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The Application of the Cost Approach to Management of the Commercial Bank's

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Abstract: The study represents the managerial decision-making mechanism for the commercial bank's equity capital based on the dynamic Black-Scholes option model in the context of selecting the method of the capital increase by means of reinvesting profits and through the additional issue of shares.

Key words: Commercial bank, equity capital, cost approach, optional dynamic model, Russia

INTRODUCTION

In the context of unstable economic situation, of particular relevance is the issue of managing equity capital of financial organizations such as commercial banks (Vazquez and Federico, 2015). The purpose of equity management is raising and supporting the sufficient capital level in order to extend the commercial bank's operations as well as provide the risk coverage (Sokic, 2015). As a rule, making a decision on the capital base build-up is based on the calculation and analysis of initial costs in various equity capitalization schemes without paying proper attention to the methods for estimating the prospective cost of equity capital considering its future use. Therefore, recent research in the banking management with respect to the commercial bank's equity capital management methods should be based on the quantitative estimation of the commercial bank's equity capital utilization efficiency characteristics (Dietrich and Hauck, 2014). The cost approach is quite appropriate to satisfy these requirements, using the cost criterion to develop the strategies for increasing equity capital and utilizing it.

It should be noted that the economic situation in Russia has a number of essential peculiarities which do not allow applying the internationally accepted estimation methods and management mechanisms for equity capital, in particular, due to the low development of the banking sector in the stock market (Ng and Rezaee, 2015). In this connection, it becomes more important to develop the equity capital cost estimation methods conforming to the Russian context as a criterion for making decisions on building-up the capital base and capital management mechanisms based on the cost approach considering the specific conditions of the Russian banking business.

It becomes apparent that different commercial bank's equity capital increase methods produce different effect onto its performance as well (Noss and Toffano, 2016; Kosak *et al*., 2015). Accordingly, bank manager shall define the influence of decisions concerning the increase of the equity capital on change of the commercial bank's operating activity.

In this connection, there is a growing need in developing new tools for estimating the equity capital cost which would consider the commercial bank's development dynamics as well as the investors' expectations (He *et al*., 2013). These tools include the real option method. In practice, the Black-Scholes option model is commonly used within the framework of the real option method. The vital feature of the method is its capability to estimate the expediency of the strategies selected by the management from the standpoint of their impact onto the bank equity capital in a rapidly changing environment which promotes obtaining more objective results in estimating equity capital.

MATERIALS AND METHODS

Theory: According to the option model, the cost of equity capital is represented as the cost of the call option composed of the assets and liabilities of a commercial bank (Yang and Zhang, 2013). The Black-Scholes dynamic model is particularly relevant for estimating the cost of companies with compatible assets and liabilities which are continuously changing over time (Amster *et al*.,

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2005). In this regard, the option method may be used for estimating commercial banks as well since this is the sector where assets and liabilities are close in their nature in view of some peculiarities of the business management, mainly due to the raised funds. The market cost of a commercial bank c alculated based on the Black-Scholes option dynamic model is expressed as follows:

$$C = S_e^{-\delta t} * N(d_1) - Xe^{-rt} * N(d_2) \quad (1)$$

where, C is the cost of equity capital of a financial company; N(d)-normal distribution function where d is defined as:

$$d_1 = \frac{\ln\frac{S}{X} + \left(r + \frac{\sigma^2}{2}\right) \times t}{\sqrt{\sigma^2 \times t}}; \quad (2)$$

$$d_2 = d_1 - \sqrt{\sigma^2}$$

Where:

S = The current cost of the bank's assets
X = The nominal cost of the bank's liabilities
r = The riskless investment rate
δ = Dividend yield norm

The application of this formula for estimating the bank's equity capital is based on the assumption that current cost of assents and liabilities considering obtaining further incomes is referred to as the asset price (S) and is the nominal cost of the debt or payments on the raised bank's funds is referred to as the option exercise cost (Hogan, 2015). Furthermore, the option exercise is defined as the hypothetical liquidation of the commercial bank with the discharge of all the available indebtedness at the expense of its assets. Therefore, in this case, the essence of the option is that as if the bank "sells" its assets to creditors with the buyout right at the price of the debt value after a certain period of time (Ajupov and Polteva, 2014). The cost of such option in the Black-Scholes model is the commercial bank's equity capital cost.

Let us consider the methodical approaches to estimating the commercial bank's cost with the application of the option method: S and X indicators which are the amount of the commercial bank's assets and liabilities, respectively, based on the liabilities associated with the raised funds. The riskless rate r within the Black-Scholes model shall be calculates as the average weighted rate in terms of the amount of raised funds which may be determined from the following Eq. 3:

$$r = \frac{\sum_{i=1}^{m} x_i * r_i}{\sum_{i=1}^{m} x_i} \quad (3)$$

where, r_i is the interest rate on the deposit of the i-th customer. The indicator σ (standard deviation) is one of the most important model elements and it is calculated as the standard deviation of the return on assets of the estimated commercial bank. The indicator σ shall be calculated based on the dispersion:

$$Var = \sigma^2 = \frac{1}{2}\sum_{j=1}^{n} \left(\delta_j - \bar{\delta}\right)^2 \quad (4)$$

Where:

δ_j = The interest rate of the jth type of the commercial bank's credit investments
δ = The average weighted value of the interest rate on the bank's credit portfolio
n = The sample size

Debt duration t represents the average weighted term of the bank's deposit and credit portfolios. As a rule, by nature of the banking activity, the average term of the deposit and credit portfolio is not time-matched as a result of low resource stabilization and high demand for the long-term credits by the borrowers (Lin *et al*., 2014). However, employing only the option expiration indicator within the model gives no possibility to consider this aspect of the banking activity. Therefore, the main focus should be on the indicator with longer maturity. The dividend yield (δ) reduces to determining the average weighted interest rate on credit investments:

$$\delta = \frac{\sum_{j=1}^{n} S_j \delta_j}{\sum_{j=1}^{n} S_j}$$

where, δ_j is the interest rate of the credit S_j.

RESULTS AND DISCUSSION

Let us modify the Black-Scholes model parameters for the case, where the bank's equity capital is increased through the profit (internal bank's sources) reinvestment. In this case, the commercial bank's assets (S) may be represented as follows:

$$S = S_u + S_{KB} + S_{cu} + S\upsilon \quad (5)$$

Where:

$S_ê$ = Investment assets
S_{KB} = Credit investments
$S_{C'H}$ = Immobilization amount
$S_â$ = Monetary funds

It should be noted that the investment assets and credit investments alone refer to interest income-generating assets. In this regard, it would be expedient to divide the assets with the growth vector according to the set average weighted interest rate of the credit portfolio (δ) and the assets non-influenced by the interest rate of the credit portfolio:

$$S = S_K + S\upsilon \quad (6)$$

Where:

S_K = The aggregate amount of the bank's investments and credit investments
$S_â$ = The aggregate amount of the bank's monetary funds and immobilization assets

It is obvious that the increase of equity capital as a rule, promotes the increase of the bank's raised funds (X). This, in turn, impacts the cost of equity capital. The Black-Scholes model allows estimating the asset distribution mechanism as a whole and identifying the impact of the bank's deposit base on the capital cost. The option model for estimating the prospective cost of the equity capital increased through the profit reinvestment will be represented as:

$$C(t) = \left(S_k.e^{\delta t} + S_\partial\right)(1+\mathrm{ROE}).N(d_1) - X.e^{r\exists\phi t}.N(d_2) \quad (7)$$

Change of the power sign (δt) and ($r_{эф}t$) is explained by the fact that the assets (as opposed to the option holders) bring the interest yield and subsequently the increase in the share of assets and the increase of the interest rate should promote the bank's equity capital increase. The increase in the amount of raised funds (X), like the raising interest rate (r) results in the decrease of equity capital.

Next, Let us consider the modification the Black-Scholes model parameters for the case where the bank's equity capital is increased through the additional issue of shares.

The additional issue of the bank's shares is referred to the external sources of the bank's equity capital gain. Issue and sale of ordinary and preferential shares are referred to particularly expensive methods due to high cost of preparation to a new issue and placement of shares. Also, there is a risk connected with the shareholder income as compared to the debtholders. Using this capital source poses a threat of erosion for the existing structure of the shareholder capital, majority interests. The capital cost may be expressed as the dividend payouts to the bank owners. It is no coincidence that in market economies the cost of a company or a bank may be determined based on the value of quoted shares. The market value of shares depends on the earnings per share and the capital multiple, the factor P/E. The bank manager's decisions on the increase of equity capital through the additional share issue are built on the estimation of the following factor indicators:

P/B; P/S; P/E

Where:

$$\frac{P}{B} = \frac{P.Q}{CK}; \frac{P}{S} = \frac{P.Q}{Д_{пр}}; \frac{P}{E} = \frac{P.Q}{ЧП} \quad (8)$$

The numerator of each of the given indicators represents the bank's market capitalization. It is obvious that the market capitalization grows with the increase of the number of outstanding shares (Q), in this case the market will tend to eliminate this lack of balance by means of decreasing the market value of shares (P). However, the market value may rise if the bank's operating income ($Д_{пр}$) grows along with the increase of equity capital which in turn, results in the increase of the net profit (ЧП). In this respect, the bank's manager should not only calculate the predicted value of the operating income and net profit but also determine the predicted market value of shares. The statistical data evidence that change of the share quoted price corresponds to the operating income dynamics. Therefore the assessment of a share by the market, P/E factor will be changing in future in proportion to the bank's operating income growth rate. Then, the future value P/E is defined as:

$$\frac{P}{Et} = \frac{P}{E} \times \frac{дпр(t)}{дпр(t-1)} \quad (9)$$

The expected market value of share after the issue:

$$Pt = \frac{P}{E} \times \frac{дпр(t)}{дпр_{(t-1)}} \times EPS_{ср} \quad (10)$$

The future value $EPS_{ср}$ shall be determined in line with the ÅÐS dynamics in the past. So far the predicted values of stock, operating income and future EPS value are concerned, the Eq. 10 should include the probability of achieving the expected results. The risk of non

achievement of the goals by the bank's management is not always due to the internal factors but due to the external ones as well such as the impact of the financial market conjecture. Let us assume n as a risk value including both the internal and external factors then the future value of share will be defined as:

$$P = \frac{P_{(t-1)}}{E} \times \frac{Д_{npt}}{Дпр_{(t-1)}} \times EPS_{cp} \times (1 \pm n) \quad (11)$$

Let us consider the indicator P/B = P.Q/CK in the Eq. 8. When calculating the indicator, the amount of equity capital after the bank's share issue shall be used:

$$CK = CK_{(t-1)} + \Delta CK, \quad (12)$$

Where

ΔCK = Equity capital build-up due to the additional issue of shares

$CK_{(t-1)}$ = The bank's equity capital before the issue of shares

Calculating the indicator P/S Eq. 8 as well as the calculation of the bank's predicted operating income are the most difficult aspects. This requires the bank's manager considering the impact of market conjecture (the demand for credits on the part of the borrowers and the supply of resources on the part of investors) on the amount of raised and placed resources as well as the the bank's operating income. Considering the above, the dynamic option model for estimating the equity capital in case of the additional issue of the bank's shares will take the form:

$$C(t) = P.Q.e^{ROE.t}.N(d_1) - X.e^{rt}.N(d_2) \quad (13)$$

Let us substitute the predicted share value P by the Eq. 10 in the Eq 13:

$$C(t) = \frac{P_{(t-1)}}{E}.\frac{Д_{np_t}}{Дпр(t-1)}.EPS_{cp}.(1 \pm n).Q.e^{ROE.t}.N(d_1)$$
$$-X.e^{rt}.N(d_2)\frac{P}{B} = \frac{P.Q}{CK} < 3.5; \frac{P}{C} = \frac{P.Q}{Д_{np}} \quad (14)$$
$$< 1; ROE = \frac{ЧД}{CK} > 0.15; \frac{ЧД_{(t)}}{ЧД_{(t-1)}} > \frac{Дпр_{(t)}}{Дпр_{(t-1)}}$$

The target function of the decision model Eq. 14 is the maximization of the bank's equity capital cost, whose change dynamics depends on the market capitalization. If the bank shares are in a public sale, their market value would dynamically and multidirectionally change in time.

CONCLUSION

The model of decision-making mechanism represented as the target function and limitations in the equation system Eq. 14 enables bank managers monitoring the dynamics of the bank's equity capital change on a real-time basis, detecting the equity capital volatility reasons and developing the efficient managerial decisions based on this knowledge. Thus, the bank's manager can select the method for increasing equity capital using the cost criterion.

It is worth mentioning that both value increase methods may be implemented simultaneously. In this case, the preconditions are the non-negative capital cost value N(t) in the option model, Eq. 7-14 and exceedance of its value over the current cost determined by the Eq. 1. Finally, the increase of equity capital as well as its proper management are the prerequisites for the bank's stability, its efficient performance, scalability and, ultimately, for maintaining its competitiveness.

REFERENCES

Ajupov, A. and T. Polteva, 2014. Handling depositary receipts for global financial markets. Life Sci. J., 11: 464-468.

Amster, P., C.G. Averbuj, M.C. Mariani and D. Rial, 2005. A black-scholes option pricing model with transaction costs. J. Math. Anal. Appl., 303: 688-695.

Dietrich, D. and A. Hauck, 2014. Bank capital regulation, loan contracts and corporate investment. Q. Rev. Econ. Finance, 54: 230-241.

He, W.P., A. Lepone and H. Leung, 2013. Information asymmetry and the cost of equity capital. Int. Rev. Econ. Finance, 27: 611-620.

Hogan, T.L., 2015. Capital and risk in commercial banking: A comparison of capital and risk-based capital ratios. Q. Rev. Econ. Finance, 57: 32-45.

Kosak, M., S. Li, I. Loncarski and M. Marinc, 2015. Quality of bank capital and bank lending behavior during the global financial crisis. Intl. Rev. Financial Anal., 37: 168-183.

Lin, J.H., J.Y. Tsai and W.M. Hung, 2014. Bank equity risk under bailout programs of loan guarantee and/or equity capital injection. Intl. Rev. Econ. Finance, 31: 263-274.

Ng, A.C. and Z. Rezaee, 2015. Business sustainability performance and cost of equity capital. J. Corporate Finance, 34: 128-149.

Noss, J. and P. Toffano, 2016. Estimating the impact of changes in aggregate bank capital requirements on lending and growth during an upswing. J. Banking Finance, 62: 15-27.

Sokic, A., 2015. Cost efficiency of the banking industry and unilateral euroisation: A stochastic frontier approach in Serbia and Montenegro. Econ. Syst., 39: 541-551.

Vazquez, F. and P. Federico, 2015. Bank funding structures and risk: Evidence from the global financial crisis. J. Banking Finance, 61: 1-14.

Yang, Z. and H. Zhang, 2013. Optimal capital structure with an equity-for-guarantee swap. Econ. Lett., 118: 355-359.