
MODELING THE SOURCES OF VALUE IN BANKS AND VALUATION THROUGH THE DISCOUNTED CASH FLOW METHOD

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Abstract: We propose an upgrade, adaptation and implementation of a factor model of historical financial analysis, forecasting and valuation of the banking institution through the method of discounted cash flows based on publicly accessible data, which can be applied in the practice. We research the adequacy and plausibility of the approach, its benefits and drawbacks, as we test it on Unicredit Bulbank Ltd, and we apply a comparative valuation approach and accounting reference values of control of the obtained results. The research objective is to upgrade and calibrate the model by introducing restrictive conditions for forecasting in compliance with the existing regulatory framework and the observations of the practice. For this purpose, we have also introduced a feasible parametrization and we have brought forth relevant recommendations for forecasting the activity of banking financial institutions.

Key words: factor model, value of a bank, CAMP², discounted cash flow model, shareholders' net income.

JEL: G21, C31, C39.

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Introduction

There are various approaches and methods for determining the value of companies in the theory and the practice, as generally they can be divided into three major groups – approach based on the assets, approach based on market comparisons and approach based on income. Each of

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² Capital Asset Pricing Model

these approaches has its own benefits and drawbacks, while the obtained results vary depending on the implemented approaches.

Bearing in mind the specific activity of financial institutions, in particular banks, determining their value presents a serious challenge. On the other hand, however, as it is with every business, the purpose of bank management is to maximize its shareholders' wealth through the maximization of the bank's share prices. In this paper, we propose an upgrade, adaptation and implementation of a factor model of historical analysis, forecasting and valuation of a banking financial institution through the discounted cash flow method (in particular, the Cash-Flow-To-Equity Valuation Model) based on publicly accessible data, which can be applied in the practice.

As a basis, we have implemented the factor model of forecasting the free cash flow of existing enterprises in the real sector developed by Copeland, Koller, Murrin (Copeland, Koller, Murrin, 1996), upgraded by Koller, Goedhart, Wessels (Koller, Goedhart, Wessels, 2010), and modified for commercial banking financial institutions by Zlatin Sarastov thereafter (Sarastov, 2017).

It is termed "factor model" because the free cash flows, i.e., the expected income, is calculated by bearing in mind the factors which shape them up. In other words, the model does not directly forecast the income itself, but the factors on which it depends, accepting that individual factors can be analyzed and forecast more precisely than the income itself.

We briefly present this model and our proposals for remedying some of its defects. The model treats an abstract economic model of a bank. We start by applying Mishkin's definition of a banking financial institution (Mishkin, 2004) according to whom, it is a "financial broker, attracting funds mainly through cheque, saving and term deposits, which are then used for granting commercial, consumer or mortgage loans, as well as for the purchase of bonds".

The following balance sheet equation sets the basis of the valuation model:

$$L + B + K + R = F + D + E \quad (1),$$

where E is the owner's equity, D is the issued debt, F is the deposit mass, K is the credit portfolio, B are the bonds in the portfolio, L are the liquid resources, and R are the real assets.

The model is also based on a summary income statement presented in equation (2) as we use the following notation: RI are the interest incomes, RE are the interest expenses QI are the non-interest incomes, QE are the non-

interest expenses, C are the operating expenses, T_c are the corporate income taxes, and NI is the net income.

$$\widetilde{R}I_t - \widetilde{R}E_t + \widetilde{Q}I_t - \widetilde{Q}E_t - \widetilde{C}_t - \widetilde{T}c_t = \widetilde{N}I_t \quad (2)$$

We propose the inclusion of an element reflecting the expenses for devaluation of assets and inventories, X , as this is a major factor for the financial result of banking financial institutions, whose activity is based on the assumption of “unfinished transaction” and depends on the quality of portfolios of loans and bonds. Among the financial assets³ and liabilities in the bank’s balance we find exclusively the unfinished transactions – overdue loans and unpaid deposits, etc. The so modified equation (2) will have the following expression:

$$\widetilde{R}I_t - \widetilde{R}E_t + \widetilde{Q}I_t - \widetilde{Q}E_t - \widetilde{X}_t - \widetilde{C}_t - \widetilde{T}c_t = \widetilde{N}I_t \quad (3)$$

A key assumption in the model is that the value of the capital of a bank equals the existing value of the future cash flows which belong to it, as this value equals the future cash flows discounted by a risk-corrected discount percent applicable to financial assets of the same risk class.⁴ In evaluating the bank, we use in the numerator (4) the free cash flows towards the owner’s equity, not those towards the whole enterprise, as in this way we treat the attracted resource as “a raw material in the process of production of loans”.

$$V_e = \sum_{t=1}^{\infty} \frac{E(\widetilde{CFE}_t)}{(1+k_e)^t} \quad (4),$$

where V_e is the value of capital, \widetilde{CFE}_t are the cash flows, k_e is the discount percent, and E is the expectation operator.

According to Koller, Goedhart, Wessels, (Koller, Goedhart, Wessels, 2010) the free cash flows are defined in the following equation:

$$\widetilde{CFE}_t = \widetilde{N}I_t - \Delta E_t + \widetilde{OCI}_t \quad (5),$$

where $\widetilde{N}I_t$ is the net income, which is defined in equation (3), ΔE_t is the change of the paper capital value, assuming the raising or buying back owner’s equity, while \widetilde{OCI}_t is any other comprehensive income which does not result from the main activity. Special emphasis shall be placed on the changes in the owner’s equity, ΔE_t , which in banking financial institutions often arise from the application of the requirements of capital adequacy. We can conclude that these are the reinvestments necessary for maintaining and expanding the activity.

In equation (3) the income entries depend on both the volume of the individual activities they are related to, and on the profitability rates, correspondingly, the expenses rates related to them. Therefore, we would

³ With the exception of the liquid funds in the assets.

⁴ Determined, for instance, through the capital asset pricing model (CAPM).

rather analyze and expand the components of equation (3), as we accept as a starting point the formulation of Copeland et al (Copeland, 1996) that similar to the enterprises of the real sector, the banks' value depends mainly on two factors: (a) sales volume and (b) the operative result (margin) resulting from those sales. According to Zlatin Sarastov (Sarastov, 2017) unlike the enterprises of the real sector, however, the sales volume in banks reflects primarily the balance, i.e., in the items reflecting the attraction of deposits and granting loans or is related to it. This is an abstraction, which, however, shall be made under the following conditions:

- A large number of – loans and deposits, but not all deals are entered in the balance sheet;
- Some of the non-interest incomes and expenses result directly from the balance sheet positions, but there are also such that rather depend on the turnover;
- There are incomes and expenses which are not at all related to balance sheet entries;
- The bank's balance reflects only the unfinished transactions.

Despite this, due to the degree of detailization and abstraction which we use, we can accept that the volume of the activity is related to the balance sheet number and the balance sheet structure, while the latter can serve as an indicator of the volume of banking activity.

In order to perform factor analysis of the sources of value and forecast the value, we shall rely on a system of factor relationships and dependencies, which will serve as the basis on which we will build the factor forecast and valuation model we propose. The proposed by Sarastov (Sarastov, 2017) system of factor relationships and dependencies shall be modified and upgraded on the basis of the observations on historical data related to the Unicredit Bulbank case study, which we use for testing. For instance, the unidirectional relationship financial resource \rightarrow owner's equity shall be replaced by an interrelation. The unidirectional relationship financial resource \rightarrow free cash flows towards the shareholder's equity shall be removed, as the attraction of deposits cannot be treated as a source of free cash flow or income to the shareholders. As the financial resource generates non-interest incomes and expenses and is an element of the leverage effect, we shall build a unidirectional relationship financial resource \rightarrow profitability of the owner's equity. The proposed modified system of factor relationships is presented schematically in Figure 1.

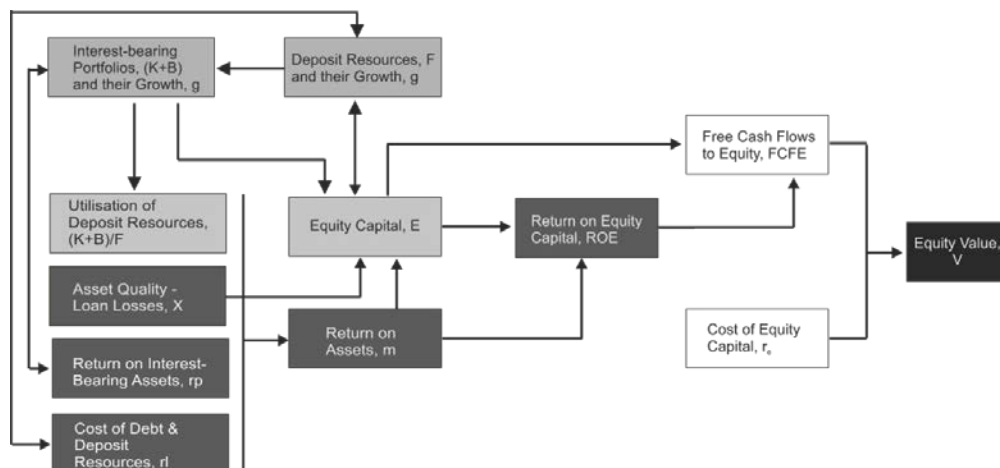


Figure. 1. Factor relationships and dependencies

The attracted and respectively the invested in loans resource and its risk profile determine the requirement of owner's equity, including the fact that banks are the object of capital regulations, but the contrary is also valid, because the owner's equity determines what resource can be attracted and respectively invested. The capital security determines the share of risk-weighted assets which the financial institution can afford. We have made the volume of interest-bearing portfolios dependent on the attracted financial resource, due to both the availability of resource and the requirement of minimal obligatory reserves.

The dynamics of the owner's equity has a direct impact on the cash flows which belong to it. The resource profitability and the amount of the owner's equity determine the return on the owner's equity, which in its absolute expression has a direct impact on the free cash flows. The cash flows themselves, along with the capital price, determine the value of the owner's equity. The presentation of those relationships is a revision of the factor model of Koller, Goedhart, Wessels (Koller, Goedhart, Wessels, 2010) and its orientation towards the banking financial institution of Sarastov (Sarastov, 2017). We place special emphasis on the factors which have an impact on the profitability, mostly the devaluation and provisioning of interest-bearing assets, which is in direct dependency on the quality of assets, especially on the investment (production) function of commercial banks.

On the basis of equation (3) the incomes from interests depend on the interest rate on loans and the profitability of the bonds in a portfolio, as well as the volumes of those portfolios. The expenses on interest depend on the interest on deposits, the interest on issued bonds and the attracted resource, as

well as on the volume of attracted resource on those instruments. Non-interest incomes depend on the volume of the granted non-interest bank products and services, which respectively are determined yet again by the volume of attracted resource on various instruments and their non-interest profitability. The non-interest financial expenses depend on the operation which the bank performs with the aim to secure all its other interest and non-interest incomes activities and again, they are generally dependent on the volume of the attracted resource and the expense rate for this. The operating expenses are predetermined by the amount of the branch network and the central organizational structure of the bank. We must point out, however, that the amount of those expenses predetermines the bank's capacity to attract financial resource and respectively to make a quality investment. Taxes are the function of the tax rate and the result before tax payment. We have added to the factor model the expenses for devaluation and provisioning which depend on the volume and quality of granted loans and investment in bonds.

This glance shows that there are two groups of factors (1) related to the scale (volume) of the activities and their growth and (2) the profitability of those activities and its dynamics in the time. As we work with a summary of reported data and cannot outline the interest incomes and expenses generated by the individual entries, what we can do is merge those entries. Thus, for instance, we merge all interest-bearing assets for the purposes of analyzing and forecasting their profitability. In a similar fashion, we approach the passive entries generating expenses for interest. The approach to non-interest incomes is similar. As we do not have access to particular data about the volume of activities which generate them, we accept that the volumes are proportionate to the balance sheet entries with which they are related and calculate the profitability indicators on this alternative basis.

Approach for application

We apply the model discreetly through modeling in a matrix format (by using spreadsheets), as we go through the following stages:

1. Historical analysis of the dynamics of the balance sheet positions, based on the groups of factors which determine the volume of activity, namely B, K, D, F for $t_{-10} \rightarrow t_{-1}$;
2. Historical analysis of the dynamics of profitability and correspondingly the expense rates of the balance sheet positions of the preceding stage based on the equations (6)...(10), $\tilde{r}p_t, \tilde{r}l_t, qi_t, qe_t, c_t$ and x_t for $t_{-10} \rightarrow t_{-1}$;
3. Forecasting the balance sheet positions, B, K, D, F for $t_{-1} \rightarrow t_{-10}$;

4. Forecasting the income and expense rates, $\tilde{r}p_t$, $\tilde{r}l_t$, qi_t , qe_t , c_t and x_t for $t-1 \rightarrow t-10$;

5. Corresponding the result values of liquid assets and capital position to restrictive conditions arising from the requirements of capital adequacy and liquidity;

$$\tilde{r}p_t = \tilde{R}I_t / (\tilde{B}_t + K_t) \quad (6)$$

$$\tilde{r}l_t = \tilde{R}E_t / (\tilde{D}_t + \tilde{F}_t) \quad (7)$$

$$qi_t = \tilde{Q}I_t / (K_t + \tilde{D}_t) \quad (8)$$

$$qe_t = \tilde{Q}E_t / (\tilde{B}_t + K_t + \tilde{D}_t + \tilde{F}_t) \quad (9)$$

$$c_t = \tilde{C}_t / (\tilde{B}_t + K_t + \tilde{D}_t + \tilde{F}_t) \quad (10)$$

$$x_t = \tilde{X}_t / (\tilde{B}_t + K_t) \quad (11)$$

6. Drawing up the forecast incomes and expenses as a product of the forecast expense and income rates and the corresponding forecast balance sheet entries;

7. Drawing up the free cash flows towards the owner's equity by making corrections for the changes in it arising from managerial decisions and the requirements for maintaining capital adequacy according to equation (5).

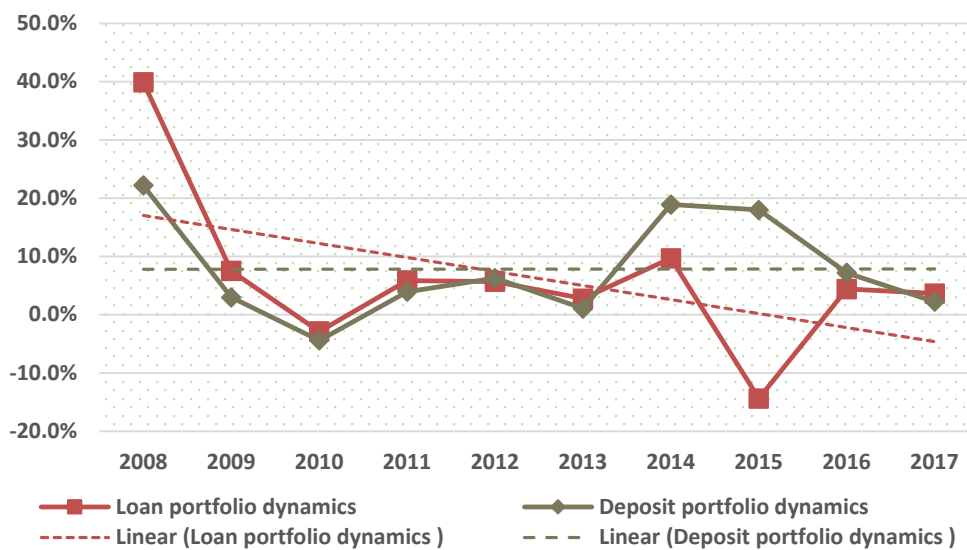
In equations (6) ... (11) the ratios $\tilde{r}p_t$, $\tilde{r}l_t$, qi_t , qe_t , c_t and x_t are respectively the income and expense rates of the corresponding balance sheet positions to which they refer. In this case we have placed the non-finance operating expenses \tilde{C}_t depending on the volume of activity, although within certain limits they are constant under certain conditions.

The restrictions we shall put are related to the requirements of capital adequacy and liquidity. On the basis of historical analysis and maintaining historical levels of capital adequacy we have calculated the ratios $E/(B+K)$ for each period which correspond to the reported levels of capital adequacy. We assume that the risk structure of the portfolios will be preserved, and we will use the ratio $E/(B+K)$ for the forecast periods $t-1 \rightarrow t-10$.

Historical analysis of the activity of Unicredit Bulbank

Following the method described above, as a first step towards the application of the model on Unicredit Bulbank, we will make a historical analysis of the balance sheet entries bearing in mind the groups of factors which determine the volume of activity, namely deposits, loans, bonds, owner's equity and funds.

Loans occupy the largest share in the asset of universal banks and to a large extent their dynamics is determined by the dynamics of deposits; therefore, in Figure 2 we have presented the dynamics of loans and deposits for the period 2008 – 2017. On an average annual basis, the loans amount to 73% of the asset of Unicredit Bulbank, whereas the share of deposits is on average around 83%.



Source. Author's calculations based on data from BNB

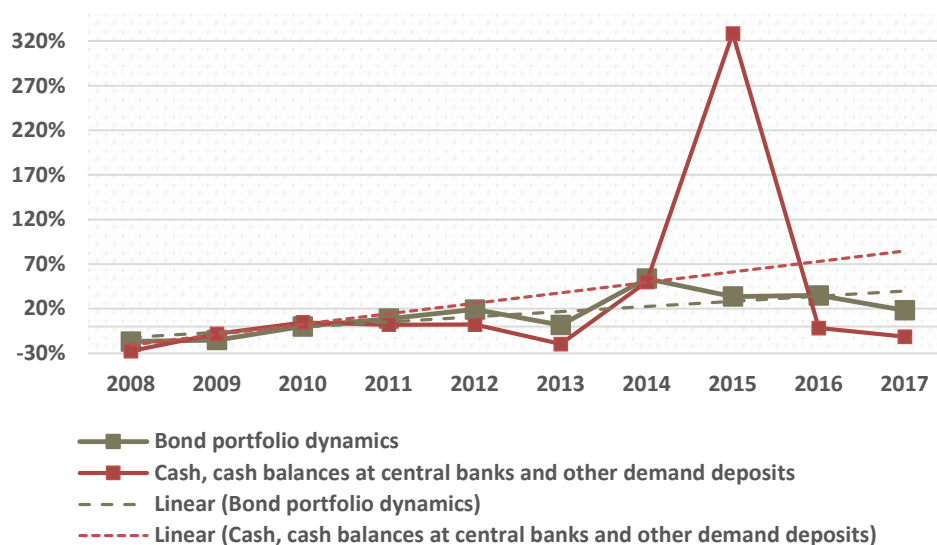
Figure 2. Deposits and loans dynamics

The figure clearly shows that the deposits and loans have nearly the same dynamics, as there are periods in which the dynamics of the credit portfolio is higher than that of the deposits. As we have already commented in the article, this is at the expense of the accumulated overliquidity in the form of funds and bonds. After the year 2014 we observe a constant decrease of the deposit base which can be due to the low interest rates and the movement of savings to more profitable investments. In the meantime, in 2015 loans show the greatest decrease – of over 25% compared to 2014.

The dynamics of the portfolio of bonds and funds, including accounts in the Central Bank, is presented in Figure 3.

The dynamics of funds and bonds is rather different from that of loans, as in most cases the relationship is reverse, i.e., when there is a decrease in loans, the bonds and funds increase, and vice versa. This dependency is by no means accidental, bearing in mind the fact that banks use bonds as an instrument for management of liquidity as well as an alternative source of investment of overliquidity.

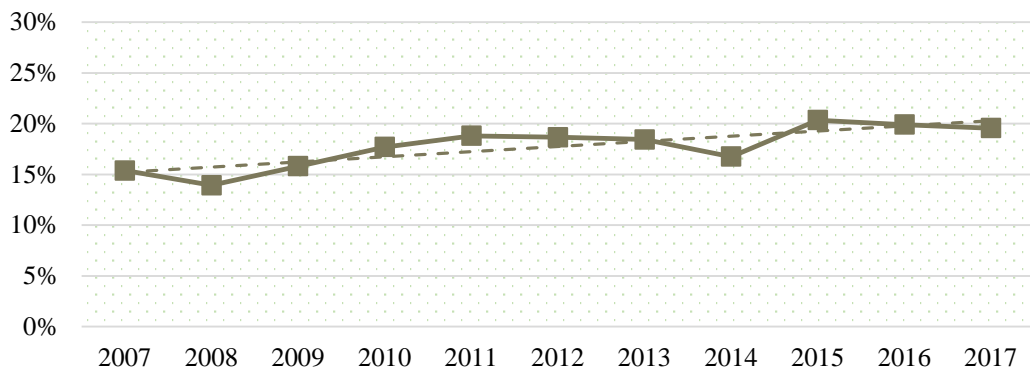
The share of bonds in the portfolio of Unicredit Bulbank varies significantly over the years as its average annual rate is around 12%. The share of funds also varies significantly as its average rate is also around 12%. The highest values of the share of both articles are reported during the last three years of the discussed period.



Source: Author's calculations based on data from BNB

Figure 3. *Bond portfolio and Cash, cash balances at central banks and other demand deposits dynamics*

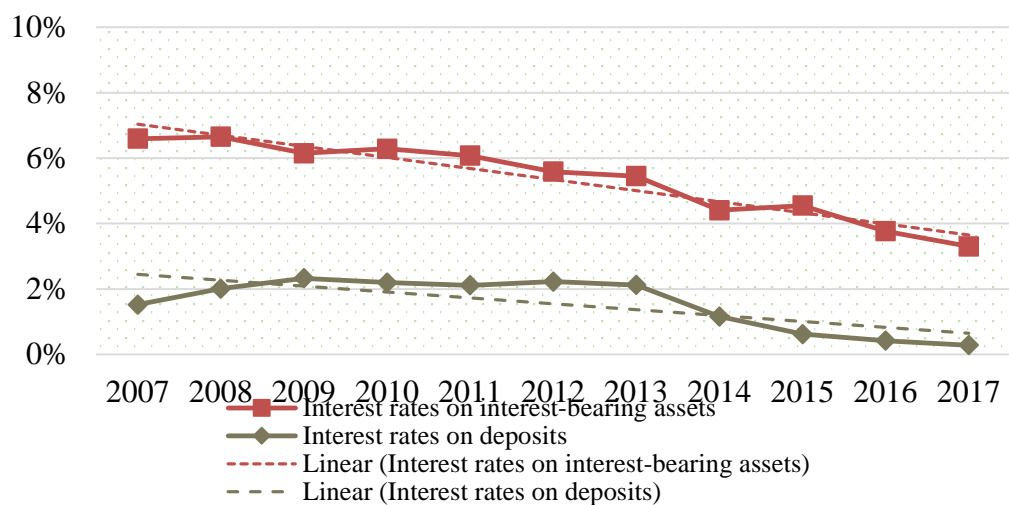
Bearing in mind the requirements of capital adequacy, the dynamics and the share of capital over the years has also been a major factor in determining the value of a bank. With Unicredit Bulbank we observe a constant increase of the ratio between owner's equity and risk assets, as in the highest values are reported in the last three years (see Figure 4). As part of the balance sheet number, the owner's equity is average annual around 15%.



Source. Author's calculations based on data from BNB.

Figure 4. *Ratio Owner's equity/risk assets*

The second step in the application of the model is the historical analysis of the dynamics of profitability and respectively the expense rates of the balance sheet entries of the preceding stage. Bearing in mind the specific activity, the major indicator of the profitability of a bank is the net interest income, or the difference between the interests received from the assets and the interests paid on the attracted resource. The incomes of interest on the other hand are influenced both by the amount of the granted loans, the investment in bonds and the market interest rates, or more particularly the interest policy of the corresponding bank. Analogous to the incomes, the expenses of interest are influenced by the deposit base, the interest rates and the interest policy. Over the last years, banks have been functioning in an environment of low or even negative interest rates, as the effect on individual banks varies. A significant fall of the interest rates can be observed at the calculated interest income and interest expense ratios for Unicredit Bulbank (see Figure 5). This downward trend is particularly pronounced after the year 2013. On the other hand, however, we observe that the bank has managed to keep the spread among the interest income and interest expenses relatively constant over the years, which is one of the reasons why the financial result of the bank continues to rise, not to fall. It is empirically determined that in the short run the interest margins are protected from the fall of interest rates due to the faster adaptation of deposit interests than the loan ones.

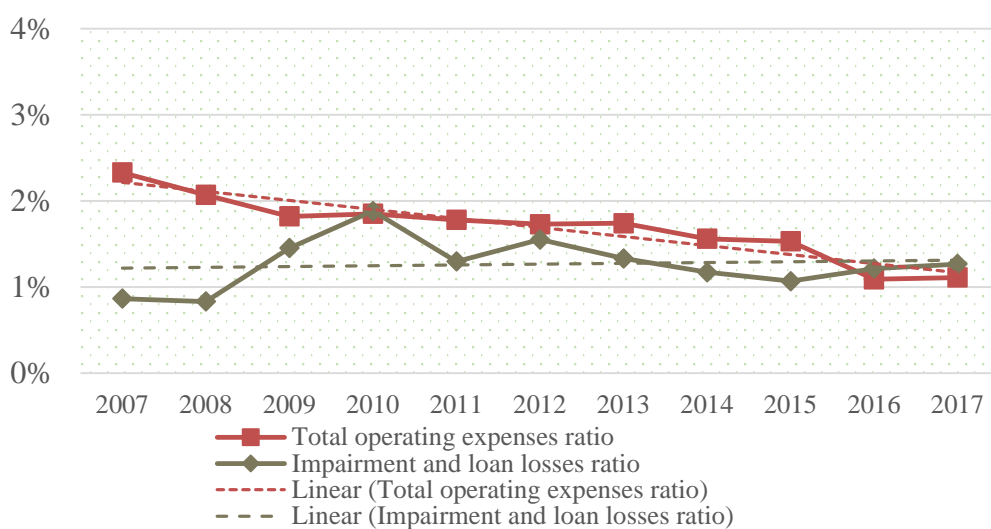


Source: Author's calculations based on data from BNB

Figure 5. Interest income ratio and Interest expenses ratio

The next factor having an influence on the net profit of a bank is the net income from fees and commissions. With Unicredit Bulbank we observe a constant increase of the net income from fees and commissions over the years.

We must also take into account the ratio of total operating expenses, the impairment and loan losses expenses. Bearing in mind their close values, we have presented them in one figure (Figure 6). The ratio of the total operating expenses is calculated as a ratio between the operating expenses and the balance sheet number of Unicredit Bulbank. We observe a constant fall of this ratio during the discussed period against the background of a constantly increasing balance sheet number. This indicates that the bank has managed to achieve economies of scale and to improve its figures in this respect. As regards the impairment and loan losses expenses ratio, no significant changes are observed as the trend over the last years is slightly upward.



Source: Author's calculations based on data from BNB

Figure 6. Total operating expenses ratio and impairment and loan losses ratio

Forecasting the activity

We forecast the activity on the basis of the results of the historical analysis, the available public consensus on the macroeconomic cycle, the monetary policy of the European Central Bank and the Bulgarian National Bank (determining the minimum reserve) and other sources relevant to the forecast that we make.

As a starting point we have selected the last reporting period, namely the data from Unicredit Bulbank for the year 2017. Respectively, the valuation which we have carried out is as of this date.

First, we forecast the volumes of banking activities, which we have accepted as best described in their balance sheet entries.

In an interim report on a project entitled “Valuation of Bulgarian Banks through the Method of Stochastic Modeling”, Emil Harsev, Irina Kazandzhieva and Zlatin Sarastov (Harsev, Kazandzhieva and Sarastov, 2018) conclude that there are statistically significant relationships between the deposit mass of the Bulgarian banking sector and the GDP, as the deposit mass increases both during periods of slowing down of the economic activity and during periods of activation. According to the same authors, this is particularly evident during the period of global financial crisis and the post-crisis period. The loan cycle, argue the same authors, follows the dynamics of the GDP, but is also influenced by the expectations which weaken the significance of the relationship GDP-loans to households and the real sector. As a result of those arguments, we assume that our best action is to extrapolate the growth of the deposit mass and the loan portfolio to the average value of the growth, calculated for the period from 2012–2017, as we eliminate the effect of the global financial crisis and the post-crisis period.

In forecasting the rate of interest incomes and expenses respectively on deposits and loans, we have taken into account the following arguments:

- (1) The period of stimulating interest policy and quantitative relief following the world financial crisis is coming to its end, bearing in mind the public announcements of the monetary authorities in the leading global economies, among which is the ECB. Despite this, in the upcoming several years, we do not forecast a sharp change of the ratios of interest rates and expenses, rather there will be smooth adaptation towards long-term equilibrium levels.
- (2) Despite the downward historical trends, Bulgarian banks manage to maintain stable interest spreads at a level of 4–5%. On the basis of this observation, we think that the interest spreads will be preserved in the future, but at an increase of the interest levels.
- (3) Deposit interests adapt faster than loan interests, which can mean a slight initial shrink of the interest spread for the period until the year 2024. We shall take into account that Unicredit Bulbank, as well as the other banks in Group I, have available overliquidity, as a result of insufficient investment of the available resource and will not be forced to resort to shrinking their spreads in order to preserve their deposit mass.

Undoubtedly, a deeper analysis of the rates of interest income and expenses shall be based on an economic analysis of the spreads and the forward interest curve. We shall leave this for future research, as by itself, it is completely independent research.

The forecast values of the interest rates, ratios and the growth of balance sheet entries is presented in Table 1.

Table 1

Ratio for calculating the forecast values in the report on the financial state and the income statement of Unicredit Bulbank

	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Loan portfolio growth	4%	4%	5%	5%	5%	6%	6%	6%	6%	6%	6%
Bonds and others portfolio growth	-10%	-9%	-9%	-5%	-3%	-9%	-5%	-5%	-5%	3%	2%
Other current assets growth	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%
Deposit growth	2%	2%	3%	3%	3%	3%	4%	4%	4%	4%	4%
Attracted funds from banks and others growth	-8%	-7%	-6%	-6%	-5%	-5%	-3%	1%	1%	1%	1%
Interest income ratio	3.3%	3.3%	3.3%	3.3%	3.3%	3.3%	3.3%	3.8%	4.0%	4.2%	4.2%
Interest expenses ratio	0.2%	0.3%	0.3%	0.4%	0.4%	0.4%	0.4%	0.8%	0.8%	1.0%	1.2%
Non-interest income ratio	1.8%	1.8%	1.8%	1.7%	1.6%	1.6%	1.6%	1.5%	1.5%	1.5%	1.5%
Non-interest expenses ratio	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%
Dividend income ratio	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%
Trade income and other income ratio	0.3%	0.3%	0.3%	0.3%	0.3%	0.3%	0.3%	0.2%	0.1%	0.1%	0.1%
Other income ratio	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%
Impairment and loan losses expenses ratio	1.1%	1.1%	1.1%	1.1%	1.1%	1.1%	1.1%	1.1%	1.1%	1.1%	1.1%

The modeling and devaluation of provisions X is of particular interest. As the purpose of the research is to build a one-sided, based on the expected

values model, we do not forecast eccentric or extreme values related to this indicator.⁵

The future growth of the major factors related to the scale of activity which we have forecast is used by us to develop the forecast balance sheet entries by applying the chain forecast index values iteratively to the exit levels from the year 2017. The results are presented in Appendix 1.

The forecast rates and interest income and expenses and non-interest expenses and income, as well as impairment and provisioning losses are multiplied by the corresponding balance sheet entries to obtain the forecast articles of the income statement. The results are presented in Appendix 2.

In order to exercise control in compliance with the established restrictive conditions of liquidity and capital adequacy, we calculate the forecast values of the share of the owner's equity and cash flows. We ascertain that the forecast expected scenario meets these requirements but is also reflects our arguments about the steady decrease of capital adequacy and the maintained liquidity, as well as a decrease of the bonds share, because their historical and exit levels are economically ineffective.

We have corrected the forecast net income to shareholders with reinvestment. Historically, the dividends paid by Unicredit Bulbank are significantly irregular and fluctuating. Therefore, we determine the reinvestment on the basis of the necessity of maintaining capital and we think that in the long run at least 15% of the net income shall be reinvested in capital to secure the planned growth of 4–5% of balance under the assumption of preserving its risk profile as we have planned an increase of the share of risk weighted assets in increasing the production function, i.e., the share of loans in the assets.

In order to complete the valuation, we shall determine the continuing value. We enclose the formula proposed by Koller, Goedhart, Wessels, D. (2010), which is theoretically grounded and correct.

$$CV = \frac{NI (1 - \frac{g}{RONE})}{k_e - g} (4),$$

where CV is the terminal value for a year t , NI is the net profit for a year $t+1$, g is the growth, $RONE$ is the return on newly issued capital and k_e is the capital price.

We shall also set up a meaningful capital price. There are various approaches for determining the capital price, as in our case we will implement

⁵ We shall leave the effects of such shocks to future research, which on the basis of upgrading and alteration of the current model will introduce stochastic elements of shock modeling, including ones through the Monte Carlo approach.

the most widespread model – the Capital Asset Pricing Model (CAPM). According to CAPM, the capital price equals the required return rate of shareholders, which respectively is a combination of the risk-free return rate and the specific risk premium for the specific enterprise, or $Re = Rf + (Rm - Rf) * \beta$ levered. In determining the discount rate, we will implement as a risk-free return rate the profitability on Bulgaria's 10-year government securities, an average market risk premium for Bulgaria's capital market and a beta leverage rate for banks in the developing markets. The discount percent that we obtain and that we will use in the discounting of shareholders' expected income is 7.7% or 8%. The table below shows the obtained rates and the sources of information.

Table 2

Capital price based on CAPM

Indicator	Value	Source/notes:
Risk-free interest rate	0.83%	Based on data as of January 2019, https://tradingeconomics.com/bulgaria/government-bond-yield
Market premium	8.6%	Based on data from the site Damodaran - http://pages.stern.nyu.edu/~adamodar/
Beta ratio	0.8	Based on data from the site Damodaran, as we have used the beta ratio for banks in the developing markets - http://pages.stern.nyu.edu/~adamodar/
Capital price, k_e		7.7% or 8%

The current value of the owner's equity of Unicredit Bulbank based on the method of discounted cash flows, in particular the Cash-Flow-To-Equity Valuation Model, is BGN3,830,789 (see Table 3).

Table 3

Results of the factor DCF model

Discount rate		Indicative value in convergence (ROE = Re)			Value in convergence (ROE = Re)		
		1.0%	1.5%	2.0%	1.0%	1.5%	2.0%
3.0%	3,151,171	8,623,818	8,666,510	8,709,202	11,774,989	11,817,681	11,860,373
5.5%	2,639,022	3,282,688	3,298,939	3,315,190	5,921,710	5,937,961	5,954,212
8.0%	2,234,625	1,588,301	1,596,164	1,604,027	3,822,926	3,830,789	3,838,652
10.5%	1,911,785	858,530	862,781	867,031	2,770,315	2,774,565	2,778,816
13.0%	1,651,328	495,746	498,200	500,654	2,147,074	2,149,528	2,151,982

Source: Author's calculations

We have implemented comparative analysis for control of the obtained results, which we present in Table 4.

Table 4
Reference value rates

	P/E		P/B		ROE		Valuation based on the model
	Centers	Regional	Centers	Regional	Centers	Regional	
Europe – Reference. *	<u>12.54</u>	14.23	0.65	0.60	6.68%	6.76%	
New markets – Reference. *	15.10	15.45	<u>1.11</u>	0.64	12.68%	35.65%	
Net income Unicredit.	297,653				10.43%		
Accounting value Unicredit.			2,853,255				
Control Values	3,732,569	4,235,602	1,854,616	1,711,953			
	4,494,560	4,598,739	3,167,113	1,826,083			
P/B of Unicredit model							<u>1.34</u>
P/E of Unicredit model							<u>12.87</u>

Source: Author's calculations. *<http://pages.stern.nyu.edu/~adamodar/> 05/01/2019 г.

As Table 4 clearly shows, the calculated current value of Unicredit Bulbank through the implemented DCF model is close to, but slightly higher than the value obtained through the implementation of the P/E ratio for banks in Europe's financial centers. In other words, the obtained value is higher than the price which the market offers for the banks in Europe's financial centers and therefore the P/E ratios are similar. On the other hand, however, the P/E ratio is lower compared to its values for the regional banks and the banks in the financial centers of new markets. Regarding the P/B ratio for Unicredit it is twice as high (1.34) compared to three of the reference values. The unusually low values of the P/B ratio for European banks following the World Financial Crisis have been researched in more details by Bilyana Bogdanova, Ingo Fender and Elod Takats (Bogdanova, Fender and Takats, 2018). The authors conclude that those low values reflect the worries of the market about the stability and profitability of banks, as well as the necessity of change to their business model.

Conclusion

We have further developed and applied a procedure of factor modeling of a bank from the point of view of an external observer. The obtained results and the used control values lead to the conclusion that the modified and

adapted by us model has achieved meaningful behavior and results. Its sensitivity and adequacy in the integration of elements of chances and scenarios will be left for future research stages. Unicredit Bulbank, in preserving the economic trend and in the absence of repercussions, creates value which is much higher than analogous EU counterparts from both old and new member states. The value which we have achieved is above the accounting value of the equity, as well as above the control values based on B/V. On the other hand, however, the obtained value is lower than 3 out of the 4 control values, based on the P/E ratio. This is due to the fact that the bank has at its disposal overliquidity and capital adequacy – they are not well-grounded from the point of view of efficiency.

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Appendix 1. Forecast report on the financial state of Unicredit Bulbank

(thousand BGN)

Assets	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Funds and accounts in the Central Bank	4,079,937	4,438,675	4,669,278	4,913,590	4,971,361	4,960,131	4,978,793	5,021,373	5,040,351	5,043,651	4,858,010	4,672,354
Bonds and other financial instruments	3,879,391	3,491,452	3,142,307	2,828,076	2,686,672	2,606,072	2,345,465	2,228,192	2,116,782	2,010,943	2,071,271	2,112,697
Other current assets	80,337	0	0	0	0	0	0	0	0	0	0	0
Loans and advances to customers net	10,712,950	11,141,468	11,587,127	12,166,483	12,774,807	13,413,548	14,218,360	15,071,462	15,975,750	16,934,295	17,950,352	19,027,374
Investments in associated, subsidiary and joint enterprises	35,337	35,337	35,337	35,337	35,337	35,337	35,337	35,337	35,337	35,337	35,337	35,337
Tangible and intangible assets	308,136	304,524	300,920	298,642	295,893	293,794	293,215	294,317	295,312	298,953	304,163	308,455
Other non-current assets	-	-	-	-	-	-	-	-	-	-	-	-
Total assets	19,096,088	19,411,456	19,734,968	20,242,129	20,764,070	21,308,882	21,871,171	22,650,681	23,463,532	24,323,179	25,219,134	26,156,216
Liabilities and Owner's equity												
Attracted funds from banks and others.	125,381	115,351	107,276	100,839	94,789	90,050	85,547	82,981	83,811	84,649	85,495	86,350
Attracted funds from customers	15,972,985	16,292,445	16,618,294	17,116,842	17,630,348	18,159,258	18,704,036	19,452,197	20,230,285	21,039,497	21,881,076	22,756,320
Tax and other liabilities	103,111	103,111	103,111	103,111	103,111	103,111	103,111	103,111	103,111	103,111	103,111	103,111
Provisions	41,356	41,356	41,356	41,356	41,356	41,356	41,356	41,356	41,356	41,356	41,356	41,356
Total owner's equity	2,853,255	2,859,194	2,864,932	2,879,980	2,894,466	2,915,107	2,937,121	2,971,036	3,004,969	3,054,567	3,108,095	3,169,080
Total liabilities and owner's equity	19,096,088	19,411,456	19,734,968	20,242,129	20,764,070	21,308,882	21,871,171	22,650,681	23,463,532	24,323,179	25,219,134	26,156,216

Appendix 2. Forecast income statement

(thousand BGN)

	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Interest income											
Income from interest and other similar	482,886	486,071	494,820	510,229	528,647	546,606	570,889	687,516	757,810	840,908	887,883
Expenses for interest and other similar	(32,816)	(50,177)	(51,653)	(70,901)	(72,997)	(75,158)	(78,141)	(162,513)	(168,993)	(219,666)	(274,112)
Net interest income	450,071	435,895	443,167	439,328	455,650	471,448	492,748	525,003	588,816	621,242	613,771
Non-interest income											
Income from fees and commissions	246,905	253,849	263,550	258,444	252,582	263,379	276,189	271,545	284,803	298,736	313,378
Expenses for fees and commissions	(26,112)	(26,461)	(27,098)	(27,918)	(28,828)	(29,740)	(30,987)	(32,309)	(33,708)	(35,322)	(37,000)
Net income of fees and commissions	220,793	227,388	236,452	230,526	223,754	233,639	245,203	239,236	251,096	263,414	276,378
Other income											
Income from dividends	177	177	177	177	177	177	177	177	177	177	177
Net income from trade	48,877	49,855	51,351	52,891	54,478	56,112	58,357	40,461	21,039	21,881	22,756
Other income from activity-net	16,292	16,618	17,117	17,630	18,159	18,704	19,452	20,230	21,039	21,881	22,756
Total other income	65,346	66,650	68,644	70,698	72,814	74,993	77,985	60,868	42,256	43,939	45,689
Net expenses for impairment and loan losses	(160,962)	(162,024)	(164,940)	(170,07)	(176,216)	(182,20)	(190,29)	(199,018)	(208,398)	(220,23)	(232,54)
Net efficient income from activity	575,248	567,909	583,323	570,476	576,002	597,877	625,640	626,090	673,770	708,357	703,297
Total operating expenses	-	-	-	-	-	-	-	-	-	-	-
Administrative expenses	(203,833)	(203,833)	(203,833)	(203,833)	(203,833)	(203,833)	(203,833)	(203,833)	(203,833)	(203,833)	(203,833)
Expenses on sales and marketing	(8,835)	(8,759)	(8,979)	(8,887)	(9,027)	(9,361)	(9,791)	(9,901)	(10,586)	(11,143)	(11,230)
Total operating expenses	(212,668)	(212,592)	(212,812)	(212,720)	(212,860)	(213,194)	(213,624)	(213,734)	(214,419)	(214,976)	(215,063)
Operating profit before depreciation	362,580	355,316	370,511	357,757	363,143	384,683	412,016	412,355	459,351	493,381	488,234
Depreciation	(36,976)	(36,543)	(36,110)	(35,837)	(35,507)	(35,255)	(35,186)	(35,318)	(35,437)	(35,874)	(36,500)
Operating profit EBT	325,604	318,773	334,401	321,920	327,636	349,428	376,830	377,037	423,914	457,507	451,735
Subsidiaries income	-	-	-	-	-	-	-	-	-	-	-
Profit before taxes	325,604	318,773	334,401	321,920	327,636	349,428	376,830	377,037	423,914	457,507	451,735
Tax on operating profit	(27,054)	(31,877)	(33,440)	(32,192)	(32,764)	(34,943)	(37,683)	(37,704)	(42,391)	(45,751)	(45,173)
Net profit	296,940	286,896	300,961	289,728	294,872	314,485	339,147	339,334	381,522	411,756	406,561

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