (ie, Estimated Risk).

• More serious losses than expected due to greater than expected exposure during default [8].

On the world market, credit derivatives showed active development, reaching a peak in the volume of operations at the end of 2007. (68.07 billion US dollars) (Figure 3). Most transactions were aimed at reducing the risk per borrower when issuing large loans. At the same time, other tasks were also solved, such as: investing, hedging,

fulfilling the requirements of regulatory authorities for capital adequacy, structuring products, optimizing the structure of the asset portfolio, etc. However, since 2008, the volume of these operations in the global derivatives market has declined annually, amounting to 8.37 billion US dollars at the end of 2018, which is 6.2 times less than 10 years ago. Some researchers call the use of credit derivatives one of the causes of the global financial crisis, which led to an increase in distrust of them, and as a result, tightening of regulation and a decrease in the volume of transactions with them in subsequent periods[13, 14].



Source: compiled by the author

Figure 3. The dynamics of the global market of credit derivatives in 1998-2018.

In order to hedge financial risks, financial instruments (derivatives) are used, credit derivatives are used to minimize credit risk. A credit derivative is a contract with payments that depend on a particular credit event. Credit derivatives are designed to hedge credit risk. Credit derivatives are usually traded on the OTC market, not on exchanges.

Credit events include:

• Bankruptcy

• non-payment

• Restructuring

• Denial

• Moratorium

• acceleration of commitment

• default commitment

There are three main differences between credit derivatives and other derivatives:

1. The transfer of credit risk for the asset specified in the contract occurs upon the occurrence of a credit event, that is, payments under these contracts are conditional.

2. Terms of transactions with credit derivatives provide for a periodic exchange of payments or payment of premiums, in contrast to one-time commission payments for other instruments.

3. This type of transaction is characterized by the use of bilateral agreements[8].

Depending on the type of instrument, credit derivatives can be divided into two large groups:

1. Own credit derivatives: forward

A forward contract is an individual contract concluded outside the exchange that meets the needs of counterparties. This contract consists of the actual sale or purchase of the underlying asset and insurance of the seller or buyer against possible adverse price changes. The conclusion of this contract does not require any costs from contractors. For the conclusion of the contract, the conditions between the parties

at the time of its conclusion are agreed. A forward contract may be from different assets. In world practice, the forward foreign exchange contract has received the greatest development and is used for hedging currency risk.

b. Swaps. A swap agreement is an over-the-counter, non-standardized, derivative financial instrument by which an asset is sold, and at the same time, an obligation arises to repurchase it at a fixed price. A swap can be used to finance securities and, conversely, to lend to securities. For example, in the case of opening a short position. One such transaction is called a repo. In addition, the swap serves to change the composition of the foreign exchange portfolio when the desired currency is used for a certain period against another currency. The most common today - swap contracts on the interbank market - for interest rates, when payments are exchanged at floating and fixed interest rates. The terms and volumes can be any by agreement of the parties and there can be an infinite number of varieties of such operations.

c. Options. An option is a fixed-term contract that gives one of its participants the right to refuse to complete a transaction. Two parties are involved in this agreement. The first party buys the option and acquires the right to fulfill or not to fulfill the contract. The second

party acquires the right to choose whether to fulfill or not to fulfill the contract.

Another person writes an option, that is, provides the right to choose. The buyer of the option pays the seller a reward. This remuneration is called a premium and the premium is paid at the time of conclusion of the contract. The seller of the option is obliged to fulfill his contractual obligations if the buyer of the option decides to fulfill it. If the buyer does not use the option, the contract expires for the seller without obligation. The buyer has the right to use the option, that is, to buy or sell the underlying asset at the price specified in the contract, which is called the strike price. Options are divided into three types according to the terms of contract execution: American, European and Bermuda. The American option can be exercised on any day before the expiration of the contract, the European - only on the day the contract expires. Bermuda option gives the right to use it at certain points in time during the term of the contract.

The terms American and European variants are derived from the historical context. American options can traditionally be exercised on any day during the term of the contract. The first option exchange, the European option exchange, appeared in Europe in 1977 in Amsterdam. Then the options began to trade on it with one single

maturity. In modern conditions, the concepts of American and European variants are only terms without a geographical reference to the place of their circulation.

There are two types of options in the world: call option or buy option; put option or sell option. A call option entitles the option holder to purchase or refuse to purchase the underlying asset. A put option gives the option holder the right to sell or refuse to sell the underlying asset. For a better understanding of such an instrument as an option, one should not forget that the investor first buys the option, that is, the very right to buy or sell the underlying asset. After that, he will exercise the option, if it is profitable for him, that is, he will buy or sell the underlying asset, depending on the type of option. If the situation is unfavorable for him, he will leave this option unfulfilled. Options are used for hedging, obtaining speculative and arbitrage profit. Writing down an option, the seller opens a short position on this transaction, and the buyer opens a long position. In this regard, the terms “short call” or “short position” mean the sale of call or put options, and “long call” or “long put” mean their purchase [9. Chapter 6].

e. Index instruments. Index instruments are a type of financial instrument in which it allows you to save and increase your savings. This type of modern financial instrument is also called mutual investment funds. A stock index is a cumulative change in the value of the securities included in the calculation of this index. For example, stocks of a specific country or industry.

The stock index is calculated for a relatively small sample of shares, and not for all assets traded in the market. The number of shares in the sample is indicated at the end of the index name: Standard and Poor's Global 100, S & P 500, FTSE 100, Nikkei 225, DAX 30. The most famous stock indices: Standard and Poor's 500 (reflects the market capitalization of the 500 largest companies in the US stock market : MSCI Emerging Markets (stock index of developing countries: Russia, India, Brazil, etc.); NASDAQ (an index of high-tech companies such as: Microsoft, Intel, Apple, Sun Microsystems, Yahoo, etc.), RTS (reflects the market capitalization of the 50 largest Russian companies: Public Company Gazprom, Public Company Lukoil, etc.).

We have our own stock index in Kazakhstan (KASE Index), which reflects the change in prices for market transactions with Kazakhstan shares in the representative list of the index, taking into account the

level of capitalization of their issuer and the number of shares in the public domain. to swim. Today, the representative list for calculating the KASE index includes 10 shares of the largest issuers in Kazakhstan (Halyk Bank, Kazkommertsbank, BTA Bank, CenterCredit Bank, TemirBank, Kazmunaigas RD, Kazakhtelecom) (Zakon.kz)

2. Replace credit derivatives:

Loan-related Note (CLN), Total Return Swaps (TRS) and Default Swaps (CDS) are the three remaining derivative financial instruments that are important for further discussion of the interaction of loan products. Credit Default Swap (CDS), like two other financial instruments (CLN, TRS), is a relatively recent invention. These tools are important for companies that intend to securitize their loan portfolios. Below, the author defines each instrument.

e. Credit note. CLN is one of the most commonly used tools in modern finance. Credit notes are securities that are issued in accordance with English law. The documentation for these securities includes a loan agreement. The main difference from a regular loan, credit notes are divided into small parts, sold to a significant number of investors and traded between them. Due to the greater ease of selling previously purchased credit notes compared to loans (i.e., their

greater liquidity as a tool), CLN returns are usually lower than loan returns, or with the same yield, they impose less restrictions on companies. Therefore, CLNs are like bonds. Thus, liquidity is also characteristic of bonds and CLN, and the issue of credit notes requires less legal documentation. Credit notes should not be listed on exchanges; for this reason, issuing CLN takes less time, and its preparation is cheaper than bonds. A credit note is an inexpensive legal credit risk cover that turns an illiquid loan into more liquid collateral. All that is required for its issuance is a loan agreement, on which the documentation for credit notes is based. This is due to payments on loans, which include documentation on bills, interest is paid on bills and they are repaid. The simplicity of the CLN issuing technology allows you to convert unsecured loans issued in accordance with the laws of any country into CLNs in accordance with English law.

f. Total Return Swap (TRS)

Total Return Swap (TRS) is a swap on the total return on the underlying asset specified in the TRS agreement. This is a contract under which the parties undertake to return profit to each other or to compensate for the loss on the underlying asset specified in it. For example, if the price of a share is an underlying asset, then in case of

its growth, the buyer receives profit from the seller. If the price falls, the seller receives compensation from the buyer. This product in its economic essence is no different from without a delivery forward; the only difference is that the latter is applied in the foreign exchange market, and TRS - in almost any other. A bank that structures TRS (creates documentation and then buys or sells it), as a rule, also provides leverage, that is, it partially finances a counterparty for an asset that remains on the seller's balance sheet. The buyer pays the seller TRS for the financing provided and for the use of the bank's capital, which structures TRS, since in the modern world, if the bank leaves an asset on its balance sheet, then it must reserve capital against it. Since the cost of funding and capital reserves in different financial institutions is different, in fact, investors arbitrate different "cost of balances", that is, the cost of reserve capital in different banks. In other words, TRS, like forward, are off-balance sheet instruments with more favorable regulation of capital than their equivalents, which are reflected on the balance sheet. Savings in arbitrage between the cost of capital reserves and the increase in transaction profitability due to cheap financing from a bank structuring total income swaps are not the only advantages of TRS.

g. Credit Default Swap (CDS)

Credit Default Swap (CDS) is a credit swap that is a complete analogue of a bank guarantee or insurance. In this agreement, insurance companies sell insurance, and banks and investors sell CDS. The subject of this type of insurance is the credit status of a particular company. Pricing is also similar to CDS pricing. That is, if the probability of bankruptcy is high, then the price levels for such swaps are very high. To understand what prices depend on and how this class of instruments works in practice, it should be noted that CDS is one of the types of derivative financial instruments, the cost of which depends on price behavior for other instruments. For example, the price of a derivative for gold depends on the behavior of the price of gold itself, that is, if the price of it becomes different, the price of the derivative also changes. This is a financial instrument, the cost of which varies depending on changes in the assessment of the credit quality of the borrower. Let us explain: the higher its reliability, that is, the better the borrower's credit rating, the lower the interest rate that he pays, or, rather, the lower his credit spread in relation to the risk-free rate.

As already mentioned, the difference between the interest rate of borrowers with the best credit rating and other categories of borrowers is called a credit spread or simply a spread. Each borrower has his own. The credit spread (Z-spread) is calculated as the difference between the interest rate, such as the yield to maturity of the bonds of

the borrower, and the risk-free rate for the period similar to the period before the maturity of the bond. Cost of the tool Changing the price of a CDS for a borrower depends on a change in the size of its Z-spread. If the financial situation of the insured company improves, its credit quality improves: the organization pays less for its debts, and therefore its spread narrows. For example, as a result of the sharp increase in steel prices, steel companies began to make big profits, and it became easier for them to pay their debts. Consequently, the credit quality of such companies has also increased, which means that the credit spread and borrowing costs have decreased. In this case, those who sold insurance to companies before the spread was narrowed can now buy it on the market at a better price and make a profit, that is, unlike classic insurance, CDS can be bought and sold throughout life. As with other products, credit swap prices may differ from the credit spread due to liquidity in a particular market. If there are few buyers, the price may be lower than the bond spread, and vice versa.

You can note the so-called CDS credit curve - a graph of the prices of insurance premiums of a given company corresponding to different periods. In ordinary cases, this curve increases with time and reflects the great uncertainty of the fate of any company in the future. And in critical cases, the cost of short-term swaps is higher than long-term ones, since at the beginning the risk of default is higher. Thus, a credit swap in a simplified form can be considered as insurance against

default of the borrower. As with insurance, the buyer of a credit swap issues a premium to the seller - usually every three months. In the event of default of the company for which insurance is issued, the seller must compensate for the loss or redeem part of his debt at the original price, although after default its value is 10-20% of the initial level. The cost of insurance depends on the credit rating of the seller CDS. Because the worse, the more dangerous it is to buy insurance from him. And if the client's risk increases, then the price of insurance purchased by him for the insured company, from the default of which he wants to insure himself, theoretically should be lower. In practice, the price of CDS depends on at least two indicators: the credit spread of the borrower and the credit spread of the insurance seller [10].

2.2. Hedging by credit derivatives.

a. Forward Hedging. As we know, hedging is a mechanism to reduce contractual risks. The hedging mechanism is the opening of financial transactions that can compensate for losses if the market turns in an unfavorable direction. The goal of hedging is to minimize potential losses due to market fluctuations.

For example, when trading foreign exchange it is not always possible to assume whether the rate will rise or fall. Suppose that the profit on the contract will be in case of increase. In this case, hedging will

consist in concluding such a contract that will give profit in case of depreciation. Naturally, the profit in this case will be less, but the possible losses will be less.

In practice, a number of such risks are mainly hedged:

• foreign currency resulting from fluctuations in exchange rates;

• interest caused by a change in the stock price;

• goods related to price dynamics, inflation and other economic factors.

b. Hedging of futures contracts. Futures hedging allows you to fix the "current" price of an asset, the exchange rate or the interest rate at which the contract will be executed "during the period". As we know, the futures market is the stock market; accordingly, it is more liquid and is not exposed to credit risk. Using the settlement center, which is the counterparty of each trader on the exchange, you can conclude both "short" and "long" transactions thanks to the margin trading system. When opening a position, an initial margin is introduced in the form of money or securities. Then the futures position is reassessed every business day, and the difference between the current futures price and the face value of the position is added (with a plus or minus sign) to the amount of the paid margin. If the calculated margin amount is less than the initial one, a notification will be sent to the account holder stating that if the difference is not settled by the end of the current business day, the Information Center will forcefully close

the position. A position can also be liquidated by the owner at any time through an “opposite” transaction. At the same time, the supply of the underlying instrument does not occur, and income is paid instead. Income is defined as income that will be received upon delivery at the price set by the derivative contract, and at the same time will close the position with the opposite transaction at current spot prices. Some futures contracts provide for the delivery of the underlying asset if the position was not closed until the last trading day inclusive. However, the client may refuse such an opportunity even after receiving a delivery notification, which ultimately gives the futures the status of settlement financial instruments. Thus, the parties enter into an agreement not for the purpose of acquiring goods, but primarily for the redistribution of risks associated with changes in prices for goods. A futures contract allows you to transfer risk from producers, distributors of goods and other persons (hedgers) to those who wish to accept it (speculators). There is a hedge between buying and selling futures. Hedging purchases associated with the purchase of futures, which provides the buyer with insurance against possible price increases in the future. When hedging a sale, it is assumed that the real product is sold on the market, and derivatives are sold in order to insure against possible price reductions in the future. Full hedging involves insurance of risks in the derivatives market for the entire amount of the transaction. This type of hedging futures completely

eliminates possible losses associated with price risks. Partial hedging insures only part of the real transaction. Using futures, you can perform two types of hedges: hedging an existing position of the underlying asset and hedging the future value of the asset, if it is planned only for transactions. You can list these types of futures, such as:

currency futures

securities

stock index futures

interest rates.

The futures buyer agrees to buy at the contract price (rate) or, in the case of interest rate futures, to take a loan at the specified rate. The seller is accordingly obliged to sell or borrow. The main advantages of using futures contracts for hedging are: lack of investment[11].

c. Hedging of currency risks. Hedging of currency risks is the conclusion of futures transactions on the purchase or sale of foreign currency in order to avoid price fluctuations. A hedge of currency risks consists in the purchase (sale) of foreign exchange contracts for a period simultaneously with the sale (purchase) of the available currency with the same delivery time and the performance of a negotiable transaction upon the actual delivery of the currency. Under foreign currency hedging is usually understood - protection of funds

from the adverse movement of exchange rates, which consists in fixing the current value of these funds by concluding transactions in the foreign exchange market (interbank forex market or on the currency exchange).

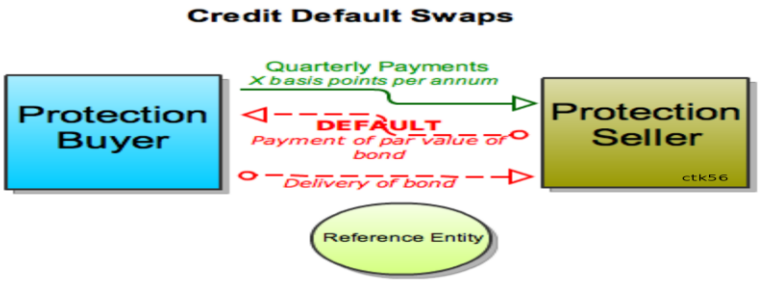
d. Hedging of securities (shares). As in the case of hedging currency risks or hedging bonds, the principle remains the same when hedging securities (stocks) - the loss of price in one of the markets is compensated by the profit received in another market. It must be taken into account that the difference between futures and spot (current share price) prices still exists. This difference is called the basis. The current futures price of the stock may be more or less than the current spot price of the stock, therefore the total hedging result depends on the difference of 2 bases and can be calculated by the formula: Result = S0 + (Basis0 - Basis1), where: S0 - spot price (price shares) at the beginning of the hedging operation; Basis0 - the difference between the futures and spot prices at the beginning of the operation; Basis1 - the difference between futures and spot prices at the date the transaction is completed.

f. Hedging bond portfolios. Suppose an investor holds his funds in bonds and wants losses from a possible fall in their price in the future. In this case, he can sell bond futures. This operation has several

advantages over the direct sale of bonds at the current price: Minimum losses on spreads and market movements (constant narrow spread in a glass) Low exchange commission, no depositary fees Hedging any portfolio of ruble bonds Minimum losses on spreads and market movements (constant narrow spread in a glass) Low exchange commission, lack of depositary fees There are a number of methods for hedging bond portfolios. By futures hedging of the underlying asset, you can compensate for 100% of losses from rising interest rates (and a corresponding fall in the bond price) for this issue. When hedging futures of bonds of another issue, you can insure yourself against a parallel shift of the yield curve up. When hedging a bond portfolio by futures, the portfolio can be insured against the adverse effects of general market factors[11].

2.3. Hedging credit default swaps.

A credit default swap (CDS) is a financial swap agreement that the seller of the CDS will compensate the buyer in the event of a debt default (by the debtor) or other credit event.



Source: internet source

Figure 4. The process of payment and delivery CDS.

When it is established that a credit event has occurred, the amount paid by the CDS seller to the buyer is calculated using the following formula:

$$\text{Payout Amount} = N*\text{Payout Ratio} = N*(1-\text{Recovery Rate}) \quad (1)$$

During the life of the CDS, the profit (loss) that accrues to the buyer (seller) of the CDS can be approximated as follows:

$$\text{Profit to buyer of CDS} = \Delta CDS*N*D \quad (2)$$

ΔCDS is the basis point change in credit spread, N is the notional amount and D is the duration of the bond. It follows that if the default spread increases over the life of the CDS, the buyer gains and if the spread shrinks the seller gains.

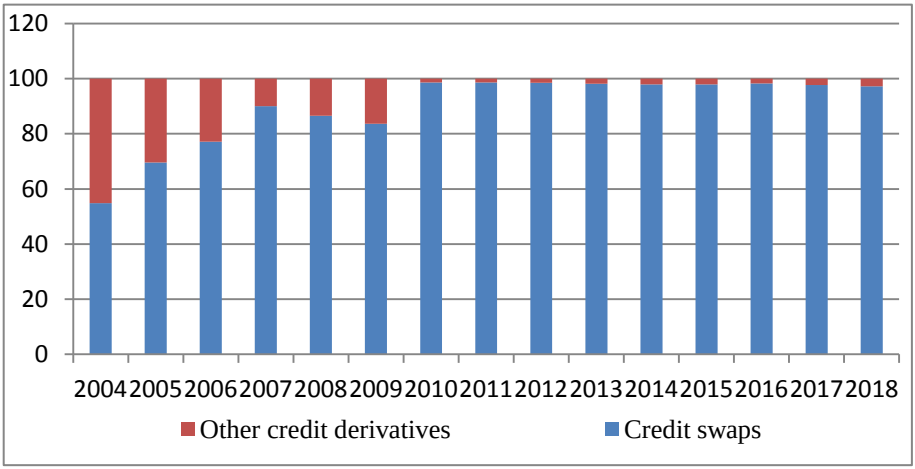
CDS contracts are concluded between contractors or through a dealer. The spread of the swap transaction in financial markets began in the mid-70s of the XX century. A swap contract is an agreement between the parties aimed at exchanging cash payments on the basis of various interest rates, stock quotes or prices calculated on the basis of the amount of money fixed in the contract. Swap hedging can be seen as a portfolio of forward or futures contracts entered into between two parties. A swap is used for insurance against various risks and for arbitrage transactions. Such operations may include changes in interest rates, unfavorable dynamics of the exchange rate, fluctuations in commodity prices and market strategy in the securities market. Swaps allow various categories of financial market participants to exchange risks, compensating for the most adverse consequences for themselves. In particular, banks use swaps to optimize the flow of interest on assets and liabilities, for greater flexibility in loan and bond portfolios. As a rule, swaps are quite liquid and change only for periods of validity during one calendar year. Currently, swaps are usually organized by financial intermediaries, who often enter into an agreement with one company and then look for another company to offset the swap. Swaps are concluded on the OTC market, therefore financial intermediaries provide a guarantee of their execution for participating companies. An intermediary is usually involved when it is difficult to find a counterparty with similar interests. Usually swap

hedging involves the conclusion of two separate contracts. Under the first contract, the first party is obligated to transfer to the seller fixed amounts for a certain amount of goods during the entire term of the contract, while the seller must transfer amounts to the bank based on a floating rate (using, for example, the commodity index). As a result, the manufacturer sells the goods at a fixed price and prevents the negative consequences of price reduction during the entire term of the contract, and the bank protects its interests from price changes by concluding a second contract with the consumer. If the price of goods increases, the difference between the higher and fixed prices is transferred to the bank to provide guarantees for the sale of goods at a fixed price. In accordance with the second agreement, the buyer agrees to pay the bank fixed payments for the established consignment of goods, while the bank is obliged to transfer payments to the consumer based on a changing rate. Such legal registration of relations between the parties allows the bank to "close" its position on payment of payments on the basis of a changing rate. The buyer, in turn, protects himself from the consequences of rising prices for goods. If the price decreases, the benefit that the consumer can receive is transferred to the bank for the provision of services. Often, swap contracts contain the provision that the actual delivery of goods does not occur, the parties transfer the difference between the fixed price and the price based on the exchange rate to each other. However, if the

manufacturer or consumer needs to sell or buy goods, they make transactions in the cash market of goods. The negative consequences that may arise due to fluctuations in cash prices are smoothed out by payments under the swap contract. Thus, a manufacturer selling a product at a lower price in the cash market of goods than that specified in the swap agreement receives from the bank the difference between the fixed price and the price based on a changing rate. In the event of a price increase, the manufacturer pays the difference to the bank. Conversely, if a buyer buys aluminum at a higher price in the cash market, he receives the difference from the bank under a swap agreement. If the price in the cash market decreases, the consumer pays the difference to the bank. It follows from the above example that hedging swaps is aimed at insuring the risks of both parties. However, there is the possibility of concluding swap contracts with speculators. Their attraction to the market can contribute to an increase in market volume and a significant increase in liquidity.

In world practice, there are dozens of types of credit derivatives that are classified according to different criteria: 1) depending on the asset underlying the contract; 2) from the moment of appearance; 3) accounting in the balance sheet (on off-balance sheet and balance sheet accounts); 4) type of instrument (guaranteeing non-performance, margin instruments, instruments for comprehensive income). The

most common type among the instruments guaranteeing non-performance is the default swap, whose share in the total volume of transactions with credit derivatives increased from 54.9% in the second half of 2004 to 97.3% in the second half of 2018 (Fig. 5).



Source: compiled by the author

Figure 5. The structure of the global credit derivatives market in 2004-2018.

In Kazakhstan practice, the use of credit derivatives is poorly represented in the derivatives market. Moreover, official statistics on the volume of the market of credit derivatives in aggregate are not yet available for open access, which significantly complicates the analysis of its dynamics. On the website KASE you can see that the debt

financial market is actively used as a source of financing investments in Kazakhstan. Government and corporate liabilities are traded on KASE with maturity up to 2044. At the beginning of September 2019, 133 issues of government bonds (GB) were registered. Issuers are the Ministry of Finance of Kazakhstan, the National Bank and municipalities. The corporate sector (CS) is represented by 255 bond issues from 66 issuers. Mostly borrowers are financial institutions (banks, microfinance and mortgage companies) in the ratio of 1/3 in favor of the financial sector. Government Stock market volume is about $ 35 billion, including both domestic loans and Eurobonds. The KSB accounts for about $ 50 billion. The total trading volume on all debt instruments since the beginning of this year exceeded $ 11 billion.

Source: KASE.KZ

Figure 6. Yield of 10 year government bonds of Kazakhstan, %.

Government debt to the country's GDP grew from 12% in 2012 to 22% in 2018. Given inflation of 5.3% per annum and the National Bank of Kazakhstan refinancing rate of 9.25%, which increased in line with global trends in September, we get yield to maturity of 10-year government bonds of Kazakhstan at the level of 9%. Corporate bonds are traded with a yield to maturity of 10% per annum.

2.4. Hedging by default options.

One of the big credit instruments is credit default options. Consider the concept and types of options. Option (from Lat. Optio - choice, desire, discretion) - the right to choose received for a fee. Credit default options are one of the major credit instruments. Their hedging is relevant.

The application of options for hedging.

You can consider several strategies for applying options to hedge risks: We buy a call to hedge against rising asset prices, that is, our goals when buying a forward for oil and buying stake for oil are the same: not to lose on market growth. A producer will never buy a call. After all, his goal is to hedge against the risks of falling prices. But the consumer will buy calls to reduce the risk of price increases. We buy put in order to hedge against the fall in the price of an asset, that is, our goals when selling a forward for oil and buying a put for oil are the same: not to lose when the market falls. In this case, the producer will be the buyer of the put, since a drop in prices reduces his income. The consumer will never buy a put: if the price of oil goes down to us, he will receive savings on fuel costs. A weaker form of hedging is the sale of options. The premium on the sale contributes to an increase in revenue rather than a significant reduction in risk. We sell a call, owning an asset (producer), usually at a price higher than the current

forward price of the asset, for example, if oil with a three-month supply costs $ 30, you sell 35 calls. If the market price does not reach 35 - the strike price at which we pledged to sell the asset, the option buyer will not want to exercise his right: in the market he will be able to buy oil cheaper. In this case, we will receive an additional profit equal to the premium we received for the option. We sell a put without owning an asset (consumer), usually at a price lower than the current forward price of the asset. For example, if oil with a three-month supply costs $ 30, we will sell 27 put. If the market price does not fall to 27 - the strike price at which we pledged to buy the asset, the option buyer will not want to exercise his right: in the market he can sell oil more expensive. In this case, we will receive an additional profit equal to the premium paid to us for the option. So, options and their combinations (strategies) can be adjusted to market forecasts of hedgers, giving hedging flexibility. For example, you can only hedge the most “catastrophic" option: at a price of $ 30 per barrel, an oil corporation can hedge from falling oil prices below $ 20 per barrel, buying a put with a strike price of $ 20. At the same time, it will remain at the risk of incurring large losses, but it remains possible to make significant profits if the price of oil rises. The flexibility of hedging instruments allows corporations or investors to tailor them to their risk appetite. One of the main criteria for risk preparedness is the planned profit margin in the budget. If the corporation’s operating

profit margin is low, hedging should be as conservative as possible, since even small market fluctuations can lead to loss making. This principle is useful for wholesalers, whose income is a small allowance for costs, and manufacturers in highly competitive industries where prices are reduced to the limit. As soon as the concept and tools of hedging are defined, the procedure should become mechanical: the risk is defined and should be hedged according to the approved algorithm. Then the hedge becomes completely independent of the market forecasts of the contractor. In practice, it is impossible to completely avoid them, since most hedging executing programs creatively manipulate timing, structures, or price levels. The development and approval of a hedging program goes through several stages. At the first stage, the company decides whether it intends to protect its products, revenues, expenses or prices of consumed raw materials from market fluctuations. Having fundamentally decided to start a hedging program, you need to make a choice between hedging through forwards and options. If options are taken as the basis, it is necessary to determine the risk parameters acceptable to the corporation and to budget the cost of hedging (option premiums). After that, you need to choose specific strategies (combinations of options) that correspond to risk parameters and resources allocated for hedging. Experience shows that the most successful hedging programs are “mechanical”, when the execution does not depend on forecasts of

market behavior and personal inclination. It is not paradoxical, but you have to choose between planned sales levels or a game of guessing the direction of the market.

III. The practical application of credit derivatives of financial instruments in the fintech market.

For analysis author choose Kaspi.kz Joint Stock Company. Kaspi.kz is the Payments, Marketplace and Fintech Ecosystem in Kazakhstan. Mobile App is at the core of the Kaspi.kz Ecosystem. Kaspi.kz Mobile App server as a single gateway to all products and services. Through the Kaspi.kz Mobile App provide a growing range of innovative, interconnected, technologically advanced products that change the way customers pay, shop and manage their personal finance. Kaspi.kz operates in Ecosystem with the mission of improving people's lives by developing innovative products and services that address their everyday needs.

The Kaspi.kz Ecosystem is comprised of following three market leading platforms centred around our customer's everyday needs:

- Payment platforms

Payments Platform allows customers to make regular payments around household needs, pay for purchases online and in stores, and make P2P money transfers online within the Kaspi Ecosystem, domestically and also international transfers.

- Marketplace Platform

Marketplace Platform organizes the customer experience from the beginning to the completion of the purchase through a mobile application, website and store. Customers come to the Marketplace Platform, where a wide selection of products from various trading partners is presented. Kaspi.kz has developed and continues to develop mobile, online and QR technologies for customers. Trading partners, in turn, have access to our vast customer base.

- Fintech Platform

Fintech Platform allows customers to access retail financial products through a network of Kaspi.kz branches and points of sale, which are strategically located in leading retail chains and shopping centers. This segment of the Ecosystem mainly includes loan products and retail deposits. After the first visit to a bank branch, more and more

customers continue to manage their retail financial products through a mobile application.

Below (Fig. 7) author present data from the company's financial statements for 2019, 2018, and 2017. Kaspi.kz Joint Stock Company is the parent Group of the following directly and indirectly held subsidiaries:

Subsidiary	Type of operation	County of operation	Ownership as at 31 December 2019	Ownership as at 31 December 2019	Ownership as at 31 December 2019
Kaspi Group JSC	Holding Company	Kazakhstan	100%	100%	100%
Kaspi Magazin LLP	E-commerce	Kazakhstan	100%	100%	100%
Kaspi Bank JSC	Banking	Kazakhstan	98.95%	94.40%	94.07%
Kaspi Insuranse JSC	Insurance	Kazakhstan	98.95%	94.40%	94.70%
ARK Balance LLP	Distressed asset management	Kazakhstan	98.95%	94.40%	94.07%
Kaspi	Real estate	Kazakhstan	100%		

Office LLP					
Digital Clessifields	E-commerce	Azerbaijan	100%		

Source: Consolidate financial statement Kaspi.kz

Figure 7. Parent Group company Kaspi.kz Joint Stock Company.

Here is the data from the consolidated financial statements(Fig. 8.9), this chart shows investment securities and derivatives:

Investment securities and derivatives comprise:	31 December 2019	31 December 2018	31 December 2017
Total financial assets at fair value through OCI	473,255	356,689	212,508
Total financial assets at faie value through profit or loss	1,326	9,942	27,000
Total investment securities and derivatives	**474,581**	**366,631**	**239,508**

Source: Consolidate financial statement Kaspi.kz

Figure 8. Investment securities and derivatives for 2019, 2018, 2017.

Financial assets at fair value through OCI comprse:	**31 December 2019**	**31 December 2018**	**31 December 2017**
Debt securities	472,943	356,311	212,256
Equity Investments	312	378	252
Total financial assets at fair value through	**784,943**	**734,311**	**464,256**

OCI:			

Source: Consolidate financial statement Kaspi.kz

Figure 9. Financial assets at fair value through OCI for 2019, 2018, 2017.

As at 31 December 2019, 2018, 2017, sovereign debt securities of ZT 391.467 million, KZT 311.604 million and KZT 176.266 million, respectively, were included in debt securities.

Financial assets at fair value through profit or loss comprise:

	31 December 2019	**31 December 2018**	**31 December 2017**
Financial assets at fair value through profit or loss: Derivative financial instruments	1,326	9,942	27
Total financial assets at fair value through profit or loss:	**1,326**	**9,942**	**27**

Source: Consolidate financial statement Kaspi.kz

Figure 10. Financial assets at fair value through profit or loss for 2019, 2018, 2017.

As at 31 December 2019, financial assets at fair value through profit or loss included swap and spot instruments in the amount of 6 million(2018: KZT 98 million, 2017: KZT 27 million) with notional amount of KZT 2.761 million(2018: KZT 63.408 million, 2017: KZT

22.198 million) and forwards in the amount of KZT1.320 million(2018: KZT 9.844 million, 2017: KZT Nil) with notional amount of 193.683 million (2018: KZT 135.513 million, 2017: KZT Nil). As at 31 December 2019, financial liabilities at fair value through profit or loss included swap and spot instruments in the amount of KZT 21 million (2018: KZT Nil, 2017: KZT Nil) with notional amount of KZT 8.915 million (2018: KZT Nil, 2017: KZT Nil) and forwards in the amount of KZT 8.817 million(2018: KZT Nil, 2017: KZT1.312 million) with notional amount of KZT 205.458 million (2018: KZT Nil, 2017: KZT 57.485 million).

In Kazakhstan, the share of loans issued in the assets of Kaspi.kz is 3 178 921 million tenge. Figure 8 shows the book value and fair value of loans for three years.

	31 December 2019		31 December 2018		31 December 2017	
	Carrying amount	Fair value	Carrying amount	Fair value	Carrying amount	Fair Value
Due from banks	43 484	43 621	22 872	22 500	_	_
Loans to customers	1 292 104	1 334 322	1 067 002	1 090 414	891 323	881 941
Customer accounts	1 626 973	1 610 650	1 232 920	1 205 660	979 639	967 667
Debt securities issued	138 574	137 651	138 094	133 085	111 335	1 106 283
Subordinated	77 786	76 347	89 603	83 320	93 579	87 597

debt						

Source: Consolidate financial statement Kaspi.kz

Figure 11. Book value and fair value of loans for 2019, 2018, 2017.

Fintech company, which occupies a large share of individuals' customers in Kazakhstan, eases collateral requirements for obtaining a loan: interest rate, loan term and potential additional requirements for collateral. As such companies actively borrow funds from foreign banks to support their local resources. Exchange rate fluctuations will have a significant impact on their creditworthiness and the overall creditworthiness of local banks. Creditworthiness increases the cost of borrowing for banks and, therefore, the cost of borrowing for small and medium-sized businesses leads to fewer approvals for loan guarantees, regardless of the amount that the government is willing to guarantee.

This section shows that the creditworthiness of local financial markets and their players strongly depends on fluctuations in oil prices, since oil revenues make up a significant part of government revenues, thereby proving the importance of oil prices in the development of credit guarantees. KASE index acts as an intermediary for determining creditworthiness and consists of a number of Kazakhstani financial,

telecommunication and energy companies, including companies such as Kaspi.kz.

Creditworthiness and oil revenues make up a significant part of the state budget and the country's total exports, the stock price index and the overall creditworthiness of the financial system are vulnerable to fluctuations in oil prices. At KASE, the index consists of a mixture of Kazakhstani financial, telecommunication, energy and oil companies. This list includes only those service industries that are vulnerable to conditions in the oil market.

The actual size of the credit default swap market is difficult to assess, since it is an over-the-counter market and those organizations that provide statistics on swaps use various methods of collecting information. There are three main sources of credit swap market statistics:

1. BIS, Bank For International Settlements.

2. ISDA, International Swap and Derivative Association.

3. DTCC, The Depositary Trust and Clearing Corporation[12].

3.1. Methods and mechanisms for applying hedging credit risks in the FINTECH markets.

Over the past few years there has been a sharp increase in the use of credit derivatives. This is directly related to the growing demand of the population for investment companies, including fintech companies, and, accordingly, for the growth of the use of different financial structures. With the growth of this market, this industry has developed, respectively, and the standard model of pricing and risk management of swaps. The swap pricing model makes it easy to evaluate market homogeneous swaps and improve domestic prices. Risk management methods have also significantly increased the prices of such financial instruments.

This research paper shows how the industry standard model can be used to calculate the default swap. We describe three different methods: two accurate calculations that require access to a survival probability curve and one approximate method based on simple discounting:

The first method calculates the current value (PV) of default swaps during a rollback request by summing all expected discounted cash flows for the remaining swap period. The second approach is similar,

but the calculation assumes that you put in the imaginary compensation immediately the initial market position of the CDS with zero fair value. We can then determine the total value of the swap by calculating the PV of the expected cash flow difference between Existing CDS and compensating CDS in the market. The third alternative method uses spread-based approximation for the survival probability curve used in the first two methods. Since it does not require access to a survival probability curve, it is fairly easy to use. Let's consider each method separately.

The first method: A direct assessment is to calculate the PV of expected credit flows. In this method, you receive a bonus for each periodic payment before the due date of the payment or before the credit event. The expected cash inflow for each payment date is equal to the premium amount multiplied by the probability of the loan being kept until the payment date. In exchange for this premium, you must pay a contingent fee minus the cost of recovery if a credit event occurs.

The expected value of cash outflows. This value is equal to the nominal recovery cost multiplied by the probability of a credit event during the period between payment dates. The fair value of existing CDSs is equal to the sum of all expected future cash flows. As we

know the estimate of market credit default swaps should correspond to the prices of market default swaps, the survival probability curve obtained from the observed market default swap rates should be used. Exhibit 1 shows the PV calculation of an existing written CDS with a remaining life of one year. The premium for over-the-counter default swap is 100 bp. per year at a conditional rate of 10 million. Dollars. Recovery rate will be 40%. By default, the market is 50 bp in year, risk free fate 1,2%.

TIME	DATE	DFARYACCOTUINOTN (Years)	PREMIUM ($)	ESAERTLTYLE Payment ($)	DFIASCCTOOURNT D(ti)	SPURROVBIAVBAILLITY Q(ti)	Probability of Credit Event Since Last Payment Q(ti-1)-(ti)	PV of Expected Premium ($)	PD of Expected Early Settlement Payment ($)	Net ($)
0	0	NA	NA	NA	1	1	NA	NA	NA	NA
1	31.03.19	0,256	25 560	- 6 000 000	0,9881	0,9979	0,0021	25 202	- 12 450	12 752
2	30.06.19	0,250	25 000	- 6 000 000	0,9884	0,9958	0,0021	24 606	- 12 454	12 152
3	30.09.19	0,253	25 278	- 6 000 000	0,9824	0,9937	0,0021	24 677	- 12 378	12 298
4	31.12.19	0,258	25 833	- 6 000 000	0,9754	0,9916	0,0021	24 986	- 12 290	12 696
PV of CDS Contract on Dec.31, 2019										49 899

Exhibit 1:PV calculation for existing CDS PV of expected cash flow approach

The second method: Direct valuation - calculating the PV of the expected cash flow difference between existing and market swaps by default with the same maturity. The second method assumes that you enter into compensating CDS with a maturity and payment date identical to the dates of existing CDS. If a credit event occurs, the settlement received in accordance with the new CDS directly compensates the settlement paid to the existing CDS. Only the premiums for the two swaps are different, so the promotion value is equal to the PV of the expected net premium.

In the second method for the same example used in Exhibit 2 (maturity is one year, the contract swap rate is 100 bp per year, and the default market rate is 50 bp per year).

			A	B	C=A+B	D	E	F=C*D*E
Time	Date	Daycount Fraction (Years)	Premium Received on Existing CDS ($)	Premium Paid on Offsetting CDS ($)	Net Premium ($)	Discount Factor D(ti)	Survival Probability Q(ti)	PV of Expected Cash Flow ($)
0,00	01.01.19	NA	NA	NA	NA	1	1	NA
1,00	30.03.19	0,256	25 560	-12778	12 782	0,9881	0,9979	12603
2,00	30.06.19	0,250	25 000	-12500	12 500	0,9763	0,9958	12152
3,00	30.09.19	0,253	25 278	-12639	12 639	0,9646	0,9937	12115
4,00	31.12.19	0,258	25 833	-12917	12 917	0,9531	0,9916	12208
								49079

Exhibit 2: PV calculation for existing CDS ñ cash flow differential approach

Consider the third method:

			A	B	C=A+B	D	E	F=C*D*E
Time	Date	Daycount Fraction (Years)	Premium Received on Existing CDS ($)	Premium Paid on Offsetting CDS ($)	Net Premium ($)	Approximated Discount Factor D*(ti)	Approximate Survival Probability Q*(ti)	PV of Expected Cash Flow ($)
0	01.01.19	NA	NA	NA	NA	1	1	NA
1	30.03.19	0,2556	25 556	- 12 778	12 778	0,9880	0,9979	12 598
2	30.06.19	0,2500	25 000	- 12 500	12 500	0,9761	0,9958	12 151
3	30.09.19	0,2528	25 278	- 12 639	12 639	0,9644	0,9937	12 113
4	31.12.19	0,2583	25 833	- 12 917	12 917	0,9529	0,9916	12 204
PV of CDS contract on Dec 31, 2019								49066

Exhibit 3: PV calculation for existing CDS spread-based approximation approach

The first two estimation methods assume that the functions of probability of discount and survival are available for your calculations. If this is not the case, you can (1) use the spread-based method to approximate the survival probability curve used in the

second direct estimation method, and (2) approximate the discount curve using a fair annuity interest rate of the same maturity as CDS .

The spread-based approximation method calculates the probability of survival for one period based on the CDS premium in the market and the assumption of recovery. You can then calculate the probability of survival for several periods, increasing the probability of survival for one period to an extent equal to the number of periods. This approximation assumes that the credit curve is flat. Similarly, you can approximate the LIBOR-based discount curve by calculating the fair interest rate for an annuity with a maturity identical to the maturity in CDS. This is a reasonable approximation because the net expected CDS cash flows outside the market are very similar to annuities.

Most market participants use a model based on the probability of default to estimate the value of assets. over-the-counter default swaps. This type of model became the market standard and the transparency of calculations of photovoltaic parameters increased significantly, which, in turn, led to a simplified execution process. In this report, we illustrated the standard model by calculating a series of examples of unwinding ratings. The first two methods assume that you have access to a survival probability curve. The first method calculates the PV from CDs by summing the expected discounted cash flows over the

remaining life of the default swap. The second method calculates the PV of the expected differential cash flow from existing CDs and offset CDS in the market with zero PV. The third estimation method is spread-based approximation, which does not require access to an accurate survival probability curve. This method is easy to use and works well for flat and moderately sloping credit curves.

Hedging CDS in a Structural Model.

Ericsson and Renault (2002) develop a structural model to connect bond market liquidity with default risk. In their model, bond spreads are related to costs of having to trade when it is not optimal to do so. Our model here is a simpler one, relating CDS spreads to illiquidity-induced hedging costs. We begin by positing the standard Merton (1974) framework for default risk, in that firm value V is assumed to follow a geometric Brownian motion under the risk-neutral measure:

$$dV = rV\,dt + \sigma V\,dW \qquad (3)$$

Where:

r is the risk free rate and σ is the volatility of the firm's assets;

dW is the standard Wiener increment.

It is well-known that in this framework, stock value S is determined as a call option on the firm's value V , with strike price equal to the face value F of zero-coupon debt (of maturity T) issued by the firm. Hence,

$$S = V\,\Phi(d1) - F\,e^{-rT}\,\Phi(d2) \quad (4)$$

$$d1 = \ln(V/F) + (r + \sigma^2/2)T / (\sigma\sqrt{T}) \quad (5)$$

$$d2 = \ln(V/F) + (r - \sigma^2/2)T / (\sigma\sqrt{T}) \quad (6)$$

where $\Phi(x)$ is the cumulative normal distribution value for x.

We consider a very simple insurance contract where the seller is obligated to make good a pre-specified loss amount on default of the firm. For simplicity, assume that the maturity of the insurance contract is T, the same as that of the firm's debt. This is analogous to a very simple CDS contract where the buyer pays only an upfront premium in return for a fixed contingent payment on default. Denoting the price of the contract as C, the price is proportional to the risk-neutral probability of default, which in the Merton model is simply $\Phi(-d2)$. The seller of this CDS hedges credit risk by taking a short equity position, either by selling stocks or buying put options, because the value of the CDS contract declines when the stock price rises, i.e. the

hedge ratio is negative, $\Delta = \partial C\ \partial S \leq 0$. Note also that as Δ changes, the seller adjusts the amount of equity shorted as a hedge. Instantiation of the initial hedge, changes in the hedge ratio, and the close out of the hedge, all result in hedging costs emanating from frictions in the equity markets. Hedging costs are proportional to the size of Δ, which may be computed in closed-form as follows:

$$\Delta = \partial C/\partial S = (\partial C/\partial V \times \partial V/\partial S) = \partial/\partial V*(\Phi(-d2)) \times (1/\Phi(d1)) = -\varphi(-d2)\ \partial d2/\partial V \times 1/\Phi(d1) = -\varphi(d2)/\Phi(d1)*(1/(V*\sigma*\sqrt{T})) \leq 0 \quad (7)$$

Where: $\varphi(x)$ is the normal density of x. We can also see that this confirms that the relationship of CDS to equity (or firm value) is an inverse one. Using the equation above, the stock price will fall, the absolute hedge ratio increases, proportionally increasing the costs of hedging[22].

Hedging costs proportional to Δ may arise as a result of various frictions in the stock markets. We will examine three well-known liquidity frictions here. The greater the need for hedging, the greater the effect on price, which makes this proxy for illiquidity a good suitable variable for explaining CDS spreads. Secondly, the absence of immediate or non-tradable stocks, proxies with zero profitability. Here, the costs of hedging arise from the fact that this form of illiquidity can lead to slippage in the dynamic hedging program, either

due to a delayed or partial hedging. Thirdly, bid ask spreads. The wider the spreads of supply and demand, the higher the cost of going through a hedge and withdrawing it both ways when closing a credit position. We note that all three illiquidity indicators affect the value of a dynamic hedging strategy, albeit through different channels. There are two other aspects of dynamic hedging that affect working with a CDS book, regardless of which illiquidity channel we consider the most influential. Firstly, dynamic hedging is costly when markets are unstable because the hedge ratio changes faster. Since changes in volatility are likely to be systematic, it is difficult to diversify this component of hedging risk. Secondly, with a change in the credit quality, even for one issuer, re-hedging of market positions occurs on one side of the spread between supply and demand, and, therefore, the costs of adverse selection are exacerbated. Both of these effects enhance the effect of stock market illiquidity on CDS spreads[22].

Distance-to-Default.

As presented in equations (3), (4), (5) and (6), the stock S of a firm is a call option on it's underlying value V with an exercise price equal to the face value of debt F and a time to maturity of T. We recall the result here.

$$S = V\,\Phi(d1) - e^{-rT} F \Phi(d2) \quad (8)$$

where $\Phi(.)$ is the cumulative normal distribution function with d1 and d2 given by:

$$d1 = \log(V/F) + (r + \sigma^2/2)T \,\sigma\sqrt{T} \quad (9)$$

$$d2 = d1 - \sigma\sqrt{T} \quad (10)$$

Since stock S(V) is function of firm value, application of Ito's lemma allows us to express stock volatility in terms of firm volatility as follows:

$$\sigma S = \frac{V}{S} \frac{\partial S}{\partial V} \sigma \quad (11)$$

The Merton (1974) model uses equations (8), (9) and (10) solve for V and σ where σS, r, S, F, and r are obtained exogenously. T is assumed to be one year following standard practice. σS is the annualized standard deviation of returns and is estimated from the prior 100

trading days of stock price returns. The market value of capital S is calculated as the number of shares outstanding multiplied by the share price at the end of the quarter. We numerically solve the system of equations in the Merton model in order to obtain the firm value V and the firm volatility σ. Then, the distance to default is calculated as:

$$DD = \log (V / F) + (\mu - \sigma 2/2) T \sigma \sqrt{T} \quad (12)$$

where μ is estimated as the average annual capital return for the previous 3 years[20].

Finally, we need to consider whether the effect of illiquidity on CDS spreads will be lower for lower quality firms. To verify this, you need to connect the distance to default with liquidity variables.

Firms with a shorter distance to default have worse credit quality. Consequently, a significant negative coefficient in the interaction variable will mean that liquidity has a greater effect on credit spreads of firms with lower credit quality.

Distributing CDS for low DD firms will be more affected by capital liquidity than high DD spreads.

3.2. Prospects for the development of the derivatives market using credit risk management methods for professional participants of the fintech market.

The astonishing growth of credit derivatives around the world suggests that market participants find them useful tools for risk management. In this case, the cost of credit derivatives is illustrated by an example of fintech companies using credit derivatives to manage the risk of a loan portfolio. But credit derivatives create their own risk management problems. The author considers three methods for calculating the present value and a mechanism for calculating the possibility of default. Credit derivatives can transform credit risk in complex ways that may not be easy to understand. They can create counterparty credit risk, which must be managed by itself. Complex credit derivatives rely on complex models, which leads to risk modeling[21]. Credit rating agencies interpret this difficulty for investors, but their ratings may be misunderstood, creating a rating agency risk. And the settlement of a credit derivative agreement after default may have its own difficulties, creating the risk of settlement. In order for the credit derivatives market to continue its rapid growth, market participants must find ways to solve these risk management.

In the Kazakhstani market, competition for financial resources goes global. Therefore, ensuring the competitiveness of Kazakhstan in the financial sector is one of the foundations for becoming one of the developed countries. The formation of a single investment space and the globalization of the financial market through the unification of capital markets of national levels influenced the financial turnover mechanism:

- The outflow of savings to countries where it is most profitable to place them has been simplified;

- National projects have become more open to foreign investment[21].

In Kazakhstan, the financial market is a combination of different markets: foreign exchange and credit stocks, derivatives, investments and insurance. One of them is the derivatives market, which has the potential to become one of the leaders in Eurasia. Derivative as a financial instrument is a contract in which the price is determined from the derivative, which is based on the basis or basic value, which is influenced by quotations on the market. The process of expanding the financial market for derivatives is confirmed by the existence of: - diversity for the use of instruments in the form of financial derivatives; - a wide range of choices of various kinds of financial

instruments to maintain the operability of the derivatives market at the full level. Further development of the derivatives market in Kazakhstan requires the creation of an institution that will have the authority and ability to carry out financial engineering to regulate financial transactions in the market, to conduct analytical work to develop a development strategy. The derivatives market, in the absence of adequate regulation, can have a destabilizing effect on the development of the economy due to the absolute level of freedom of capital flow processes, and especially highly speculative-short-term ones, which can trigger a crisis. One of the main factors influencing the growth rate of the derivatives market is: - the use of modern technologies to operate on the market; - the non-vanishing potential for the emergence of various types of risk, both monetary and financial; - the introduction into circulation of previously non-existent financial instruments; - stabilization or strengthening of economies at the national level after or during the process of integration into globalization processes in the financial market on a global scale; - modification of the types and types of derivatives, an increase in their number or variety[21].

Legal regulation of transactions with derivatives is a very complex operation, which creates more opportunities for speculative acts and accelerates the separation of the financial sector from the real sector of

the economy. Growth in the volume of derivatives trading gives them specific properties: hybridity and liquidity. Derivative liquidity lies in the fact that, regardless of the time, it is possible to sell it on the exchange or over-the-counter segments of the secondary market. Derivative hybridism appears in the possibility of using it for the implementation of several tasks, for example, both for risk hedging and for speculative operations. Further liberalization of relations in the financial sector as a result of the globalization of national economies creates the prerequisites for expanding the derivatives market, including in Central Asia. However, the rapid development of innovations in the provision of financial services in the Republic of Kazakhstan creates an additional incentive for the growth of speculative acts in the market. One example is that there is a variety of financial instruments, derivatives, which, despite the level of their own interest and currency risks, create the potential for operating with flows of financial resources several times larger than the amounts that investors had initially. Therefore, with the development of the derivatives market in Kazakhstan, investors may encounter fewer "restraining counterbalance systems," which may deprive investors of protection from a large level of financial losses due to the lack of a regulatory mechanism for risky speculative operations. A derivative may carry a certain risk in itself[23].

The future development of the derivatives market according to Figure 1 is impossible without creating an adequate legal and regulatory framework, which is unlikely without the active support of the state. Standardization and constant monitoring of market changes (Figure 1) is necessary to simplify the response process in the form of an adequate strategy for changes in the financial sector. Therefore, the elimination of the emerging restrictions in the form of the lack of an adequate level of technology development, the inadequacy of certain rules, the absence of the necessary standards and terminological apparatus is possible only if there is a sufficient level of development of professionalism in society along with an adequate level of state interest in the development of the derivatives market. Correlation analysis shows that changes in the derivatives market at the global level have an impact on changes in the domestic derivatives market in Kazakhstan, which is a consequence of the globalization of the financial market, so it becomes possible to describe the development strategy of the stock derivatives market, given the experience of strengthening the financial sector. In conclusion, the development of the derivatives market in Kazakhstan is a successful example of integrating the national financial system into the global system of economic relations thanks to a sufficiently effective development strategy that meets the requirements of the times and trends in the global financial market[24].

3.3. Development of a set of measures to improve the regulation of financial risk hedging operations in Kazakhstan.

At the moment, it is still too early to talk about the full use of hedging of credit risks through credit derivatives in Kazakhstan due to the lack of an appropriate regulatory and market base. Nevertheless, this method deserves attention both from a scientific and from a practical point of view, since the objective process of development of productive forces and economic relations in Kazakhstan will create the necessary prerequisites for its development. In order for credit derivatives to become real instruments of credit risk insurance in Kazakhstan and domestic companies to be able to use the accumulated world experience in using these instruments, it is necessary to determine the main directions of development of the Kazakhstan market of credit derivatives:

1. There is a need for clear legislative regulation of activities related to the use of derivative financial instruments. Imperfect legislation is one of the main factors hindering the development of the derivatives market in Kazakhstan and, in particular, the market of credit derivatives.

2. Along with the development of legislation for the successful functioning of the market of credit derivatives in Kazakhstan, it is necessary to develop the infrastructure of the derivatives market.

3. The next important step in the development of the Kazakhstan market of credit derivatives is to ensure transparency of information about campaigns and borrowers, in particular the creation of rating agencies.

4. Implementation of a policy to prevent the outflow of investment activity abroad.

If an understanding is reached of the mechanism of the new instruments and the conditions for their functioning are created, then in the next few years, Kazakhstani companies, in particular fintech companies, will be able to use credit derivatives as an effective method of managing credit risks in full.

Conclusion.

Summing up, it should be noted that the development of fintech solutions requires an appropriate infrastructure, a marketing plan to attract customers by presenting new, comfortable products, innovative use of data, the presence of investors who are ready to invest in the product and support regulators [1].

Around the world, the implementation of fintech solutions has received significant attention both at the government level and by private companies and corporations, significant investments in startup products, and discussions are ongoing at the interstate level.

In Kazakhstan, most fintech areas are at the stage of formation and development. At the same time, the most promising solutions are those based on the “blockchain” technology, the construction of a remote customer identification system aimed at further digitalizing services, the creation of “regulatory sandboxes” for testing startups in the financial market, the use of Big Data features, the development of open APIs that provide third-party access to accounts and information systems, the use of cloud technology for remote customer service, P2P lending, further robotization and the introduction of artificial intelligence.

Stable, progressive development of the banking sector involves the competent management of credit risks in order to optimize them and ensure on this basis a safe working environment for banks, this can be achieved by using advanced risk management and forecasting methods, provided that the bank has a well-functioning risk management system. “Receptions and methods of economic analysis are constantly being improved. This work goes towards the development of a mechanism for their joint application. ... Thus,

analysts are not faced with the question of finding new universal methods. It is necessary to more widely apply what has already proven itself in the practice of analysis and can provide new opportunities if they are used together in analytical studies ". Based on the stages and methods of banking risk management, having analyzed the Kazakhstan and foreign practice of banks, we can conclude that the main problem of the risk management system in the field of credit risk management is the segmental approach.

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Appendix 1. List of Fintech companies in Kazakhstan.

Number	Name of Firm	Product	Industry
1	Baribirge	Craudfunding	Investment
2	Nebank.kz	P2P lending	Investment
3	Ules	P2P lending	Investment
4	Lendex	P2P lending	Investment
5	Intervale	Service for making online payments	Infrastructure Solutions
6	Региональные платежные системы	Telebank.Retail Telebank.Corporate InfoMe	Infrastructure Solutions
7	Paybox	Service for making online payments	Infrastructure Solutions
8	Первое кредитное бюро	Information service	Infrastructure Solutions
9	Kredit24	Online loans	Lending
10	CreditOn	Online loans	Lending
11	altTenge	Online loans	Lending
12	ccloan.kz	Online loans	Lending
13	МФК	«Честное слово»	Online Loans
14	ДеньгиClick	Online loans	Lending
15	ДоПолучки	Online loans	Lending
16	Solva	Online loans	Lending
17	Zing	Online loans	Lending
18	Займер	Online loans	Lending
19	Moneyman	Online loans	Lending
20	LemonTree	Advertising platform	loyalty
21	Kopilka.kz	Cashback service	loyalty
22	Chocolife.me	Cashback service	loyalty
23	BeSmart	Cashback service	loyalty
24	Prodengi	Financial supermarket	Marketplace
25	BAI.kz	Financial supermarket	Marketplace
26	Wooppay	Online wallet	Payments
27	E-kzt	Online wallet	Payments
28	Allpay	Online wallet	Payments
29	Kassa.24	Terminal for payment	Payments
30	Smart	POS terminal	Mobile Payment Points
31	mini POS	Mobile Payment Points (mPOS)	Payments
32	torgai	Mobile Payment Points (mPOS)	Payments
33	Processing.Kz	Internet Acquiring	Payments

34	ePay	Internet Acquiring	Payments
35	Paypoint	Service for making online payments	Payments
36	Stock	Metrix	bank chat-bots
37	M'PAY	Service for making online payments	Payments
38	Quickpay	Service for making online payments	Payments
39	Таулинк	Payment system	Payments
40	Buhta	Online accounting	Management Accounting
41	Fin-Apps	Integrated Solutions	Management Accounting
42	iDocs	Online reporting	Management Accounting
43	Подпиши онлайн	Service for signing documents in real time	Management Accounting
44	Планета учета	Online accounting	Management Accounting
45	Учет.kz	Online accounting	Management Accounting