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Using Derivatives to Hedge Foreign Exchange Exposure in Russia: Academic Research Review

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Abstract

The review analyzes Russian academic publications from the early 2000s to the present on financial derivatives and their use by Russian non-financial companies to hedge foreign exchange exposure. During this period, studies have made significant progress, from discussing general issues, like the concept of FX exposure, the types of derivatives and the basics of hedging, to original research of hedging effects on company value or cost of equity using generally accepted quantitative methods, such as VaR evaluation. The research demonstrates that hedging practices vary by industry and by the firm size; the 2008 and 2014 financial crises followed by increased FX volatility had a twofold effect on these practices, with some companies starting to apply hedging on a larger scale, and others abandoning it at all. The general opinion is that the use of derivatives to hedge foreign exchange exposure, specifically the transaction one, in Russia is much lower than in developed markets due to the market immaturity, regulatory and accounting difficulties, low demand for hedging instruments because of underdeveloped corporate treasury function, high hedging costs, etc. Instead, companies adhere to natural hedging, use non-financial techniques, or accept foreign exchange exposure. Still, most authors agree that to manage FX exposure, companies need to develop a comprehensive strategy; however, commercial flows reorientation due to the current political and economic situation requires developing new FX derivatives and a market for them. Overall, it can be concluded that the studies of Russian practices of using financial derivatives to hedge foreign exchange exposure are relatively small in number compared to foreign ones; data availability limits their factual base to information disclosed by public companies and model examples and does not allow to consider mid-sized and private firms' practices.

Keywords: foreign exchange risk, transaction exposure, risk management, foreign exchange derivatives, derivatives market, hedging factors, hedging strategy, natural hedging, company value

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Introduction

Using financial derivative instruments to hedge foreign exchange (FX) exposure is quite common among foreign non-financial companies involved in international operations. Academic research in this area is extensive and dates back to the 1970s. The existence of three types of foreign exchange exposure – transaction, translation, and economic exposure – has long been universally recognized; it is believed that transaction exposure should be hedged in the first place, and forwards (futures) and options are the major types of contracts being used for this purpose. Current international research mainly focuses on reasons behind companies' decisions to hedge and discusses the impact of hedging on company value directly or via different factors such as firm size, corporate structure, dividend policy, etc.

Foreign exchange exposure hedging is especially relevant for Russia because the financial results and financial position of many non-financial companies are affected by the volatility of the Russian ruble exchange rate. The contracts include exports, mostly of natural resources and low value-added products; imports of machinery and technologies, as well as food products and consumer goods; and loans in foreign currency. While it is ordinary practice to hedge such transactions in the international market, many issues remain unresolved in Russia due to its short market history. The fact that Russian practice in this area hardly takes international research and practice into account only adds to the problem.

The goal of the present paper is to review Russian academic studies on foreign exchange hedging practices using derivatives by Russian non-financial (corporate) companies and to highlight the state and main issues of this research. We do not analyze the use of derivatives by financial institutions such as banks or hedge funds, as these are professional market participants with specific regulatory requirements, and their practices require a separate discussion. Our review focuses on Russian literature on the subject, does not consider foreign research and its methodology, and does not intend to make any specific cross-market comparisons.

Derivatives Market in Russia

A remarkable feature of this market, as noted by V. Liaulin [1], is that it began forming simultaneously with the market of underlying assets. Foreign exchange futures and options were the first derivatives in Russia: the first USD/RUB futures contracts began to be traded on MOEX in October 1992. However, the literature on derivatives of that period is limited to academic books and does not contain any publications on the use of FX derivatives to hedge FX exposure, as we see from the comprehensive bibliographic index “Securities market and derivative financial instruments” for 1993–2003 [2].

The first original research on foreign exchange derivatives and their use to hedge FX exposure of non-financial companies dates back to the early 2000s. D. Piskulov [3] attributes this to the following:

- The Russian economy recovered from the 1998 financial crisis and began to experience stable development supported by high oil prices.
- The currency basket regime increased the ruble exchange rate uncertainty and volatility.
- Russian banks recovered from the 1998 crisis and regained access to international capital markets, while Russian interbank market activity increased.
- The demand for financial derivatives to hedge interest rate risks began to grow, and the first interest rate and cross-currency swap deals were concluded.
- Legal obstacles to the development of the derivatives market were removed, starting with legal protection for settlement deals concluded by qualified market participants.
- Professional organizations of market participants, such as the National Foreign Exchange Association and the Association of Russian Banks, were founded to identify and solve market problems.

However, results of a bank survey by the National Foreign Exchange Association cited by D. Piskulov [3] show that, in the early 2000s, FX derivatives transactions were carried out exclusively in the interbank market. Some scholars [4–8] argue that one of the biggest obstacles to hedging development in Russia was legislation stipulating that non-deliverable instruments were considered bets rather than financial instruments, and therefore not subject to legal protection. This issue was resolved only in 2007 by special amendments to article 1062 of the Civil Code of the Russian Federation.

According to a 2016 survey by the National Financial Association, the share of client transactions amounted to 33% of the total volume of bank transactions with FX derivatives at that time [9]. Thus, transactions involving non-financial companies represent a significant share of the market. Most authors agree that export-import transactions and foreign currency denominated liabilities are the main sources of exchange rate exposure [5; 10], with foreign exchange volatility and open foreign exchange positions being key risk factors (96 percent and 40 percent, respectively) [5]. A. Efimov [10] states that companies involved in import substitution are also exposed to foreign exchange risk.

Different publications consider the history [1; 3; 11], structure and dynamics [3; 9; 11–20] of the Russian FX derivatives market or make international comparisons [5–6; 14–15; 21]. However, they are mostly based on secondary data drawn from market research and reports by the Bank for International Settlements, PJSC Moscow Exchange, Russian Central Bank, and SRO National Financial Association (D. Piskulov [9]) and surveys conducted by consulting companies such as PwC and KPMG. The best among them are probably the original study by Yu. Danilov [7], containing the most complete information on the development of the derivatives market in 2001–2017, including its volume, structure, liquidity, dynamics, comparisons with foreign markets, regula-

tory problems, and obstacles to and proposals for further market development, and the fundamental research by M. Dmitrieva [5]. These papers show that the derivatives market in Russia is developing, with FX derivatives prevailing over interest rate derivatives, unlike the situation in other countries.

Some papers are devoted to issues that have long been discussed and resolved in international research, such as:

- The nature of derivatives [22].
- The different types of derivatives and the purposes of their use [5; 6; 10; 11; 16; 18; 22–26], including three strategies: hedging, speculation and arbitrage [11; 18; 27].
- The concept of FX exposure [10; 28] and its three types – transaction, translation, and economic exposure [4; 5; 21; 29–31] – as well as unobvious (hidden) exposure [10; 32], and the different approaches used to mitigate them [31–32].
- The nature of hedging [33] and analysis of international hedging practices [22; 34].

For the theoretical background, most authors use the fundamental books on financial derivatives by A. B. Feldman, V. A. Galanov, A. N. Burenin [5; 16; 19; 23; 25–27; 33; 35–36], as well as the Russian translation of *Options, Futures, and other Derivatives* by John C. Hull [5; 6; 12; 13; 19–21].

Most authors acknowledge that the Russian market of derivatives is immature [11; 13; 15], which, along with the impact of the 1998 financial crisis [3], explains some of its problems, such as:

- The high ruble exchange rate volatility that makes it difficult to develop long-term hedging strategies [16; 17].
- Underdeveloped infrastructure [15; 17; 36].
- Numerous gaps and contradictions in the legislation [9; 11; 17; 22; 36–37].
- Little or no support from the government [15].
- Difficulties in financial and tax accounting of transactions involving derivatives [9; 16–17; 22; 36].
- Low control over transactions, enabling price manipulation based on the use of insider information [34–35] and creating potential counterparty risks and conflicts of interest [18].
- Low demand for derivatives due to underdeveloped corporate planning and treasury functions, low financial literacy and low risk tolerance of treasury employees [9; 15; 18; 38], and lack of support from top management [22].
- High hedging costs, including the costs of legal support [17; 36; 38].

Most of these problems are specific to or more pronounced for the Russian market, as shown by M. Dmitrieva [5]. As a result, the use of derivatives to hedge foreign exchange exposure is much lower than that in developed markets.

Factors Affecting Hedging Practices

Based on a 2011 PwC study, I. Khmelev [4] and V. Okulov, V. Skripyuk [24] state that 30 percent of companies do not hedge their exchange rate risks, because in the majority of cases they are not directly exposed to them (or do not have open foreign currency positions). According to a 2015 PwC study [39], only 11 percent of analyzed Russian companies were not exposed to foreign exchange volatility, while 43 percent of companies regarded their foreign exchange risks as material. At the same time, the share of companies not managing their foreign exchange exposure decreased to 25 percent, yet only 19 percent actively managed it. However, unlike developed markets where “active management” means the use of derivatives, Russian companies understand it to include natural hedging, which is the dominant approach (56 percent), with the percentage of those using derivatives being much lower than in international markets.

T. Polteva and E. Luk'ianova [22] explain this situation by the low financial literacy of treasury employees, difficulties in assessing initial and residual risk, as well as poor hedging results and lack of understanding and support from top management. Dmitrieva's findings [5] that on average (depending on the industry) 60 percent of analyzed companies use financial hedging, while 90 percent of non-financial companies use at least some kind of hedging, are probably due to her sample specifics. However, she recognizes that most companies hedge less than 40 percent of their open foreign exchange positions.

When risks materialize, companies mostly try to revise the terms of current agreements – increase prices to compensate for higher costs in the case of importers and for national currency appreciation in the case of exporters [36], reduce costs, use reserves, and even reduce capital investments [40].

A. Efimov [10] states that companies sometimes deliberately refrain from using hedging instruments as they expect exchange rates to be stable or change in a favorable direction. Such enterprises deliberately speculate and, if their expectations turn out to be wrong, incur losses. G. Mazin [40] analyzes the annual reports of companies for 2019 to show that exchange rate losses amounted up to 24% of revenues due to the significant volatility of exchange rates. Companies explicitly admitting in their reporting that risks can significantly affect their position yet showing reluctance in using derivatives include Tatneft and the Alrosa Group [40–41]. Other companies such as Transneft, Aeroflot, and PhosAgro have abandoned the use of derivatives because of past massive losses [13; 34].

Many authors note that the most popular approach to managing foreign exchange exposure in Russia is natural hedging [4; 17; 24; 32; 34; 40; 42]. The most widespread natural hedging techniques include matching the currency structure of revenues/expenses and assets/liabilities and using foreign currency nominated loans [33; 43–45]. This observation is confirmed by surveys of the corporate treasury function by PwC [39] and KPMG [46]. This trend per-

sists today, as confirmed by a 2020 KPMG study [45]. Alrosa Group, PJSC NOVATEK and PJSC Gazprom are among companies committed to natural hedging [43].

However, these studies do not examine other potential non-financial techniques mentioned, such as transferring exchange rate risks by concluding all contracts in national currency or in different currencies that have opposite exchange rate trends; using risk sharing agreements; using leads and lags; employing international diversification of revenues and costs and using subsidiaries to balance cash flows in different currencies (currency netting) [5; 29; 32; 43]; and applying money market instruments [23]. The only exception is exchange rate clauses widely used before the 2014 crisis, in which contracted prices are made to depend on the exchange rate [4; 32; 42; 45].

Researchers' opinions on the use of derivatives differ. According to A. Kokosh [38], the scope of hedging transactions should be very limited in Russia – companies should rather use natural hedging by matching revenues and expenses, assets and liabilities, and diversifying their business. K. Kurilov [43] justly argues that only net or open currency positions deserve hedging. However, M. Kiseliov [36] states that hedging an open currency position only with the use of derivatives makes for effective foreign exchange exposure management.

E. Fedosov [45] makes the general conclusion that derivatives as a means of managing FX exposure evokes limited interest among Russian companies – in part, due to the significant losses incurred by some of the largest companies as a result of ruble devaluation in 2014 – and do not fully meet the requirements of the Russian economy. This contrasts with international practice, where derivatives are the most common tools to manage FX exposure.

Several articles show that *exposure to FX risk and hedging practices vary by industry*.

Analyzing corporate annual reports, G. Mazin [40] observes that the impact of foreign exchange exposure is high in oil and gas production, machinery and manufacturing, industrial and commercial services; medium in electric power generation and the chemical industry; and low in food processing.

E. Kayasheva [32] considers real estate investments in a foreign market and shows that initial investments, the periodic (lease) payments, and the liquidation value are all subject to FX exposure. As the first two flows are predetermined, they can be hedged with swap contracts. However, it can be difficult to find the right contract, and hedging incurs additional costs. As for the cash flow from the sale of real estate, it is hard to forecast, and its hedging effectiveness depends largely on its liquidity.

A. Kurilova [23] and K. Kurilov [43] state that Russian automakers are affected both by ruble depreciation that increases material (i.e. steel) and component costs and by ruble appreciation that decreases export revenues. The cyclical character of the industry normally aggravates each scenario. Therefore, when hedging commodity and currency risks, it is necessary to determine the optimal mo-

ment to enter the market to avoid losses (A. Kurilova [23]). Thus, automakers are advised to develop a holistic hedging system integrated with planning to make decisions on the use of foreign exchange as well as commodity and interest rate derivatives [43].

D. Balaburkina [44] shows that, in a telecommunication company, exchange rate exposure affects operating cash flows, as some of the company's revenues and expenses are nominated in foreign currency. However, the effect on financial cash flows from foreign currency nominated loans and interest payments is much more profound. The author suggests hedging them with foreign exchange options. S. Shvets and A. Sobolev [48] state that importing innovative equipment and hardware components is the major cause of FX exposure for telecom companies; however, they do not specify whether operating or financing cash flows are affected, nor do they suggest any hedging strategies.

V. Cherkasova [29] demonstrates that oil and gas companies have both FX nominated export revenues and costs stemming from investments in equipment and participation in international projects, so the total effect is uncertain, explaining why natural hedging is so popular. However, using derivatives can help stabilize operating cash flows.

V. Zaernyuk and N. Snitko [28] mention the importance of FX risks for Russian gold mining companies; however, they do not explore methods for minimizing them or optimal management techniques.

P. Pankov [34] analyzed hedging practices by PJSC NLMK and noted that, in the metallurgical industry, commodity price and FX risks need to be assessed jointly due to their strong statistical correlation. In 2012–2014, the company used forward contracts to mitigate the FX exposure, while, in 2015–2019, it used “natural” hedging by maintaining optimal long-term open positions in major currencies. Currently, the company hedges revenues in US dollars with Eurobonds and related coupons in US dollars. The author notes that three more Russian companies mention using foreign debt for hedging purposes in their reporting.

JSC Uralkali, producer of fertilizers, hedged its bonds using cross-currency interest rate swaps [22].

G. Mazin [40] claims that Russian non-financial companies, mostly importers, but also exporters, face two factors contributing to future cash flow uncertainties: exchange rate volatility and commodity price volatility; Pankov finds that their statistical correlation is strong [34]. Analysis demonstrates that, on the whole, commodity derivatives used to hedge price risks are much more popular than FX derivatives among Russian companies.

Thus, many authors do not distinguish between the three types of FX exposure and their hedging techniques. Only V. Yurchenko [21] argues that, in Russian hedging theory and practice, translation exposure is not considered separately, as the number of public companies is small, and they are less concerned with their balance sheet values than economic or operating exposures originating from significant changes in business conditions, including regulatory changes. At the same time, risks relating to the market

(commodity prices), FX exchange (transaction exposures) and interest rates are the most relevant for hedging decisions in Russia, according to the author.

Another factor affecting corporate hedging practices is *company size*. I. Khmelev [4] observes that large companies (with revenues of more than 100 billion rubles) tend to hedge operating profits (40%) and cash flows (30%). Overall, large companies (Aeroflot, Novolipetsk Metallurgical Plant, Rosneft, X5 Retail Group, Gazprom Neft, Vimpel-Com) pay much more attention to FX exposure management and mainly use exchange-traded derivatives – options and futures – due to their reliability, despite limited currency pairs and maturities. At the same time, such instruments can be complex and costly for mid-sized companies. S. Shvets and A. Sobolev [48] state that higher risk exposure is typical for small companies, while large corporations are usually more conservative and risk-averse: for them, higher risk levels must be accompanied by higher compensation.

Research shows that corporate hedging practices were strongly affected by the *2008 and 2014 financial crises*. M. Kiseliy [36] mentions that the 2008 crisis demonstrated the inability of Russian businesses to effectively protect themselves from adverse foreign exchange fluctuations.

E. Kayasheva [32] observes that, according to experts, adjustments due to exchange rate volatility accounted for 30–40% of total revenues in 2008, so companies started applying hedging strategies on a larger scale. However, they faced increased counterparty risk and low liquidity and high costs in the derivatives market.

N. Krasovskij [25] mentions that, after 2008, increased volatility in the foreign exchange market has forced many Russian banks to require clients involved in export and/or import transactions to hedge foreign exchange exposure. However, using derivatives is extremely costly in the conditions of exchange rate volatility, and hedging loses its economic sense [36]. Still, I. Khmelev [4] shows that the crisis made companies pay more attention to financial risks management, and the interest in hedging instruments increased. Research by P. Pankov [34] demonstrates Russian blue chips using derivatives for both speculation and hedging after 2008. According to V. Lialin [1], the weakening of the ruble against major currencies since 2013 has contributed to a demand for FX futures among non-financial companies for both FX risk hedging and speculation.

The trend has been ambivalent after the 2014 crisis. On the one hand, research by M. Dmitrieva [5] shows that the percentage of companies recognizing the importance of FX risks has increased, while O. Okorokova and A. Pisetskaja [12] make use of Central Bank statistics to demonstrate an increasing demand for hedging instruments such as currency swaps and options. On the other, P. Pankov [34] observes that the 2014 ruble devaluation and subsequent market volatility made companies revise their hedging practices. For example, PJSC Transneft and others abandoned the use of derivatives and hedging, while other companies started using foreign currency nominated loans for hedging purposes.

Qualitative and Quantitative Studies

Different examples of the use of FX derivatives to hedge FX exposure are described in publications.

E. Kayasheva [32] discusses the use of FX derivatives to hedge transaction exposure. A. Efimov [10] presents accounts receivable and accounts payable hedging strategies employing forward contracts and put and call options. I. Khmelev [4] considers different hedging options available to companies in the Russian market, including exchange-traded (futures) and OTC (forwards and options) contracts, together with their advantages and disadvantages and with examples of hedging deals and their costs.

N. Krasovskij [35] identifies factors limiting the use of futures as hedging instruments, including additional cash needed to pay initial and maintenance margins, potential losses and margin calls, and the limited ability to manage the hedged position. He advocates using OTC currency options due to their flexibility and limited losses; at the same time, he recognizes that their liquidity is lower, leading to an increase in hedging costs.

V. Cherkasova [29] compares the results of using forward and option contracts to hedge operating cash flows and shows that forwards have preference over options because of lower costs.

K. Kurilov [43] proposes hedging USD nominated loans using exchange traded FX options.

D. Balaburkina [44] suggests using delivery futures contracts to hedge long-term foreign currency loans and compares hedging costs with losses from national currency depreciation.

A. D'yachkov [6] discusses using futures contracts to hedge revenues and costs in foreign currencies.

E. Fedosov [45] considers employing put options to hedge revenues; forward contracts and call options to hedge accounts receivable; and currency swaps to hedge foreign currency nominated loans.

However, the survey by M. Dmitrieva [5] shows that FX forward and swap contracts prevail as FX hedging instruments, being used by 74 and 69 percent of respondents, respectively, while only 35 percent of companies use futures contracts. Still, S. Shvets [42] examines FX options for hedging a foreign currency nominated loan and its interest payments.

V. Yurchenko [20] claims that non-financial companies are interested in delivery contracts: for them, exchange traded derivatives are convenient in terms of maturities and expiration dates, while commissions can be as low as 0.1 percent of the contract.

Unlike numerous articles published abroad, Russian research of the effect of hedging *on company value* is limited and fragmented. However, analyzing the foreign literature, M. Dmitrieva [5] states that hedging positively affects company value.

M. Bobrovskaya [8] discusses two existing approaches to account for exchange rate exposure in company valu-

ation: adjusting the discount rate and incorporating the exchange rate factor in the cash flow forecast. She identifies the shortcomings of the first approach and asserts that the cash flow forecast is more methodologically correct as the exchange rates it uses reflect the FX exposure estimate. She employs imitation modelling to forecast expected cash flows and shows that the international diversification of sales increases the company value while augmenting its volatility because of exchange rate risks.

V. Okulov and V. Skripyuk [24] applied imitation modelling to analyze the returns of two portfolios consisting of shares of companies that, according to their reports, used or did not use hedges. The authors demonstrated that the differences in portfolio performance were not statistically significant before 2008, while hedging companies performed better on average during the 2008–2009 crisis. However, during the market recovery, shares of companies that did not use hedges had higher returns. They conclude that investors in the Russian stock market regard hedging as a means to protect their value during a crisis, and in this respect, their behavior is the same as that of investors in developed markets.

G. Mazin [41] states that risk management has a significant impact on the market value of Russian public companies. He analyzes the annual reports of 136 public nonfinancial companies for 2014–2018 to determine whether their market capitalization and stock returns were affected by hedging using derivatives. By applying the Tobin coefficient to compare companies and time-series analysis to test the Fama-French three-factor model, the author demonstrates that public companies using hedging to reduce the volatility of forecast cash flows are traded at a conditional positive premium.

I. Kuchin et al. [49] investigate the impact of currency risk on the cost of equity in BRICS countries, including Russia, by adding currency-risk factors to the Fama-French three factor model. They show that the currency risk premium is positive and significant for companies positively exposed to the depreciation of national currency (exporters) and negative for companies with negative exposure to the national currency depreciation (importers or debtors). Risk premiums for exposure to unfavorable exchange rate movements are negative.

P. Pankov [34] draws on foreign research to argue that there is limited and contradictive empirical data supporting the positive effect of hedging on company value and its investment attractiveness. This is partly due to the ineffective management of hedging, including the suboptimal choice of hedging strategies and excessive hedging costs.

Hedging Costs and Hedging Strategy

Some of the aforementioned publications with hedging examples calculate *hedging costs*.

I. Khmelev [4] discusses different hedging options available to companies in the Russian market, including ex-

change-traded (futures) and OTC (forwards and options) contracts, their advantages and disadvantages, and provides examples of hedging deals and their costs. D. Bala-burkina [44] estimates the cost of hedging foreign currency nominated loans and interest payments using delivery futures contracts as compared to foreign exchange losses (for different levels of depreciation).

The articles [36; 38] state that the costs of foreign exchange exposure hedging are extremely high in Russia due to FX volatility, non-competitive pricing in the OTC market and high transaction costs, amounting to as much as 20 percent of the hedged transaction.

All these examples are based on accounting data; O. Okorokova and A. Pisetskaja [12] outline a procedure to account for hedging costs. However, Pankov [50] reasonably argues that the use of accounting information (financial statements) to assess the effect of hedging is limited to the hedged positions and corresponding derivatives and does not account for other costs and risks associated with the use of derivatives. He suggests an “economic” approach to assess the effectiveness of risk hedging by comparing internal and external benefits, on the one hand, and associated costs and risks, on the other. Internal benefits include profit predictability, improved liquidity, more reliable cash flow forecasting, procurement and sales stabilization, tax optimization; among the external benefits are a better corporate image and higher investment attractiveness due to cash flow stability. Internal costs include high wages of hedging professionals, contract transaction and legal expenses, software, increased financial and tax accounting costs, management monitoring and control, while external costs comprise the value of the hedging instruments, including option premiums and OTC derivative spreads, brokerage and exchange commissions, subscriptions to information sources, and opportunity costs of funds diversion (margins, loans to maintain a position).

As for FX *hedging strategy*, its discussion breaks down into several topics.

The first is whether to use total hedging, i.e. hedging the entire amount of the transaction, which completely eliminates both possible losses and possible additional profits, or selective hedging to mitigate some of the risks [10; 26; 32]. According to I. Kiseleva and N. Simonovich [30], the objective of an effective hedging strategy is not to eliminate risk, but to achieve an optimal risk structure, that is, the relationship between the benefits of hedging and its costs. Another option is to apply hedging when the exchange rate passes some predetermined acceptable level [10].

The second topic, discussed by M. Dmitrieva [5] and E. Afendikova, V. Malyar [17], relates to static and dynamic hedging strategies. M. Dmitrieva [5] states that companies normally use forward contracts for static hedging and futures contracts for dynamic hedging. At the same time, she mentions that exchange traded derivatives are not popular among non-financial companies, which aligns with conclusions by N. Krasovskij [35].

Most authors admit that FX hedging as part of a general risk management practice requires a consistent strategic approach – from risk identification and classification to accounting policy and monitoring. Hedging policies are usually developed by companies, which specify the steps and procedures, responsible employees and decision levels. A. Kurilova [23] suggests a general algorithm that can be used to select financial engineering tools in order to decrease FX, price, interest rate and other potential risks and costs, while increasing company liquidity and profitability.

M. Dmitrieva [5] develops a holistic approach to FX and interest rate management that includes setting hedging objectives and hedged positions, identifying and assessing risks, determining the amount of “risk appetite”, selecting hedging instruments and determining their key parameters, and calculating hedging costs and efficiency, as well as developing internal documents regulating hedging practices and appointing managers responsible for specific activities.

P. Pankov [51] tries to develop an effective algorithm for planning hedging (price, interest rate, and FX risks) as well as speculative transactions involving derivatives for non-financial organizations, depending on the corporate strategy; thus, comprehensive strategic analysis is required to determine the strategic prerequisites for speculation and the strategic problems requiring hedging.

We should note that the proposed algorithms are designed to hedge different risks. This means that FX exposure management should be part of a company-wide risk management strategy. However, A. Suleimanova et al. [26] regard FX exposure as a stand-alone risk and list the steps required to hedge it effectively, including the identification of FX risks, their qualitative and quantitative evaluation, hedging strategy development and implementation, and results monitoring.

FX Exposure Evaluation and Accounting

To manage FX exposure properly, instruments are needed for its evaluation. Using the results of a PwC study, I. Khmelev [4] asserts that, to evaluate financial risks, more than half of the surveyed companies (61 percent) use sensitivity analysis; 50 percent use scenario modeling; and only 11 percent use Value at Risk (VaR) indicators that are the most common method in international practice.

The advantages and disadvantages of the VaR method are discussed in [29; 32; 42; 48]. E. Kayasheva [32] traces its origins to the banking industry, where it was originally developed to assess capital adequacy. V. Cherkasova [29] argues that VaR can be used not only for internal control and information disclosure but also to monitor the effectiveness of hedging strategies, including those using FX derivatives, analyze possible scenarios, and limit risks. She offers an empirical analysis of the applicability of the VaR methodology for investigating the impact of FX rate change on a company's operating cash flows approximated

by EBITDA by incorporating it into the multiple regression model. Of the three strategies considered – no hedging, hedging using a forward contract, and hedging using an option contract – the latter two result in higher profits and lower VaR estimates. Of the two hedging strategies, the strategy using forward contracts provides better results because of lower hedging costs. Thus, the VaR method can be used not only to evaluate risk but also to compare different hedging strategies.

S. Shvets [42] applies different methods – VaR, ETL, Monte Carlo simulation – to evaluate the exposure of foreign currency loans and corresponding interest payments to FX risk and shows that the results are close, possibly overestimated, and nonetheless acceptable for non-financial companies. He identifies another important issue for developing an FX risk management system: determining a company's level of risk tolerance, or losses as a percentage of equity, net profit, or revenue.

A. Sherstobitova and N. Kolacheva [31] discuss existing statistical approaches to risk evaluation and contrast the classic Value-at-Risk method with synthetic evaluation models based on its algorithm, such as Marginal VaR, Incremental VaR, EaR, Cash Flow-at-Risk (C-FaR), as well as beta analysis, SARM, ART, Short Fall, Capital-at-Risk, and Maximum Loss models. According to them, the factors behind the popularity of the VaR model include its software availability, the substantial losses by financial institutions, both from FX risks and from transactions with FX derivatives, and the use of VaR for external monitoring, as the regulator requires commercial banks to use it to determine the volume of reserves. VaR can also be used for internal monitoring. If statistical methods cannot be applied, expert methods such as questionnaires, interviewing, scenario analysis, Delphi, etc. are used.

V. Zaernyuk and N. Snitko [28] list existing instruments of risk evaluation, including models by Marcowitz, Black and Schowls, CAPM, expected shortfall, and Monte Carlo simulation, and discuss their original historical simulation-based Value at Risk (VAR) evaluation method, which is applied to a portfolio of open foreign exchange positions, followed by stress testing.

S. Shvets and A. Sobolev [48] recognize the VaR method as the most common in Russian practice and argue that its limitations can be overcome if the “tail loss” evaluation (ETL – expected tail loss) using such metrics as expected shortfall (ES), tail conditional expectation (TCE), tail VaR (TVaR), conditional VaR (CVaR), etc. are applied. Another approach gaining popularity in the Russian market is spectral risk metrics (SRM) based on companies' willingness to tolerate risk. Testing various methods at different time periods, they show that when markets are relatively stable, the ETL approach can be used to evaluate FX risk, while during crisis periods as well as when trends are mixed, the SRM approach can be more relevant.

V. Yurchenko [21] compares different financial risk assessment techniques, including impact matrix, CAPM, and VaR. He concludes that the historical simulation VaR

method is the optimal choice as it takes into account not only market fluctuations but also the value of assets or liabilities at risk and proposes a VaR calculation algorithm.

Accounting difficulties were cited as one of the problems of using derivatives – a problem that persists today. The specifics of accounting for derivatives in accordance with Russian standards are described in several papers, mostly written by consultants, like A. Chuguj [52], or by professionals sharing their experience [53]. However, they were mainly published in professional magazines or on the web.

However, many non-financial organizations using derivatives are holding structures required to submit their consolidated financial reports according to IFRS. Initially, financial instruments disclosure was regulated by IFRS 7 [24], which was later replaced by IAS 39 and IFRS 9. IFRS 9 permits the use of hedge accounting, which treats an asset and its hedge as one when adjusting the fair value.

O. Okorokova and A. Pisetskaja [12] outline the hedge accounting prerequisites and procedure according to IAS 39 and IFRS 9 and argue that, when accounting for the effect of risk management using derivatives on profits and losses, companies should prioritize content over form for meeting requirements related to organization and administration of hedging transactions. A. Kuz'min [54] advocates centralized FX exposure management by the parent company in the interests of the whole group using IFRS 9.

P. Pankov [55] analyzes the use of hedge accounting in line with IFRS and US GAAP provisions by Russian non-financial blue chips and shows that only half of the sample considered employ this method, despite its advantages such as increased transparency and management performance. On the other hand, the use of hedge accounting increases accounting and auditing expenses, and so the author proposes a methodology to determine whether it is needed. This methodology should be useful for consulting companies providing services in risk hedging.

Conclusions

We can draw the following conclusions from our study. Some of them are related to the reviewed Russian research.

First, Russian publications on derivatives and their use began to appear later and are much less numerous than international research – the topic became popular only in the 2000s with the development of the derivatives market and hedging practices.

Second, Russian research is secondary in comparison to international studies: Russian authors tend to consider issues that have long been discussed and resolved in international research.

Indeed, many Russian specialists ignored international research, especially at first. Of the articles reviewed, only a few [for example, 5; 24, etc.] cite foreign research or are based on it. However, the situation has begun to change for the better, and some recent articles [8; 49] are more aligned

with international research in terms of problems, tools, and discussion level.

Next, most articles are descriptive or analyze secondary data; the share of original research, as well as the use of quantitative instruments, is low. These articles mostly treat model examples, while the factual data is limited to the blue chip sample, probably because public companies have to disclose information on using derivatives. Nevertheless, this makes the research one-sided, as the segment of non-public and mid-sized companies is not analyzed, and their hedging practices are not assessed.

Few authors distinguish between economic and transaction exposure or specify the type of exposure being hedged; the latter becomes clear only from the context. Most studies concentrate on hedging transaction exposure, ignoring economic exposure. Moreover, unlike foreign research focusing on specific types of risk and related hedging instruments, FX risks are often considered together with price and interest rate risks and the corresponding derivatives.

To sum up, Russian academic studies are marked by the following features:-

- Short history of economic analysis in the immature market.
- Focus on transaction exposure and secondary data, which may be explained by a comparably small number of listed companies disclosing accounting data and the limited access to the real financial data of private businesses.
- Limited analysis of statistical models and methods used in FX risk management due to a relatively low level of professional financial knowledge in most Russian corporate companies.

Our second set of conclusions is related to the derivatives market.

Different studies note that the market is still immature, and some issues remain unresolved. The latter include the accountancy and taxation of derivatives (from M. Kiselev in 2012 [36] to E. Afendikova and V. Malyar in 2021 [17]). According to article 304 of the Russian Tax Code, the taxable amount of transactions involving derivatives should be treated separately unless their hedging purpose is substantiated by the company in a special hedging reference. Even if such a reference exists, these deals may be requalified as speculative by tax authorities and entail extra tax liabilities. At the same time, some problems such as high transaction costs mentioned in early studies [36; 38] are not relevant anymore due to the market's development.

Many papers examine derivatives market statistics and hedging trends. However, some of the evidence is contradictory. For example, D. Piskulov [9] estimates the client share at one third of the total bank transactions with FX derivatives by 2016. However, according to official Central Bank of Russia statistics¹, this is true only for FX forwards, while FX swaps and options are much less popular among

¹ URL: http://www.cbr.ru/content/document/file/126537/instruments_market_20210929.pdf

non-financial companies. P. Pankov [34] states that hedging commodity price risks using derivatives is more popular than FX hedging among Russian companies. However, a Central Bank of Russia derivatives market study (2022) notes that commodity derivatives account for an insignificant share of exchange-traded instruments².

Other conclusions are of a more general character and are related to Russian company practices of hedging FX exposure using derivatives.

Starting with E. Kayasheva [32], authors debate about optimal hedging volumes – whether to hedge total FX exposure or only part of it. On the one hand, total hedging minimizes transaction exposure for companies. On the other, it reduces flexibility, as underlying transactions remain vulnerable to unexpected changes in contract conditions, counterparty risk and internal decisions. Thus, the discussion should begin with an evaluation of FX exposure. Along with explicit transaction exposure, companies should consider economic exposure and market risks in general. After identifying risks, they should forecast cash flows depending on the FX rate volatility. However, hedging economic exposure using FX derivatives is still an open issue even in foreign research.

A. Efimov [10] suggests hedging when the exchange rate breaks through some predetermined level, ignoring the fact that hedging costs increase with market volatility. Waiting for a favorable market moment to enter hedging turns it into speculation.

The proposal of V. Cherkasova [29] and D. Balaburkina [44] to select optimal hedging instruments based on their maturities and costs raises doubts, as hedging costs are defined from the accounting standpoint, with options carrying explicit costs (option premiums).

Moreover, using accounting information from financial statements to evaluate the effect of hedging is inadequate, as recognized by P. Pankov [50], because, in accounting terms, hedging generates cash flows that are opposite to changes in other accounting items resulting from market volatility. So, the total anticipated accounting effect should be zero.

As for hedging objectives and results, researchers generally agree that hedging aims at risk mitigation rather than earning extra value, in alignment with hedging theory. However, fundamental quantitative studies are still rare in Russia. The article by I. Kuchin et al. [49] is a good example of the latter, as it contributes to international studies confirming investor behavior patterns and differences in importer and exporter positions observed in other markets.

For further research, P. Pankov [34] suggests analyzing FX risk hedging strategies used by individual non-financial companies, with an expanded sample of firms. Also of interest are hedging strategies and the revision of derivatives use under economic sanctions, when some of the cash flows subject to hedging should no longer be received.

The current political and economic situation has inevitably influenced the FX derivatives market and hedging practices. V. Bel'kovec-Krasnov [56] shows that market volume has decreased overall due to sanctions, the withdrawal of foreign participants from the market, and the blocked assets of companies under sanctions. Secondary effects of sanctions in the interbank market include decreased liquidity on the derivatives market, the lower activity of market makers, and insufficient market information and infrastructure due to the withdrawal of foreign news agencies and trading platforms from the Russian market. As commercial flows gradually reorient to other countries, it is necessary to develop new FX derivatives and a market for them.

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² Market PFI – 2022. URL: https://www.cbr.ru/content/document/file/141791/press_5.pdf

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