7th International Scientific Conference
"Business and Management 2012"
May 10-11, 2012, Vilnius, LITHUANIA

ISSN 2029-4441 print / ISSN 2029-929X online
ISBN 978-609-457-116-9 CD
doi:10.3846/bm.2012.032
http://www.bm.vgtu.lt

VALUATION MODEL FOR LATVIAN BANKS

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Abstract. Considering predicted M&A activities in banking sector, bank valuation is one of the most actual issues on the agenda. Some valuation specialists consider that a valuation of a financial institution can be undertaken mainly using Discounted Cash Flow approach. However, we face some difficulties while using this method for valuation of Latvian commercial banks. The goal of the research is to develop a mathematical model as an alternative to existing company's valuation models. The factors affecting bank value are represented by financial ratios that were selected, using correlation analysis. The real value of a bank estimated based on average P/B ratio for CEE banks.

Keywords: valuation, banks, correlation analysis, regression.

Jel classification: C20

1. Introduction

The recent financial crises and associated turmoil in the capital markets have created extraordinary opportunities for mergers and acquisitions.The M&A market has already emerged from depressed levels due to the financial distress of the credit crisis (Wong 2011). In 2010 deal activity increased 34 per cent comparing with the previous year (Business Valuation Resources 2011).

According to the new KPMG survey, dealmakers have expressed optimism that M&A markets will continue to improve in 2012. Besides, the respondents expect that M&A activity will be greatest in banking (KPMG 2011). PriceWaterHouse Coopers' consultants also believe that banking sector will remain relatively active area of M&A during the early part of 2012 (Price Waterhouse Coopers' 2011).

The valuation of an entity is an integral part of any M&A transaction. Besides, the value-based management skill is one of the main components of successful doing business today. However, the concept of value makes sense only if it is possible to estimate it. Thus, bank valuation is one of the most actual issues in today's financial business.

The method of Discounted Cash Flow (DCF method) is the most often applied bank valuation method (Copeland *et al.* 2002; Damodaran 2007). Using this method, all future cash flows are estimated and discounted to determinate the present value. It based on valuing either a stream of dividends, which is the Dividend Discount Model (DDM), or a stream of free cash flows, which is the Discounted Cash Flow (DCF) method (Vernimmen *et al.* 2009).

Using the argument that the only cash flows that a stockholder in a publicly traded firm receives are dividends, equity is valued as the present value of the expected dividends (Damodaran 2007). However, to apply DDM properly, it is necessary to predict values of future dividends using retrospective information. For instance, many of Latvian commercial banks do not pay dividends or pay them irregularly. Besides, using DDM can lead to the improper valuation of a bank, if, for instance, dividends are paid less, than a bank can afford to pay. However, using Cash Flow to Equity Discount model in Latvia, we face other challenges, such as discount rate estimation (Titko, Lace 2009).

Due to the limitations in the technical applicability of the DCF, analysts are forced to rely in practice upon valuation multiples and subjective judgments of whether the market price 'feels right' (Imam *et al.* 2008).

The goal of the reasearch is to develop a regression model for valuation of a commercial bank of Latvia. The research is conducted by the analogy with our previous study for European banks (Titko, Kozlovskis 2011).

The factors affecting bank value are represented by financial ratios that were selected, based on the results of correlation analysis. It is often applied method in economic studies (Lakštutiene *et al.* 2011; Lee *et al.* 2011). The "theoretical" value of banks was calculated, using price-to-book ratio as a multiple (CFA 2010). It is not possible to use such measure as market capitalization, because the shares of only few banks in Baltic region are quoted in the stock exchange (NASDAQ OMX 2011).

2. Research description and empirical results

To achieve the goal of the research, the following tasks should be accomplished:

1. To form the initial data base. The resulting variable (y) is a bank value estimated using average value of P/B ratio for banks of Central and Eastern Europe region. It was not possible to use P/E ratio, because since 2008 almost all Latvian banks end the year with losses (Association of Latvian Commercial Banks 2011).
2. To check the degree of correlation between the selected arguments and the function.
3. To compose various regression equations describing relationships between function and the most valuable arguments.
4. To check the adequacy of the equations. The decision about the reliability of the model is made based on the value of the determination coefficient and F-test results.
5. Using the most adequate equation, to calculate the value of the selected banks.
6. To analyse the reliability of the results, comparing model-estimated values with real values of the banks and evaluating the residuals.

2.1. Selection of the model arguments

Value of a company is influenced by range of factors, such as company's performance results and development plans, trends in economy and attitude of market participants.

The first task of our survey was to select a range of indices that can be included into the valuation model. We started with analyzing banks' performance, using the indicies of the financial ratio analysis (Gitman 2006; Bodie, Merton 2000).

Based on theory, company's value depends on its ability to generate cash flows from business activities (Damodaran 2007; Fabozzi, Drake 2009; Sinkey 2007). So, it is necessary to check the correlation between a bank value and a value of cash flow (CF). It is logically to assume the strong relationships between profitability and company's value. That is why we used return on assets (ROA) and return on equity (ROE) for the analysis.

We analyzed the relationships between a value of the selected banks and twenty bank performance indicators in total. To select the indicators we used analytical reports of European Central Bank (European Central Bank 2010), International Monetary Fund (International Monetary Fund 2006) and Financial and Capital Market Comission (Financial and Capital Market Comission 2011), and the results of our previous research in the field of performance measurement in banking (Titko, Lace 2010). All the indices are divided into five groups (Table 1):

Table 1. Indices for the correlation analysis

No	Group	Indices
1	Profitability and efficiency indices	ROA – return on assets; ROE – return on equity; NIM – net interest margin; CI – cost-to-income ratio.
2	Income and cash flow statement indices	NII – net interest income; NFCI – net fee and commission income; SE/C – staff expenses as a percentage of total costs; NII/I – net interest income as a percentage of total income; II/IE – interest income to interest expenses; CF – cash flow for the year.
3	Balance sheet indices	D/L – deposits to loans; L/A – loans to assets; A – total assets; D – total deposits.
4	Asset quality	NPL/L – non-performing loans to total loans; P – provisions for doubtful loans; P/L – provisions to loans.
5	Capital adequacy	CAR – capital adequacy ratio; E/A – equity to assets; E/L – equity to liabilities.

At the current moment 32 banks operate in Latvia, including 10 branches of foreign banks. We used information on financial performance of 18 Latvian commercial banks for the analysis.

The only one criterion was used for the selection – the sufficiently long history of business activities to get statistically significant results.

The values of Pearson's product-momentum correlation coefficient are received, based on processing of statistical information over a period of 2006–2010. The results of the correlation analysis for each bank are presented below (Table 2).

The received results indicate the fact that the correlation coefficients between the selected financial ratios and bank value differ widely in some cases. For instance, for such indicators, as cash flow, capital adequacy ratio, equity-to-assets and some others the cases of strong negative and positive correlation occur simultaneously.

The summary for the correlation analysis (minimum value, maximum value and median of correlation coefficients for each index) is presented in the Table 3.

Table 2. Pearson's correlation coefficient (Bank value vs financial performance indices of the banks)

	ABLV Bank	Baltikums Bank	DNB banka	GE Money	LHZB	Latvijas Krajbanka	LTB Bank	NORVIK BANKA	Rietumu Banka
ROA	0.791	0.066	0.578	0.947	0.578	0.504	0.147	0.688	0.822
ROE	0.800	0.259	0.565	0.970	0.588	0.480	0.663	0.808	0.865
NIM	0.348	-0.644	-0.269	0.676	-0.409	0.252	0.151	-0.067	0.289
CI	-0.736	-0.318	-0.390	-0.558	0.539	-0.292	-0.554	-0.052	0.195
NII	0.285	-0.568	-0.231	0.695	-0.604	0.270	0.411	0.031	0.342
NFCI	-0.738	-0.688	-0.190	0.854	0.394	-0.288	0.614	-0.691	-0.002
SE/C	-0.634	0.302	0.622	0.493	-0.501	0.468	-0.536	-0.222	-0.452
NII/I	0.249	0.555	0.273	0.589	-0.202	0.445	0.486	0.534	0.441
NPL/L	-0.521	n/a	-0.564	-0.791	-0.984	-0.577	n/a	-0.670	0.313
P	-0.856	-0.362	-0.546	-0.739	-0.586	-0.422	0.251	-0.854	-0.957
P/L	-0.831	-0.414	-0.548	-0.738	-0.562	-0.429	0.364	-0.864	-0.948
D/L	-0.485	0.481	-0.672	0.014	-0.204	0.600	0.900	-0.073	0.286
L/A	0.494	0.065	-0.525	-0.282	-0.134	-0.508	-0.962	-0.364	-0.500
A	-0.341	-0.456	-0.195	0.565	-0.234	0.038	0.507	0.175	0.176
D	-0.428	0.249	-0.797	0.164	-0.711	0.056	0.549	-0.032	0.120
E/A	0.446	-0.461	0.248	0.945	-0.234	-0.358	-0.770	-0.674	-0.863
E/L	0.446	-0.432	0.253	0.949	-0.241	-0.360	-0.751	-0.665	-0.857
CAR	-0.461	-0.594	-0.856	0.794	-0.223	-0.145	-0.868	0.231	-0.669
CF	-0.201	-0.086	0.809	0.376	0.855	0.383	0.507	0.415	0.480
II/IE	0.687	-0.581	-0.331	0.882	0.572	0.326	-0.331	0.263	0.351
	SEB banka	Swedbank	TKB	UniCredit	BIB	SMP Bank	PrivatBank	RIB	Citadele banka
ROA	0.615	0.485	0.770	0.576	0.757	0.744	0.541	0.722	0.866
ROE	0.629	0.495	0.822	0.564	0.816	0.673	0.508	0.677	0.777
NIM	0.421	0.558	0.391	0.175	0.642	0.760	0.471	0.468	0.585
CI	-0.700	-0.547	-0.616	-0.094	-0.758	0.641	-0.419	-0.108	-0.666
NII	0.438	0.372	0.648	-0.458	-0.165	-0.614	0.276	-0.307	0.439
NFCI	-0.610	-0.293	-0.192	-0.859	-0.679	-0.808	-0.202	-0.812	0.579
SE/C	0.635	0.754	0.258	-0.285	-0.844	-0.840	-0.329	-0.542	-0.865
NII/I	0.018	0.497	0.364	0.562	-0.170	0.659	0.363	0.469	0.370
NPL/L	-0.772	-0.304	-0.593	-0.772	-0.685	-0.745	-0.359	-0.547	-0.439
P	-0.471	-0.442	-0.308	-0.641	0.087	-0.832	-0.558	-0.620	-0.681
P/L	-0.470	-0.456	-0.241	-0.600	0.263	-0.775	-0.548	-0.606	-0.741
D/L	0.658	-0.107	-0.115	-0.689	-0.558	-0.893	-0.475	-0.606	-0.404
L/A	0.205	0.544	0.815	-0.721	0.555	0.791	0.552	0.539	0.494
A	0.748	0.587	0.758	-0.594	-0.850	-0.780	-0.423	-0.721	0.234
D	0.326	0.022	0.839	-0.763	-0.854	-0.825	-0.453	-0.754	0.298
E/A	-0.505	-0.362	-0.626	0.625	0.735	0.880	0.841	0.646	0.721
E/L	-0.506	-0.371	-0.631	0.622	0.731	0.872	0.847	0.655	0.728
CAR	-0.629	-0.651	-0.191	0.406	0.810	0.877	0.461	0.827	0.327
CF	-0.365	-0.165	0.772	-0.706	-0.770	-0.783	-0.204	-0.544	0.287
II/IE	0.177	0.582	0.842	0.353	0.724	0.734	0.508	0.590	0.675

Based on median value for the set of correlation coefficients, the most valuable indicators are:

1. return on assets;
2. return on equity;
3. non-performing loans to total loans;
4. provisions and provisions to loans;
5. interest income to interest expenses;
6. net interest income to total income;
7. cost-to-income ratio.

From the economic point of view ROE and ROA should correlate positively with a value of a bank. It means that an increase in bank's profitability should lead to increase in a bank's value.

The correlation coefficients for ROA and ROE are positive in all the cases. The same assumption can be made for the ratio "interest income to interest expenses". It is also confirmed by figures in most cases (only three banks demonstrate negative correlation). In turn, it is logically to assume that increase in the value of non-performing loans, as well as in the value of provisions will reduce bank value. This assumption is also confirmed – average correlation coefficients are negative.

Table 3. Analysis of the correlation coefficients

No	Index	Min	Max	Median
1	ROA	0.066	0.947	**0.652**
2	ROE	0.259	0.970	**0.668**
3	NIM	-0.644	0.760	0.369
4	CI	-0.758	0.641	**-0.405**
5	NII	-0.614	0.695	0.273
6	NCFI	-0.859	0.854	-0.291
7	SE/C	-0.865	0.754	-0.307
8	NII/I	-0.202	0.659	**0.443**
9	NPL/L	-0.984	0.313	**-0.585**
10	P	-0.957	0.251	**-0.572**
11	P/L	-0.948	0.364	**-0.555**
12	D/L	-0.893	0.900	-0.160
13	L/A	-0.962	0.815	0.135
14	A	-0.850	0.758	-0.078
15	D	-0.854	0.839	-0.005
16	E/A	-0.863	0.945	0,007
17	E/L	-0.857	0.949	0.006
18	CAR	-0.868	0.877	-0.168
19	CF	-0.783	0.855	0.100
20	II/IE	-0.581	0.882	**0.540**

Thus, the return on equity seems to be the first most appropriate argument for our model (r = 0.668). Considering that ROE and ROA are strongly related, it is not essential which of them will be used in the equation. We put a priority on ROE, just because it has a higher average correlation coefficient than ROA. However, the analysis of cross-correlation tables indicates the problem of multicollinearity. There is a sufficient correlation between ROE and other indices (Table 4).

So, it is clear that we can not use simultaneously ROE and value of provisions, or ROE and non-performing loans to total loans in the same model. However, we can try to combine ROE with cost-to-income ratio. Besides, we can exclude ROE from the model and to use combination of other indices.

We should also remember that intangible assets amount to about 75 percents of company's value (Kaplan, Norton 2003). That is why we wanted to use also a non-financial indicator for our model. For Latvian banks the information about only one non-financial measure is available. This is EPSI rating – the index to measure customer satisfaction and loyalty in European countries (EPSI 2011). It was impossible to conduct a full correlation analysis, because usually EPSI is estimated for the banking sector as a whole. As for separate banks, we received the information about EPSI for only three largest Latvian banks since 2006. For all three banks correlation index between EPSI and bank value were positive: 0.575 (Citadele bank), 0.345 (SEB bank), 0.166 (Swedbank).

Table 4. Correlation between ROE and other indices

Bank	CI	NII/I	NPL/L	P	II/IE
1	-0.98	0.51	-0.09	-0.99	0.87
2	-0.98	-0.19	n/a	-0.92	-0.73
3	-0.94	-0.13	-0.7	0.11	0.84
4	-0.06	-0.29	-0.32	-0.96	0.11
5	0.49	0.62	-0.7	-0.99	-0.39
6	-0.68	0.75	-0.91	-0.73	0.96
7	0.99	-0.91	-0.51	-0.99	-0.11
8	-0.6	0.91	-0.95	-0.53	0.97
9	-0.97	0.95	n/a	-0.05	0.10
10	-0.3	0.47	-0.74	-0.89	0.60
11	-0.92	0.41	0.43	-0.95	0.68
12	0.09	0.89	-0.84	-0.96	0.99
13	-0.26	0.69	-0.03	-0.89	0.38
14	-0.19	0.45	-0.74	-0.97	-0.13
15	-0.06	0.19	-0.13	-0.33	0.06
16	-0.29	0.55	0.21	-0.99	0.66
17	-0.8	0.76	-0.92	-0.05	0.99
18	-0.49	0.45	-0.68	-0.99	-0.32
Median	-0.40	0.49	-0.69	-0.94	0.49

Considering that positive relationship between customer satisfaction and loyalty and profitability of a company are proved by many researchers (Jamal, Anastasiadou 2009; Beerli *et al*. 2004; Heskett *et al.* 2008) we can use EPSI as an argument.

2.2. Development of the regression model and empirical results

One of the most often applied approaches to examine relationships between variables in economics and finance is regression analysis, in particular linear regression (Bistrova *et al*. 2011; Horne 2002; Titko, Kozlovskis 2011).

Based on the results of correlation analysis we selected several ratios for explanation of the variation in bank value. Thus, our model takes the form of multiple regression equation (Ghauri, Grønhaug 2005).

We test hypotheses of the form H0: $b_1=0$, $b_2=0$ … $b_n=0$ against the alternative that one or more are wrong.

Using different combinations of variables, we developed 23 variants of a model in total. We used the values of financial indices from banks' reports of 2010.

To select the best variant we conducted regression diagnostics of each model. It included R-squared, F-test of the overall fit and t-tests of individual parameters.

The optimal model is expressed by the equation (1):

$$BV = 2{,}038 * P + 3{,}693 * NII\ , \qquad (1)$$

The values of the variables for the model are presented in the Table 5.

Table 5. Values of the variables, 000' LVL

Bank	Bank Value	Provisions	NII
1	82161	28917	17567
2	21814	2342	5489
3	19422	1020	3327
4	91604	10712	-2473
5	133299	50641	36177
6	19903	9188	-491
7	91212	76,887	27388
8	61738	940	2364
9	48394	2	461
10	64273	9470	8616
11	21230	10681	-1251
12	15700	1858	2830
13	150321	19225	20904
14	237210	25261	43298
15	9365	665	1444
16	523603	117061	62895
17	31606	141	3222
18	49605	36667	8904

R-squared of the model is equal to 0.922, indicating that 92.2 per cent of the variability in the bank value is explained by this model.

For a confidence level of 95 per cent, if „significance F" is less than 0.05, then the null hypothesis is rejected (there is a statistically significant associatian between dependent variable and indepedent variables). The significance F for the model is equal to 0.000.

As for regression coefficients, p-values for both are less than 0.05 (for Provisions p=0.007, for NII p=0.002). It means that both coefficients are not equal to zero with a probability of 95 per cent. The intercept was excluded from the model.

One of the classical assumptions for multiple regression is that independent variables are not highly correlated. In our case there is no multicollinearity problem, because average correlation coefficient between model arguments is equal to 0.015.

The difference between the banks' value, estimated using P/B ratio, and the estimated function value is presented in the Table 6.

In most cases the estimated function values are lower than sample values (Fig. 1). It means that banks are underestimated, applying the developed model.

However, it can be explained with the fact that the model involves only financial ratios. EPSI index was not statistically significant to include it into the model. Thus, using this model we do not take into account value of intangibles.

Table 6. Residual output, 000' LVL

Bank	BV	Predicted BV	Residuals	GAP, %
ABLV	82161	123810	-41649	-51
Baltikums	21814	25044	-3230	-15
BIB	19422	14365	5057	26
Citadele	91604	12699	78905	86
DnB	133299	236812	-103513	-78
Ge Money	19903	16912	2991	15
LHZB	91212	101301	-10089	-11
LKB	61738	10646	51092	83
LTB	48394	1707	46687	96
NORVIK	64273	51119	13154	20
PrivatBank	21230	17149	4081	19
RIB	15700	14238	1462	9
Rietumu	150321	116381	33940	23
SEB	237210	211384	25826	11
SMP	9365	6688	2677	29
Swedbank	523603	470850	52753	10
TKB	31606	12186	19420	61
Unicredit	49605	107612	-58007	-117

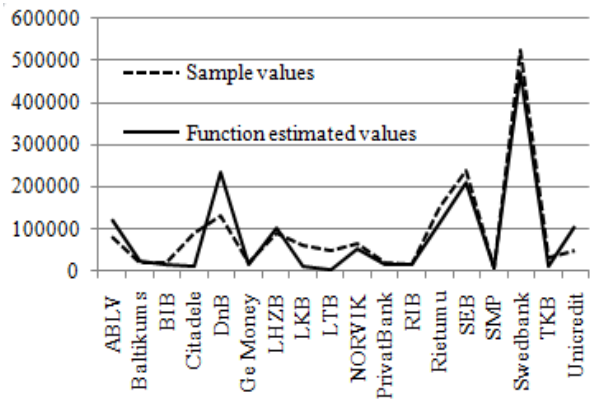

Fig.1. Sample and function estimated values (Source: authors' calculations)

As for value of residuals, the gap between the model estimated value and market data based value exceeds 50 per cent for seven banks. It points to the fact that despite the high statistical significance the developed model does not provide sufficiently accurate results. It indicates the necessity of continuing research in the given field. The statistical period of five years is not sufficiently long. Besides, this time period involves two years of financial crisis. Probably, iterative analysis of the data covering the longer period of time will elicit other variables for explanation of the variation in bank value.

It is also important to note that results of correlation and regression analysis depend heavily on "theoretical" bank value. In the given research we used price-to-book ratio to estimate the "theoretical" value. However, another option exists. The business magazine "Kapitals" together with the Agency of Investment Banking "IBS Prudentia"

and the Latvian representation of the stock exchange NASDAQ OMX publish the list of Latvian most valuable companies. The research is conducted since 2006 (Kapitals 2011). The authors' estimated banks' value and the value estimated by Latvian financial experts differ widely in 2008-2009. It means that the results of the correlation analysis also will be different. We did not use this data, because currently, only 13 Latvian banks are included in this list. However, it is a good information source for the future research.

3. Conclusions

The given paper reflects the results of the authors' conducted research, which was aimed to develop a multiple regression model for valuation of Latvian banks.

1. The developed model has a high statistical significance. However, the difference between the model estimated values and the theoretical values exceeds 50 per cent in several cases. In most cases, the model application leads to the undere-valuation of banks. It points to the fact that such kind of models should involve not only financial ratios, but also non-financial measures, because the intangible assets have a critical weight in a company's value. However, the attempt to involve EPSI index into the model was not successful due to the low statistical significance of the variable.

2. We strongly believe that it is absolutely necessary to iterate the research, because application of multifactor regression models allows reducing complexity of valuation. Besides, this is a good valuation alternative for such countries as Latvia, where application capabilities of worldwide used methods are limited.

3. Probably, the results of the future research will be absolutely different, because of using the longer statistical period. Besides, it would be interesting to use for the analysis banks' values, estimated by Latvian financial experts.

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