Development of Bank Value Model

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ABSTRACT

Finance specialists predict a new wave of M&A activities in banking sector. The integral part of any M&A transaction is a valuation of an entity. Thus, bank valuation is one of the most actual issues in today's financial business. Some valuation specialists consider that a valuation of a financial institution can be undertaken mainly using earnings-based methods, in particular, Discounted Cash Flow (DCF) approach. However, we face some difficulties while using this method for valuation of Latvian commercial banks. One of them is the determination of discount rate, because the models of discount rate calculation were devised by foreign specialists for using in developed countries with mature stock markets. The goal of the paper is to develop a mathematical model as an alternative to existing company's valuation models. As a proxy for a bank's value the market capitalization was used. Taking into account, that shares of only few banks of Baltic States are quoted in the stock exchange, the statistical base was formed from data about European banks.

Keywords: Bank Value, Regression Analysis, Financial Ratios.

1. INTRODUCTION

The process of globalization exercises a significant influence on banking business today. Globalization in banking sphere is attended by financial market liberalization. It means the abolition of restrictions for foreign financial institutions' entrance into domestic banking markets that, in turn, exacerbates a competition and activates processes of banking capital consolidation. Competitive pressure has prompted financial institutions pursue diversification strategies, often including mergers and acquisitions (M&A) [18]. As a result, M&A activity is increased worldwide during last decades. In spite of negative repercussions of global financial crisis, recent survey findings indicate a positive outlook for corporate transactions for the nearest future [11, 19].

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.

There are different valuation methodologies that provide an estimate of a company's value. All the methods can be combined into three groups: earning-based methods, assets-based methods and market-based methods [4]. Earning-based methods use the fundamental principle of finance – time value of money [5]. Market-based valuation methods use price or enterprise value multiples, such as price/earnings (P/E) ratio or EBIT multiple [2]. The asset approach to business valuation is based on the principle of substitution: no rational investor will pay more for the business assets than the cost of procuring assets of similar economic utility [6].

The method of Discounted Cash Flow (DCF method) is the most often applied bank valuation method [3, 4]. 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 [17].

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 [4]. 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. Today, considering the complex and dynamic financial environment, financial service companies are expected to reinvest all their profit into business activities. 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 [16].

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' [9].

The goal of the paper is to develop a proxy model for valuation of a commercial bank by the analogy with Z-score models [8]. The factors affecting bank value are represented by financial indices that were selected, using correlation analysis. The degree of correlation between selected variable was quantified by estimating Pearson product-momentum correlation coefficient r.

Application of multi-factor 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.

2. RESEARCH DESCRIPTION AND EMPIRICAL RESULTS

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

1) To form the initial data base. In or case the resulting variable (y) is a market capitalization (CAP) of a bank. The shares of only few banks in Baltic region are quoted in the stock exchange. This was the reason for using statistical information about European banks' market capitalization;
2) To check the degree of correlation between the selected arguments (financial indices – x_1, $x_2 \ldots x_n$) and the function (a bank value - y);
3) To form a regression model that describes a relationships between function and the most valuable arguments;
4) Using the developed model, to calculate the value of selected banks;
5) To analyse the reliability of the results, comparing estimated market values with real values of the banks (market capitalization).

Selection of the indices for including into the model

Stock price, and as a consequence, market capitalization 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 [14].

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 financial ration analysis [1, 7].

Based on theory, company's value depends on its ability to generate cash flows from business activities [4, 5, 15]. Thus, it is logically to assume the strong relationships between profitability and company's value. That is why we focused primarily on profitability ratios: return on assets (ROA), return on equity (ROE) and earnings per share (EPS).

Besides, we used the analytical indices of European Central Bank: Cost-to-income ratio (CI) and operating income-to-assets (I/A). We selected Net interest income (NII) ratio for our analysis because of its critical weight in the total bank income. We also analyzed relationships between market capitalization and dividend payout ratio (DPR – dividends per net income) of selected banks. This hypothesis was based on the assertion that company's value depends on investor expectations [13]. Investors, expecting high dividends from a company, increase a demand for its stocks and, consequently, stock price also rises.

The results of the correlation analysis of the market capitalization and selected financial indices of the banks are presented in the Table 1.

The objects of our analysis are European banks, which stocks are quoted on the stock exchanges. The statistical information is provided by financial reports of the selected banks and by information and financial agencies, such as Morningstar, Reuters and Financial Times.

The values of Pearson's correlation coefficient are received, based on processing of statistical information over a period of 2002-2010.

The received results indicate the fact that the correlation coefficients between the selected financial ratios and value of bank market capitalization differ widely among the banks. The cases of strong negative and positive correlation occur simultaneously. Income-to-assets ratio, net interest income and dividend payout ratio have very low correlation coefficients.

The most suitable indices are ROE and Cost-to-income ratio. From the economic point of view ROE should correlate positively with market capitalization, and cost-to-income ratio should have negative correlation with it. It means that an increase in bank's profitability should lead to increase in bank's value. In turn, increase of value of bank's cost should reduce its value. Only few banks (see Table 1) have a negative correlation between ROE and market capitalization, and only one bank has a positive relationship between costs and market capitalization. Thus, in most cases the logical assumption is confirmed by figures. However, the average correlation coefficients are not sufficiently high to include them into the valuation model.

Table 1

Pearson's correlation coefficient between Market Capitalization and financial indices of the banks (I)

Bank name	ROE	CI	I/A	NII	DPR
Banco Comracial Portugues	0,491	0,161	0,509	-0,081	-0,706
Barclays	0,505	-0,266	0,397	-0,259	-0,101
Credit Suisse	0,794	-0,332	-0,131	-0,486	0,534
BNP Paribas	0,549	-0,833	0,111	0,259	0,578
Danske Bank	0,77	-0,569	-0,122	-0,355	0,627
Deutsche Bank	0,418	-0,832	0,485	-0,498	0,004
DnB NOR	0,57	-0,74	-0,515	0,305	-0,574
Dexia	0,689	-0,755	0,562	-0,587	0,716
Erste Group	-0,429	-0,781	-0,226	0,161	-0,574
KBC Groep	0,765	-0,674	0,49	-0,706	0,789
Handelsbanken	0,275	-0,434	-0,074	-0,118	0,157
Lloyds	-0,327	-0,139	-0,305	0,587	-0,718
National Bank of Greece	-0,35	-0,883	0,784	0,196	n/a
Nordea	0,413	-0,794	-0,436	0,473	-0,169
SAMPO OYJ	0,419	-0,865	-0,608	n/a	-0,353
Santander	0,554	-0,73	0,067	0,402	-0,498
Sabadell	0,931	-0,412	-0,871	0,343	n/a
Storebrand	0,351	-0,726	0,36	n/a	0,285
SEB	0,179	-0,353	-0,125	-0,019	0,119
Sydbank	0,622	-0,807	-0,218	n/a	n/a
UBS AG	0,64	-0,503	0,316	0,195	-0,785
Swedbank	0,325	-0,201	0,265	-0,673	0,371
Unicredit	0,424	-0,28	-0,505	-0,182	-0,463
Min	**-0,429**	**-0,883**	**-0,871**	**-0,706**	**-0,785**
Max	**0,931**	**0,161**	**0,784**	**0,587**	**0,789**
Average	**0,416**	**-0,554**	**0,009**	**-0,052**	**-0,038**

We selected indices ROA and EPS as arguments for the linear regression function, because the average correlation between these variables and market capitalization is higher than in previous cases (Fig. 1, Fig. 2).

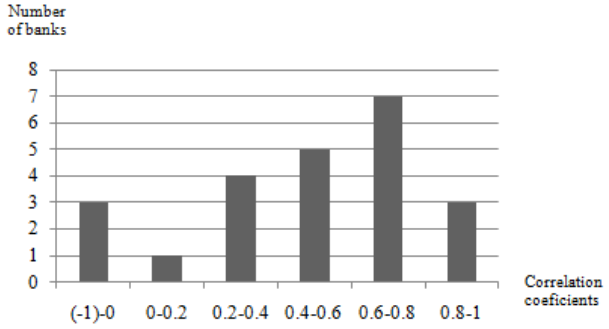

Fig.1. Distribution of the correlation coefficients – relationships between ROA and market capitalization

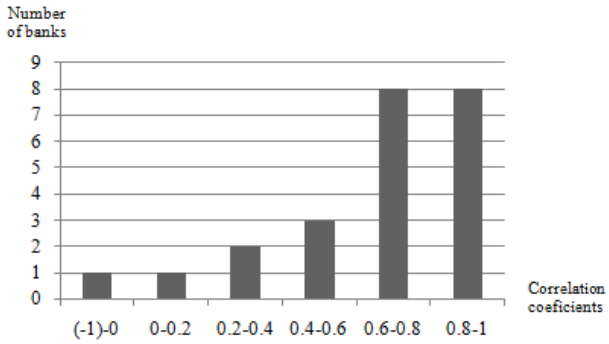

Fig.2. Distribution of the correlation coefficients – relationships between EPS and market capitalization

If we assume the accidental nature of negative correlation between ROA, EPS and market capitalization of some banks and remove them (Table 2), the average values will be equal to 0.552 and 0.676 respectively.

Table 2

Pearson's correlation coefficient between Market Capitalization and financial indices of the banks (II)

Bank name	**ROA**	**EPS**
Banco Comercial Portugues	0,756	0,704
Barclays	0,398	0,191
Credit Suisse	0,75	0,837
BNP Paribas	-0,547	0,775
Danske Bank	0,686	0,88
Deutsche Bank	0,884	0,895
DnB NOR ASA	0,553	0,772
Dexia	0,831	0,817
Erste Group	0,833	0,744
KBC Groep NV	0,761	0,805
Handelsbanken	0,458	0,452
Lloyds	-0,373	-0,282
National Bank of Greece	0,425	0,791
Nordea	0,207	0,428
SAMPO OYJ	0,424	0,51
Santander	-0,021	0,817
Sabadell	0,61	0,816
Storebrand ASA	0,647	0,838
SEB	0,213	0,2
Sydbank	0,599	0,795
UBS AG	0,612	0,721
Swedbank	0,345	0,307
Unicredit	0,056	0,786
Min	**-0,547**	**-0,282**
Max	**0,884**	**0,895**
Average	**0,439**	**0,635**

Development of the bank valuation model

Thus, we have values of two arguments (x_1 – ROA, x_2 – EPS) and values of function (y – market capitalization) to construct a linear regression model for bank valuation. To determine the final view of the model (to find the regression coefficients), we need to solve the set of equations that consists of the elements such as Eq. (1):

$$Yi = a_i x_{1i} + b_i x_{2i} \quad (1)$$

where i=1…n;

n – number of selected banks;

a_i ,b_i - regression coefficients.

Statistical data that was used for the development of the model are represented in the Table 3.

Table 3

Financial indices of the banks, 2009

Bank name	CAP, EURm	ROA, %	EPS, EUR
Barclays	34997	0,54	0,96
Banco Comercial Portugues	3967	0,24	0,03
BNP Paribas	66215	0,28	5,20
Danske Bank	11081	0,05	0,34
Erste Group Bank	9849	0,45	2,57
Dexia	7861	0,16	0,57
DnB NOR	12273	0,47	0,77
National Bank of Greece	10987	0,25	0,28
Swedbank	6570	-0,58	-1,03
Nordea Bank	294328	0,47	0,60
Sabadell	4650	0,64	0,44
Sampo	9555	16,50	1,14
SEB	9538	0,01	0,06
Handelsbanken	12338	0,80	1,59
Storebrand	2137	0,26	0,25
UBS	38386	-0,16	-0,50
Unicredit	23100	0,25	0,10
Sydbank	1335	0,49	1,57
KBC	10867	-0,76	-7,26
Lloyds	35965	0,28	8,33
Credit Suisse	40795	0,65	3,55
Santander	95043	0,86	1,05
Deutsche Bank	30683	0,33	7,92

Data processing was conducted, using the statistical program eViews as a software tool. To find the optimal equation for our model, the OLS method was applied.

Main statistical indices for the dataset from Table 3 are presented in Fig.3.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ROA	705.5449	1749.138	0.403367	0.6908
EPS	3256.620	1493.416	2.180852	0.0407

R-squared	-0.531591	Mean dependent var	21241.35
Adjusted R-squared	-0.604524	S.D. dependent var	22727.13
S.E. of regression	28788.41	Akaike info criterion	23.45627
Sum squared resid	1.74E+10	Schwarz criterion	23.55501
Log likelihood	-267.7472	Hannan-Quinn criter.	23.48111
Durbin-Watson stat	1.553103		

Fig. 3. Descriptive statistics for dataset analysis

The R-squared (R^2) statistic measures the success of the regression in predicting the values of the dependent variable within the sample. In program eViews it can be negative if the regression does not have an intercept, as it is in our case.

The regression coefficients are positive, and it is logically from the economic point of view: profitability ratios positively impact banks' value.

EPS has statistically significant impact on market capitalization with probability more than 95 per cent. However, results of the analysis indicated the problem with ROA index. Based on received results, ROA is not statistically significant ratio. Due to this fact, the estimated values of the selected bank may considerably vary from real values. One of the topics of the future research is to find the more appropriate financial index for the model, which will have the stronger statistical significance.

The percentage gap between the estimated values of the selected banks and the market capitalization values is presented in the Table 4.

Table 4

Market capitalization and estimated values of the banks

Bank name	CAP, EURm	ROA	EPS	Value, EURm	GAP, %
Barclays	34997	0,54	0,96	3501	-90
Banco Comercial Portugues	3967	0,24	0,03	280	-93
BNP Paribas	66215	0,28	5,20	17132	-74
Danske Bank	11081	0,05	0,34	1130	-90
Erste Group Bank	9849	0,45	2,57	8687	-12
Dexia	7861	0,16	0,57	1969	-75
DnB NOR	12273	0,47	0,77	2846	-77
National Bank of Greece	10987	0,25	0,28	1088	-90
Swedbank	6570	-0,58	-1,03	-3773	-157
Nordea Bank	294328	0,47	0,60	2286	-99
Sabadell	4650	0,64	0,44	1884	-59
Sampo	9555	16,50	1,14	15354	61
SEB	9538	0,01	0,06	186	-98
Handelsbanken	12338	0,80	1,59	5755	-53
Storebrand	2137	0,26	0,25	998	-53
UBS	38386	-0,16	-0,50	-1754	-105
Unicredit	23100	0,25	0,10	502	-98
Sydbank	1335	0,49	1,57	5465	310
KBC	10867	-0,76	-7,26	-24179	-323
Lloyds	35965	0,28	8,33	27338	-24
Credit Suisse	40795	0,65	3,55	12016	-71
Santander	95043	0,86	1,05	4012	-96
Deutsche Bank	30683	0,33	7,92	26025	-15

It is critically important point to be made that the model cannot be applied for banks with negative values of return on assets or earnings per share indices. Taking into account that regression coefficients are positive, in this case estimated value will be negative.

However, even removing from the dataset the banks with negative ratios, the analysis of estimated value indicates the fact that in the most cases the estimated values are considerably lower than the values of market capitalization (Fig. 4).

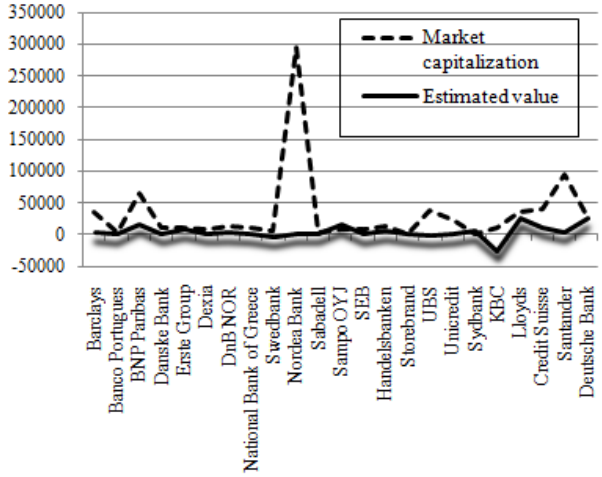

Fig. 4. Real and estimated values of the banks

It can be explained with the fact that, nowadays, intangible assets, in particular the relational capital, amount to over 70 percents of company's value [10]. Relational capital describes an organization's relations with customers, suppliers, investors, co-operation partners and the public [12]. Relational capital keeps customers from abandoning a commercial relationship. Using in valuation model only financial indices, banks will be underestimated.

Besides, it is necessary to check the level of relationships between bank value and other financial indices. As a basis for the selection, it is possible to use the financial ratios from the European Bank's statistical reviews.

Thus, studying the relationships between non-financial indices and banks' market capitalization in order to develop more relevant valuation model seem to be interesting topic for future research.

3. CONCLUSIONS

The current research represents an attempt to develop a linear regression model that can be used by external analysts to estimate a value of a bank.

The model was developed based on the analysis of financial indices of the banks, which stocks are publicly quoted.

The estimated values of the selected banks were sufficiently lower than their market capitalization. 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, such as customer base, have a critical weight in a company's value.

Using the developed model for valuation of Latvian banks, we received absolutely non-adequate results. Thus, the topic of our future research will be creation of specific valuation model for Latvian banks. One of the possible non-financial indices for the model is EPSI rating that is the most popular index to measure customer satisfaction and loyalty in European countries.

4. REFERENCES

[1] Z. Bodie, R. C .Merton, **Finance**, Upper Saddle River, NJ: Prentice Hall, 2000.

[2] CFA Institute, **Equity. CFA Program Curriculum,** New York: Pearson Custom Publishing, 2010.

[3] T. Copeland, T. Koller, J. Murrin, **Valuation: Measuring and Managing the Value of Companies**, New York: John Wiley & Sons, Inc., 1995.

[4] A. Damodaran, **Tools and Techniques for Determining the Value of Any Asset**, New York: John Wiley & Sons, 2002.

[5] F.J. Fabozzi, P.P. Drake, **Finance: Capital Markets, Financial Management and Investment Management**, Hoboken, NJ: John Wiley & Sons, 2009.

[6] J. P. Friedman, N.J.D. Ordway, **Income Property Appraisal and Analysis,** New Jersey: Prentice Hall, 1989.

[7] L.J. Gitman, **Principles of Managerial Finance**, Boston: Pearson, Addison Wesley, 2006.

[8] J. Horne, **Financial Management Policy**, Upper Saddle River, NJ: Prentice Hall, 2002.

[9] S. Imam, R. Barker, C. Clubb, **"**The Use of Valuation Models by UK Investment Analysts", **European Accounting Review**, Vol. 17, Issue 3, 2008, pp. 503-535.

[10] R. S. Kaplan, D. P. Norton, **Strategy Maps: Converting Intangible Assets into Tangible Outcomes,** Boston: Harvard Business School Press, 2003.

[11] A. Kronimus, A. Roos, **M&A:Back to the New Reality: a Survey of European Companies' Mergers and Acquisition Plans for 2011**, The Boston Consulting Group Inc., 2010.

[12] K. Mertins, W. Wang, M. Will, "InCaS: Intellectual Capital Management in European SME - Its Strategic Relevance and the Importance of its Certification", **The Electronic Journal of Knowledge Management,** Vol.7, 2009, pp. 111 – 122.

[13] E. Olsen, F. Plaschke, D. Stelter, **Missing Link: Focusing Corporate Strategy on Value Creation,** Boston: Boston Consulting Group, 2008.

[14] A. Pelane, I. Ukenābele, **10:00-14:00. Vērtspapīru tirgus. Latvijas pieredze 2008, [10:00-14:00. Stock Market. Latvian Experience 2008**], Riga: Riga Stock Exchange, 2008.

[15] J.F. Sinkey, **Commercial Bank Financial Management**, Upper Saddle River, NJ: Prentice Hall, 2007.

[16] J. Titko, N. Lāce, "Valuation of a Commercial Bank in Emerging Markets: Case of Latvia", **VII International Scientific Conference "Management and Engineering' 09**", June 22-24, 2009, Sozopol, Bulgaria, pp. 364.-374.

[17] P.Vernimmen, P. Quiry, M. Dallocchio, Y. Le Fur, A. Salvi, **Corporate Finance: Theory and Practice,** Hoboken, NJ: John Wiley & Sons, 2009.

[18] J. O.S. Wilson, B. Casu, C. Girardone, P. Molyneux, Emergind, "Themes in Banking: Recent Literature and Directions for Future Research", **The British Accounting Review,** No. 42, 2010, pp. 153-169.

[19] S. Wong, "Energy and Financial Sector Deals Heat Up", **Global Finance**, Vol. 25, No. 4, 2011, pp. 87-88.