DOI: https://doi.org/10.18371/fp.4(36).2019.190228

JEL Classification E64, G11, G21

BANKING ACTIVITY ON THE MARKET OF DERIVATIVE FINANCIAL INSTRUMENTS IN THE CONTEXT OF FOREIGN CURRENCY SECURITY

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Abstract. *In the context of financial globalization and the development of monetary relations, the liberalization of the foreign currency market and its upward impact on economic processes, the problem of financial and currency security management is currently of great interest. To ensure currency security in the conditions of flexible exchange rate, any producer company in the civilized world hedges its risks with derivatives. The progress of foreign currency market liberalization in Ukraine has created the conditions for the use of the common world practice, but in the condition of preliminary solution of the problem of theoretical and methodological support of mechanisms of banking activity in the derivative financial instruments market.*

Keywords: *financial and economic security; bank security threats; currency forwards; risk assessment of currency forwards; derivatives; hedging.*

Аннотация. *В условиях усиления финансовой глобализации и развития денежно-кредитных отношений, либерализации валютного рынка и его восходящего влияния на экономические процессы, особое значение приобретает проблема управления финансовой безопасностью, составляющей которой является валютная. В условиях гибкого курсообразования для обеспечения валютной безопасности любые компании-производители в цивилизованном мире хеджируют свои риски средствами производных финансовых инструментов. Продвижение либерализации валютного рынка в Украине создал условия для использования общепринятой мировой практики, но при условии предварительного решения проблемы теоретико-методологического обеспечения механизмов деятельности банков на рынке производных финансовых инструментов.*

Ключевые слова: *финансово-экономическая безопасность; угрозы безопасности банка; валютные форварды; оценка рисков валютных форвардов; производные финансовые инструменты; хеджирование.*

Introduction. The problem statement of the article is precisely in view of providing mechanisms of banking activity in the derivative financial instruments market due to the development of the market of derivative financial instruments and the growing need of the real market for hedging currency risks. The emerging economic policy paradigm leads to a high level of dollarization, producing a tendency to devaluation processes, which leads to a scientific search to solve the problems of banking activity in the derivatives market through the lens of currency security insurance.

Research Publications and Problem Statement. The research on the problem of banking security is devoted to many theoretical and practical developments in which bank security is considered in terms of economic, financial, information, personnel security and security of individual banking operations. Among the authors who have investigated the issues of banking security, the works of well-known Ukrainian and foreign scientists, in particular O. I. Baranovsky, N. Dudchenko, A. Epifanov, V. A. Gamzu, M. O. Kolodizieva, S. I. Melnyk, M.I. Zubka, O.L. Plastun, A. M. Shtayer, I. B. Tkachuk, N. V. Zachosov and others, can be mentioned.

In the context of the development of a fixed market in economically developed countries, theoretical issues of economic content and risk management by derivative financial instruments have made a significant contribution such scientists, as A.Achkasov, G. Alexader, J. Bailey, K. Bansal Vypule, A.N. Burenin, J.R. Hicks, S. Hughes, J. M. Keynes, V.V. Kiselev, T. W. Koch, R. W. Kolb, J. F. Marshall, K. Redhead, P. S. Rose, G.A. Salich, F. Schwartz, W. Sharp, J. Shinky, V. T. Sevruk, L. Suren, K. Valraven, Y. Williams and others.

Among Ukrainian researchers-theorists who have made a real development of the theory of derivatives and the practical application of currency derivatives of financial instruments, V. I. Mishchenko, L.O. Primostka, O. M. Sochatska and others should be distinguished. Since the beginning of using hedging mechanisms in our country, L. A. Primostka has carried out a number of studies in the field of analytical and accounting aspects of financial derivatives, as well as in solving the problems of formation and development of derivatives market, introduction of hedging in the risk management system in banking institutions [10]. O. M. Sokhotska is the author of scientific research in the context of derivatives and the organization of the term market, in particular the stock market - futures markets [11]. V. I. Mishchenko has carried out a number of scientific studies on the mechanisms of currency hedging by banks using currency derivatives [12].

Despite scientific achievements, nowadays the problem of ensuring bank security in the derivatives market is not solved. There is also no reliable tool for assessing the risks of using derivatives to hedge currency risks in current market.

The purpose of the research is to determine ways to improve the process of bank security management in the context of organizational and methodological provision in terms of performing foreign currency hedging operations by means of forward contracts.

Results of the Research. In the conditions of the economy high dollarization,

weakening in the foreign currency market, especially with securities and derivatives, investments abroad, as well as expansion of the functionality of financial institutions, the research of ensuring the safety of the mechanisms of activity of banks in the market of derivative financial instruments, is relevant.

In countries with a bank-centric model of the financial market (bank-based system), banks have more significant role - they are often positioned as the engine of economic growth. The uniqueness of banks is that they are monetary institutions, financial intermediaries and financial market intermediaries. Banks also act as leading players in the foreign exchange markets and in the sphere of international payments [1, p. 11].

In the context of external relations, the bank is an open system that operates under uncertainty (lack of determination), that is why, the economic security of the bank is determined by the level of economic security of all subsystems that are part of it.

O. I. Baranovsky notes in his researches that the security of the bank is viewed through the lens of protecting the interests of the owners, customers, employees and management of the bank against external and internal threats. It is also the state of its external and internal environment. One of the key elements of banking management, which involves the organization of measures to prevent possible threats to the bank.

To diagnose a commercial bank crisis, it is necessary, first of all, to identify the most probable future threats of its security, the nature and direction of their impact, by the status quo analysis of and development forecast. According to O. I. Baranovsky [1], in addition to clearly quantified parameters of financial security of banking institutions, qualitative indicators should be also used. Thus, the overall efficiency of banking, along with components such as solvency, profitability, satisfaction of diverse customer needs, should include economic reliability (quality) - a characteristic that reflects the effectiveness of the impact on the non-financial sector of the economy, which includes industrial and agricultural production, construction, transport etc. Therefore, the scientist emphasizes that the concept of “reliability of the bank” is complex and is determined by the degree of conformity of the results of the bank's activities to the set goals (requirements): firstly, as a proper bank; secondly, as an element of the banking system; thirdly, as an element of the financial and credit mechanism of the state [1, p. 218].

The main types of risks for the derivatives market are: liquidity risk, arising from small volumes of transactions with certain instruments and insufficient number of participants; settlement risk caused by counterparty risk; price risk, caused by fluctuations in derivative quotes; legal risk associated with the incompleteness of the legal base formation [1, p. 422].

However, despite the spread of currency risk hedging practices, in Ukraine this segment of the market remains underdeveloped and regulated, exposing financial institutions and entrepreneurs to significant risks.

According to the NBU, at present, the share of SDR operations in the Interbank Currency Market of Ukraine exceeds 97% [8].

There are also regulatory restrictions. According to the NBU Resolution No. 5,

bank clients carry out foreign currency buying and selling operations on hryvnia on "forward" terms (with or without foreign currency delivery) and on swap terms exclusively through banks [12].

Banks are prohibited to conduct transactions in buying and selling foreign currency on hryvnia under "forward" terms (with or without delivery of foreign currency), except:

- transactions with resident clients (SOEs and FDs - entrepreneurs) to hedge customers with the risk of changes in foreign currency exchange rates for transactions: on export and import of goods (products, works, services, intellectual property rights and other non-property rights intended for sale / payment transfer);
- under the loan agreements of resident borrowers to raise funds from non-residents or from the bank.

In the context of flexible exchange rate, a worldwide practice, that has become widespread, is the practice of hedging currency risk producers with financial instruments such as forwards, swaps, etc.

Forward contract, or forward is an agreement that provides the calculations, that exceed current (cash) terms of foreign exchange transactions - spot conditions (up to 3 days).

Therefore, it is possible to buy or sell currency either now or in the future - in a week, a month, half a year, etc. To calculate the forward price (price on the date of currency exchange), it is worth noting that this is not the forecast rate, but the price of buying / selling currency after a while, which is determined as the SPOT rate multiplied by the interest rate difference of the two currencies:

$$Forward\ rate = SPOT\ rate \times \left(1 + \frac{\%UAH - \%USD}{100}\right) \quad (1)$$

For example, we model hedges by entering into forward contracts [8]. The manufacturing company wants to buy dollars with the delivery of the currency in half a year, but to fix the current rate for now. In this case, the bank is credited in UAH at 14%. At the corresponding value in UAH, the bank purchases currency (at 25 UAH / USD), placing on deposit at 4%. The current exchange rate is UAH 25 / USD, the cost of hryvnia loans is 14% per annum, and the value of dollar loans is 4% per annum. In fact, bank expenses (4% -14%) are - 10% per annum. For 6 months it is 5% per annum (-10%: 12 × 6). The bank charges the relevant costs in the price for the client: 25 + 5% = 26.25 UAH / USD. Therefore, the cost of operations is 26.25. The price also includes the services of a bank (conditional 0.5 UAH), and we will get the purchase price of the currency for the hedging company - 26.75 UAH / USD. In the same conditions, if after half a year the client prefers to sell the currency, a similar but reverse process takes place. The bank receives a loan in foreign currency at 4%, sells it (at 25 UAH per USD) and places the hryvnia on deposit at 14%. Thus, the bank makes a profit of: 14% -4% = 10% per annum, and for 6 months it is 5%. The bank adds this profit to the price for the client: 25 + 5% = 26.25 UAH / USD, which is the cost. The motivation of the bank should also be taken into account - since it buys, then minus the contingent 0.5 UAH, it proposes to sell the currency at 25.75 UAH / USD, having fixed this rate at the present time.

Therefore, the forward rate (the future rate of currency supply) is the rate of the future transaction, calculated on the basis of the current rate difference between the currencies.

At the time of the conclusion of the agreement, only forward coverage is required, that is a contribution in the form of a security deposit in case of default by the client. This is a matter of agreement between the bank and the customer (banks may even offer a loan to cover it).

For Ukrainian banks, hedging operations do not cause risks, and this allows manufacturers to fix the exchange rate for the future that is acceptable to them, to put appropriate costs into the business plan and not to worry about fluctuations in exchange rates.

The real sector has a fixed income level and the ability to plan business activities. And getting more profit from the change of currency rate is the area of activity of professional market speculators, not of the producers companies. Hedging is a currency risk management that does not prevent a negative event, but if the event occurs and the transaction is properly insured, the negative impact of such event is significantly mitigated.

In terms of risk management organization, and therefore the assessment and minimization of threats to the security of banking activities, the analysis of the types of risks that affect the financial activities of banking institutions is paramount.

Modern risk management theory answers the question of what can be risk and how to measure it. Risk, according to theory, should be understood as standard deviation of cost [9].

In practice, the use of risk as a standard deviation has several disadvantages. With the development of financial markets, alternative methods of risk measurement and management have also evolved. One such method of risk measurement is known as Value-at-Risk (VAR). Using the concept of VAR as a value of risk is formulated the problem of finding the optimal distribution of “yield-risk”.

The achievements of scientists who have undertaken a number of scientific developments and researches cannot be overestimated, but the issues of ensuring the bank security in the derivatives market require concretization of the studies in assessing the quantitative and qualitative characteristics of the bank's risks, and thus threats to the bank security. The overall objective of the research is to improve the methodology of value-at-risk assessment and to update the issues of the mechanisms of the banking activity in the derivatives market, including the conduct of forward contracts in the context of currency security management.

The key tasks of quantitative assessment of bank risks are to carry out quantitative measurement, evaluation and comparison of elements of these economic processes, interconnections, trends, regularities with their description in the system of economic indicators, which is impossible without the use of statistical, mathematical methods and models. Economic and mathematical methods allow to carry out qualitative and quantitative analysis of economic phenomena, to quantify the value of risk and market uncertainty, to choose the most effective (optimal) solution. Economic and mathematical analysis methods that regulate

economic activity, taking into account external and internal threats and offering the choice of optimal solutions, allow to mathematically analyze, measure the values and opportunities of risk minimization, to program risk for the best management of activities based on reducing uncertainty in decision making result.

To calculate the values, one of the most common models - the non-parametric model (historical modeling), will be used [8].

In historical modeling, historical data is used to reflect changes in the changing state, namely, an empirical distribution function is constructed.

The empirical distribution function is formed as follows. Let X be a random variable that has an unknown distribution function F (x), (X1,…, XT) be a sample of this random variable. To construct a sample model, use the notation:

$$\theta(x) = \begin{cases} 0, x \prec 0, \\ 1, x \geq 0 \end{cases} \quad (2)$$

The empirical (selective) distribution function is defined as follows:

$$F_T(x) = \frac{1}{T} \sum_{i=1}^{T} \theta(x - X_i) \quad (3)$$

The empirical distribution function has a stepwise form that makes problems in determining the quantile values. To eliminate this drawback, an alignment is made. Alignment can be accomplished by reconciling FT (x) with core V:

$$f_T(x) = \frac{1}{Th_T} \sum_{i=1}^{T} V\left(\frac{x - X_i}{h_T}\right), \quad (4)$$

where, $f_T(x)$ – distribution density function, and the core V: $R \rightarrow R^+$ meets the condition:

$$\int_{-\infty}^{\infty} V(x)dx = 1 \quad (5)$$

the sequence $\{f_T\}$ is such that

$$h_T \xrightarrow[T \to \infty]{} 0,$$

$$Th_T \xrightarrow[T \to \infty]{} \infty \quad (6)$$

As a function of core V is often used: $V(x) = e^{-x^2/2}$, with some restrictions imposed on $f(x)$, the sequence $\{f_T(x)\}$ is reduced to $f(x)$.

For the sample that underlies the empirical distribution function, we use T of the last yield from the historical series, as recommendation around 250 (Bank of International Settlements Recommendation), followed by the α-quantile, which is the VaR value.

To construct an empirical distribution function, any segment of the historical series that corresponds to any event but has a significant effect on the behavior of the corresponding series, can be used.

To make calculations on a specific example of a hypothetical, close to the actual transaction of hedging the currency risk of the bank, we use a similar example, which is given for the manufacturer. Thus, the bank entered into a three-month forward contract on the terms of the supply of euro currency in the amount of 10 million in exchange for $ 15 million. Currency date is 91 days. The spot exchange rate on the contract date was S (USD / EUR) = 1.5335. The interest rate on three-month loans in USD is

rUSD = 5,469%, in EUR - rEUR = 6,063%.

The basis for calculating of VaR currency forward contract by historical modeling is based on the idea of a historical simulation method, which will remain unchanged in the next period under the conditions of the historical distribution of profitability. Therefore, the VaR estimate uses a true profit distribution. The historical simulation method does not require forecasts and independent serial observations of normal distribution. This approach is a form of empirical distribution, and percentiles are directly defined as empirical percentiles of the historical portfolio return.

The calculation of the risk value of a foreign exchange forward contract will be constructed in a sequence of steps of implementation of actions. The first step is determining the main market factors and calculating the market value of the forward contract.

The market value of this contract is:

$$V_F = \left[S(USD/EUR) \times \frac{EUR10million}{1 + r_{EUR}(31/360)} \right] - \frac{USD15million}{1 + r_{USD}(91/360)} = 32777\,1USD$$

The second step is to collect data and record the real values of market factors over the "historical period" used for VaR calculations. The historical period is 100 days. Daily changes in the values of market factors in sequence are used to form hypothetical values of market factors in VaR calculations.

The third stage is the calculation of hypothetical values of market factors. It's the key stage of VAR calculation. At this stage changes of market factors (growth rate) multiply by VAR calculations the value of market factors that have been formed for the period.

Using the value of market factors, they calculate the contract value changes in one day. An example of calculating the hypothetical values of market factors is given in Table 1.

Table 1

Hypothetical values of market factors

Estimated parameters	Market factors			Market value of the contract, thousand USD
	%, USD	%, EUR	Exchange rate (USD/EUR)	
The real values on the day of VaR calculations	5,469	6,063	1,536	327,771
Day 0	5,688	6,500	1,553	
Day 1	5,688	6,563	1,557	
% changes in the range 0-1	0,000	0,9692	0,2576	
Hypothetical values for the day 1 (1 and 4)	5,469	6,121	1,539	362,713
Hypothetical changes in contract value per day				34,942

Source: formed by the authors [8]

The calculation (Table 1) is repeated 99 more times for each day in the time series of 100 observations, using the values of market factors on the day of VAR calculation and the percentage daily changes of market factors in the time series. As a result, 100 hypothetical values of the change in the market value of the forward contract are acquired (Table 2).

Table 2

Hypothetical changes in the value of a forward contract

Data	Hypothetical values of market factors			Market value of the contract, thousand USD	Changes in the cost of the contract, thousand USD
	%, USD	%, EUR	Exchange rate		
1	5,469	6,121	1,539	362,713	34,942
2	5,379	6,063	1,531	278,216	-49,555
3	5,469	6,005	1,529	270,141	-57,630
4	5,469	6,063	1,542	392,140	64,8
…					
96	5,438	6,063	1,536	332,140	4,369
97	5,438	6,063	1,534	310,766	-17,005
98	5,469	6,125	1,536	325,914	-1,875
99	5,469	6,001	1,536	338,368	10,597
100	5,469	6,063	1,557	539,821	212,05

Source: formed by the authors [8]

The next, fourth stage is characterized by the sorting of changes in contract value. At this stage, the hypothetical changes in the value of the contract are sorted in descending order: from the highest revenue per day to the largest losses per day (Table 3).

Table 3

Empirical distribution of allowable daily earnings / losses under a forward contract

The order of contract yield decline	Approximate market value of the contract, thousand USD	Allowable changes in contract value, thousand USD
1	539,821	212,05
2	480,897	153,126
3	434,228	106,457
4	425,982	98,211
…		
96	230,541	**-97,23 $VaR^{95\%}$**
97	230,319	-97,452
98	203,798	-123,973
99	196,208	-131,563
100	184,564	-143,207

Source: formed by the authors [8]

The sample sorted in descending order is an emp

\\\\irical distribution of one-day changes in the value of a forward contract. Since the entire sample consists of 100 observations, each value has a probability of 1%. As can be seen from Table 3, the highest daily income in this contract is 212.05 thousand USD. And the largest daily losses amount to $ 143,207 thousand USD.

Stage Five: Select the surveillance that matches the VaR with the specified confidence level. In this last step, the value of the loss corresponding to the VaR with the specified probability level is selected.

For example, for 95% VAR, it is necessary to select a daily loss level that has been exceeded in no more than 5% of cases. As in this case, a 100-day sample was used, the VaR 95% resulted in a fifth observation of 97.23 thousand USD.

It is worth noting that the historical modeling method has two drawbacks. First of all, it is quite difficult to obtain a reliable estimate of the extreme percentiles of the distribution with a small number of observations. Also, historical modeling method assumes that yields are independent and identically distributed, so this does not allow volatility to change over time. Solving the problem of optimization of banks risk assessment models in the derivatives market necessitates scientific search in the future.

Using O.I. Baranovsky scientific works we can note that the development of derivatives markets (derivatives) significantly affects the efficiency of banking business, and therefore the economic reliability and security, due to the practical importance of derivatives and hedging operations with the use of appropriate instruments [1, p. 609].

It should also be noted that the use of derivative financial instruments to hedge currency risks, including forward contracts, must necessarily be based on the conclusion of counterbalancing agreements whereby currency risks are proportionally distributed among all their participants.

Conclusions. The conducted research makes it possible to conclude that currency hedging is a complex mechanism that requires specific forms of regulation, supervision and operational procedures. The key obstacles to the development of derivatives include: underdevelopment of the financial market (underdeveloped exchanges, clearing institutions, etc. required to perform foreign currency hedging operations); inconsistency of current legislation with world standards and lack of reliable mechanisms for regulating transactions with currency forwards.

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