

Determining the value of an enterprise on the example of two leading Ukrainian banks

Yaroslav Yeleyko,^a Oksana Yarova,^b Petro Garasyim^c

Abstract. The paper addresses the issue of determining the precise value and the financial prospects of enterprises subject to sales or purchase by investors. In order to illustrate the process of calculating the value of a company, the article analyses the financial condition and capital of the two largest Ukrainian banks, i.e. PrivatBank and Oschadbank. The aim of the study is to compare the values of these enterprises on the basis of statistical criteria. The statistical and comparative analysis of the aforementioned entities covering the years 2015–2021 was carried out using the following indicators: total assets, total liabilities, total capital, net interest income, profit before tax, annual net profit and total aggregate annual income. The study was based on data available in the banks' financial reports. The study method consisted in statistical analysis, correlation and multiple regression. The research determined the value of both banks, indicating that PrivatBank outperforms Oschadbank in this respect.

Keywords: bank, value of an enterprise, total asset, net profit, correlation, multiple regression

JEL: C10

Ustalanie wartości przedsiębiorstwa na przykładzie dwóch największych banków w Ukrainie

Streszczenie. Tematem artykułu jest precyzyjne określenie wartości i perspektyw finansowych przedsiębiorstw przeznaczonych do sprzedaży lub zakupu przez inwestorów. Proces obliczania wartości przedsiębiorstwa przedstawiono na przykładzie analizy kondycji finansowej i kapitału dwóch największych ukraińskich banków: PrivatBanku i Oschadbanku. Celem badania omawianego w artykule jest porównanie wartości tych przedsiębiorstw na podstawie kryteriów statystycznych. Przeprowadzono analizę statystyczną i porównawczą za lata 2015–2021 przy użyciu następujących wskaźników: sumy aktywów, sumy pasywów, sumy kapitału, wyniku z tytułu odsetek, zysku przed opodatkowaniem, rocznego zysku netto i całkowitego zagregowanego rocznego dochodu. Wykorzystano dane dostępne w sprawozdaniach finansowych badanych

^a Ivan Franko National University of Lviv, Institute for Historical Research; Uniwersytet Jana Kochanowskiego w Kielcach, Wydział Prawa i Nauk Społecznych / Jan Kochanowski University of Kielce, Faculty of Law and Social Sciences. ORCID: <https://orcid.org/0000-0002-2200-8447>.
E-mail: yikts@yahoo.com.

^b Ivan Franko National University of Lviv, Department of Theoretical and Applied Statistics. ORCID: <https://orcid.org/0000-0002-6284-1193>. Autor korespondencyjny / Corresponding author,
e-mail: oksana.yarova@lnu.edu.ua.

^c Uniwersytet Jana Kochanowskiego w Kielcach, Wydział Prawa i Nauk Społecznych / Jan Kochanowski University of Kielce, Faculty of Law and Social Sciences. ORCID: <https://orcid.org/0000-0001-5282-8799>.
E-mail: garasymp@ukr.net.

banków. Jako metodę badawczą przyjęto analizę statystyczną, korelację i regresję wielokrotną. Wyniki badania wskazują, że PrivatBank przewyższa Oschadbank pod względem wartości.

Słowa kluczowe: bank, wartość przedsiębiorstwa, suma aktywów, zysk netto, korelacja, regresja wielokrotna

1. Introduction

What often poses a problem for buyers and investors is defining the value of an enterprise and predicting whether it will bring the desired profit, sales growth, capital increase, rise in shares prices, and in general – whether it will be a successful investment worth risking. Similarly, among those willing to sell their businesses a doubt arises about what price to ask for, what the long-term prospects of their enterprises are, and whether they will not regret their decision to sell their business.

The solution to the problem could be a comprehensive statistical-mathematical analysis of an enterprise, conducted in order to determine the overall prospects of the business and verify the relevance of the price. The procedure may apply to any enterprise in any branch of business, although this paper focuses specifically on the banking sector and involves the analysis of two leading Ukrainian banks.

Banking is actively developing in the modern world, also in Ukraine. As of today, there are 67 banks operating in Ukraine, 30 of which have foreign capital. In this article, we will analyse the financial situation and capital of PrivatBank (Privatbank, n.d.) and Oschadbank (Oschadbank, n.d.), i.e. the two largest banks operating in Ukraine. The aim of the study is to compare the values of these banks on the basis of statistical criteria.

2. Research methods and results

The study involved a statistical and comparative analysis based on the following literature on the subject: Answr (2019), Damodaran (2004), Halafyan (2009), Ivchenko and Medvedev (2014), and Komsomolskaâ Pravda (2022).

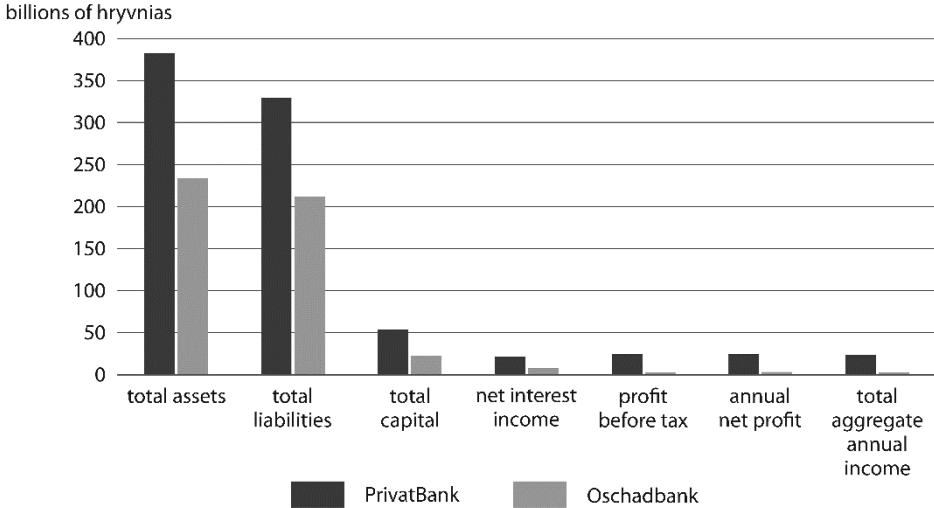
The following indicators have been selected for our research: total assets, total liabilities, total capital, net interest income, profit before tax, annual net profit and total aggregate annual income.

Figure 1 shows that in 2019 the main indicators were significantly higher for PrivatBank than for the state-owned Oschadbank. The former bank, which is private-owned, was generally more popular in Ukraine than the latter.

The next step involves the analysis of the main economic trends these two banks experienced in the period of 2015–2021. As regards the total assets of PrivatBank, a decline in their value occurred in 2017, but after that the indicator tended to increase. During the studied period, the bank's total assets increased by 67%. The average value in the studied years reached 276,213 billion hryvnias. In the case of the

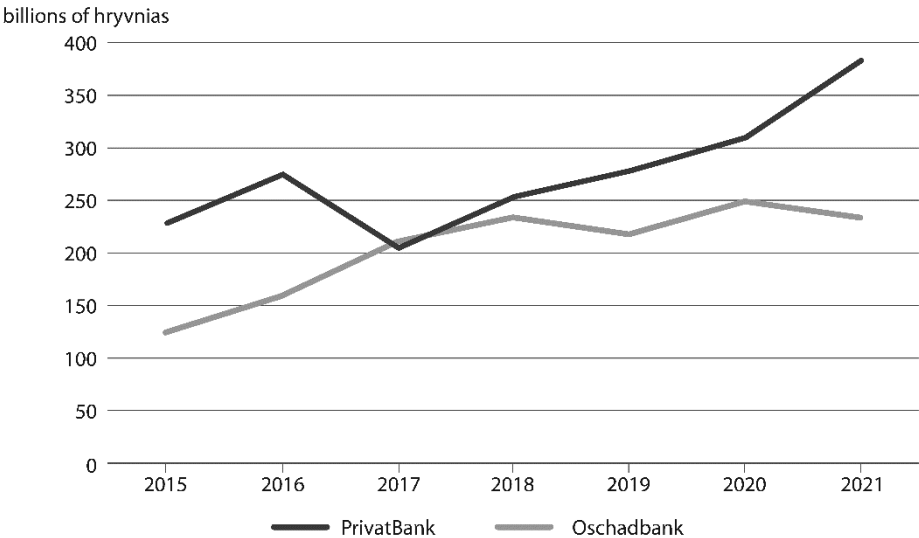
total assets of Oschadbank, in general they also tended to increase between 2015 and 2021. During these years, they grew by 87%. The average value in the studied period amounted to 204,064.7 billion hryvnias. Figure 2 compares the total assets of both banks.

Figure 1. Comparison of selected indicators for PrivatBank and Oschadbank in 2019



Source: authors' work.

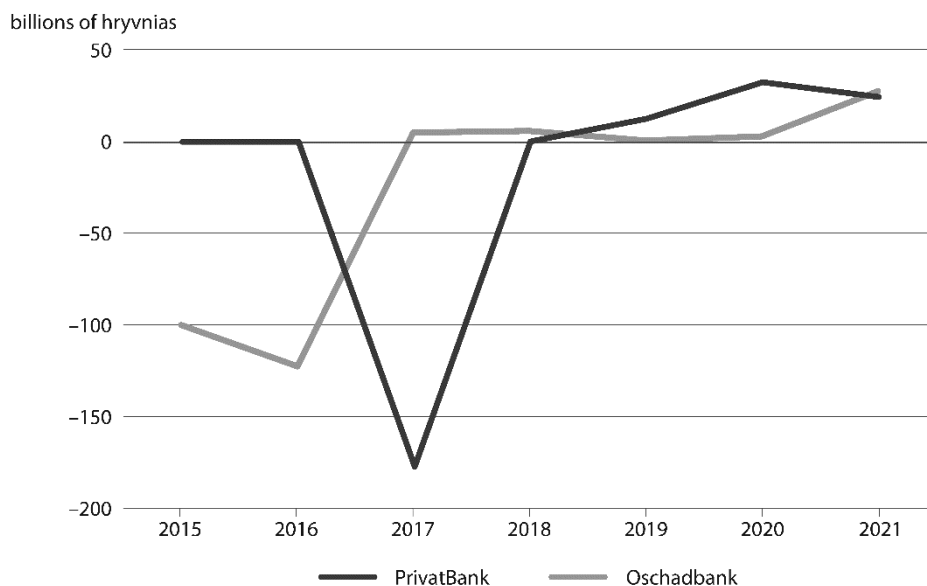
Figure 2. Comparison of the total assets of PrivatBank and Oschadbank



Source: authors' work.

The next considered indicator is the annual net profit of both banks in the studied period. As Figure 3 shows, the net profit of PrivatBank declined sharply in 2017, reaching negative value; in the following years, however, the bank's net profit improved and stabilised. Oschadbank's net profit started growing in 2017 and was steadily increasing in the years that followed.

Figure 3. The annual net profit of PrivatBank and Oschadbank



Source: authors' work.

Subsequently, the total net income of these banks is analysed. The following indicators need to be obtained: interest income, interest expenses, deductions to the provision for impairment, commission income, commission expenses, net loss/profit from foreign exchange transactions, net loss/profit from transactions in financial instruments, other net income, operating costs, income tax expenses, and other total expenses/income. All of the indicators are presented in hryvnias. The data are provided by the official websites of these banks.

Table 1 and 2 present a correlation analysis of the above-mentioned data for PrivatBank and Oschadbank, respectively.

Table 1. Correlation analysis for PrivatBank

Specification	Interest income	Interest expenses	Deductions to the provision for impairment	Commission income	Commission expenses	Net loss / profit from foreign exchange transactions	Net loss / profit from transactions in financial instruments	Other net income	Operating costs	Income tax expenses	Other total expenses / income
Interest income	1	.	.	.	.	.	.	.	.	.	.
Interest expenses	-0.122	1	.	.	.	.	.	.	.	.	.
Deductions to the provision for impairment	-0.235	0.631	1	.	.	.	.	.	.	.	.
Commission income	0.538	0.643	0.184	1	.	.	.	.	.	.	.
Commission expenses	-0.560	-0.643	-0.234	-0.991	1	.	.	.	.	.	.
Net loss / profit from foreign exchange transactions	-0.110	0.632	0.989	0.266	-0.327	1	.	.	.	.	.
Net loss / profit from transactions in financial instruments	-0.430	-0.667	-0.296	-0.750	0.699	-0.320	1	.	.	.	.
Other net income	0.324	-0.308	-0.849	0.224	-0.202	-0.798	0.191	1	.	.	.
Operating costs	-0.309	-0.801	-0.250	-0.957	0.931	-0.299	0.789	-0.144	1	.	.
Income tax expenses	0.090	-0.389	-0.936	-0.148	0.197	-0.937	0.228	0.836	0.135	1	.
Other total expenses / income	0.151	0.047	0.423	-0.116	-0.017	0.499	0.302	-0.270	0.216	-0.384	1

Source: authors' work.

Table 2. Correlation analysis for Oschadbank

Specification	Interest income	Interest expenses	Deductions to the provision for impairment	Commission income	Commission expenses	Net loss / profit from foreign exchange transactions	Net loss / profit from transactions in financial instruments	Other net income	Operating costs	Income tax expenses	Other total expenses / income
Interest income	1	.	.	.	.	.	.	.	.	.	.
Interest expenses	-0.890	1	.	.	.	.	.	.	.	.	.
Deductions to the provision for impairment	0.329	-0.463	1	.	.	.	.	.	.	.	.
Commission income	0.362	-0.167	0.676	1	.	.	.	.	.	.	.
Commission expenses	-0.331	0.122	-0.654	-0.998	1	.	.	.	.	.	.
Net loss / profit from foreign exchange transactions	0.252	-0.473	0.767	0.551	-0.516	1	.	.	.	.	.
Net loss / profit from transactions in financial instruments	0.128	0.256	-0.579	-0.116	0.083	-0.849	1	.	.	.	.
Other net income	0.076	-0.261	0.773	0.260	-0.247	0.380	-0.362	1	.	.	.
Operating costs	-0.347	0.197	-0.743	-0.994	0.990	-0.622	0.210	-0.324	1	.	.
Income tax expenses	0.128	-0.182	0.119	-0.269	0.285	-0.314	0.178	0.549	0.270	1	.
Other total expenses / income	0.240	-0.179	-0.166	-0.171	0.184	-0.244	0.357	0.280	0.205	0.543	1

Source: authors' work.

A multiple regression equation is then constructed to establish the relationship between the banks' net profit and other financial indicators for the years 2015–2021. The first analysis will be devoted to PrivatBank (Table 3).

The annual net profit is the dependent variable (Y), while the independent variables are: interest income (X_1), interest expenses (X_2), deductions to the provision for impairment (X_3), commission income (X_4), commission expenses (X_5), net loss/profit from foreign exchange transactions (X_6), net loss/profit from transactions in financial instruments (X_7), other net income (X_8), operating costs (X_9), income tax expenses (X_{10}), and other total expenses/income (X_{11}).

Table 3. Multiple regression for PrivatBank

Y	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8	X_9	X_{10}	X_{11}
247	25,624	-18,366	-4,689	4,650	-1,092	3,020	0	925	-9,948	98	1,574
275	31,154	-28,857	-3,789	6,998	-1,703	5,033	0	701	-9,065	-197	1,183
-176,644	31,560	-29,474	-154,536	10,692	-2,298	-26,175	0	3,490	-10,639	576	-1,234
406	24,485	-18,373	-7,379	13,211	-3,017	2,074	0	1,671	-12,240	-26	-1,020
12,846	30,754	-13,996	-6,089	19,590	-4,402	3,131	-3,085	993	-14,041	-9	-1,874
32,670	33,841	-14,162	-4	24,575	-6,383	8,720	-1,526	2,144	-14,502	-30	1,974

Source: authors' work.

As a result, the coefficients for the regression model are obtained for Privatbank:

- interest income: 36.5;
- interest expenses: 27.5;
- deductions to the provision for impairment: 29.3125;
- commission income: -163.25;
- commission expenses: -568;
- net loss / profit from foreign exchange transactions: -147.875;
- net loss / profit from transactions in financial instruments: 27;
- other net income: 216;
- operating costs: 24.125;
- income tax expenses: -976;
- other total expenses / income: -43.25.

Then, the formulation of the equation of multiple regression takes place, described as:

net annual profit, independent variables = $36.5 \cdot$ interest income + $27.5 \cdot$ interest expenses + $29.3 \cdot$ deductions to the provision for impairment - $163.25 \cdot$ commission income - $568 \cdot$ commission expenses - $147.875 \cdot$ net loss/profit from foreign

$$\text{exchange transactions} + 216 \cdot \text{other net income} + 24.125 \cdot \text{operating costs} + \\ - 976 \cdot \text{income tax expenses} - 43.25 \cdot \text{other total expenses/income.}$$

The coefficient of determination is 0.85, which indicates the adequacy of this regression model.

The same procedure is adopted for Oschadbank.

Table 4. Multiple regression for Oschadbank

Y	X ₁	X ₂	X ₃	X ₄	X ₅	X ₆	X ₇	X ₈	X ₉	X ₁₀	X ₁₁
-10,014	13,697	-8,387	-9,662	1,590	-330	-3,331	168	-28	-4,230	99	-741
-12,270	19,489	-12,500	-15,735	2,131	-497	-4,868	6,352	-1,423	-4,246	0	400
467	19,489	-13,609	-3,203	2,912	-788	-3,602	3,676	1,065	-5,576	992	2,189
559	19,747	-14,228	-1,935	4,001	-1,305	-451	1,156	530	-7,140	-38	150
32	19,345	-13,895	1,127	5,236	-1,771	865	-2,411	94	-8,558	129	-2,615
254	19,066	-13,567	187	6,439	-2,236	3,455	-3,649	381	-9,821	1	802

Source: authors' work.

As a result, the coefficients for the regression model are obtained for Oschadbank:

- interest income: 163.875;
- interest expenses: 237;
- deductions to the provision for impairment: 24.5;
- commission income: 96;
- commission expenses: 280;
- net loss / profit from foreign exchange transactions: 32;
- net loss / profit from transactions in financial instruments: 32;
- other net income: 48;
- operating costs: -10;
- income tax expenses: 10;
- other total expenses / income: -26.

Thus, the equation of multiple regression takes the form below:

$$\text{net profit for the year, independent variables} = 163.875 \cdot \text{interest income} + \\ + 237 \cdot \text{interest expenses} + 24.5 \cdot \text{deductions to the provision for impairment} + \\ + 96 \cdot \text{commission income} + 280 \cdot \text{commission expenses} + 32 \cdot \text{net loss/profit from} \\ \text{foreign exchange transactions} + 32 \cdot \text{other net income} + 48 \cdot \text{operating costs} + \\ - 10 \cdot \text{income tax expenses} + 26 \cdot \text{other total expenses/income.}$$

The coefficient of determination is 0.82, which also indicates the adequacy of this regression model.

The next step involves determining the value of the banks using the capitalisation method.

The essence of the method is to determine the amount of annual or quarterly income (depending on the selected period) and then the corresponding capitalisation rate and the total amount of capital.

The value of the bank is calculated according to the following formula:

$$V = \frac{NI}{R} + C,$$

where V denotes the bank value, NI is the net profit of the bank, R shows the capitalisation ratio, and C represents the amount of capital.

Let us calculate all the necessary values to apply in the formula. The net income and equity are already calculated in the financial statement, while the capitalisation ratio is calculated on the basis of the following formula:

$$R = \frac{Z}{Z + C'}$$

where Z denotes long-term liabilities.

As a result, we obtain the capitalisation indicators, specified in Table 5.

Table 5. Capitalisation indicators

Bank	Z	C	NI	R	V
Oschadbank	211,646	21,954	2,776	0.91	25,018
PrivatBank	329,586	53,057	24,561	0.86	81,572

Source: authors' work.

We are therefore able to calculate the respective values of Oschadbank and PrivatBank, which total 25,018 and 81,572 billion hryvnias, respectively.

3. Conclusions

As a result of the comparison of the two largest banks in Ukraine, the following conclusions can be drawn: their total assets were steadily growing in the studied period, although the total indicators were higher for PrivatBank than for Oschadbank. The same applied to the annual income, which was generally higher for

PrivatBank compared to Oschadbank, with the exception of 2017, which saw a sharp decline of the indicator for PrivatBank.

The research based on the capitalisation method showed that the value of the banks is likely to decrease in the near future, suggesting that it would be more advisable for buyers or investors to refrain from investing in these two banks, and for the owners to either introduce relevant changes in management processes to improve the situation, or sell their business with profit while it is worth dear. For the time being, however, PrivatBank and Oschadbank remain the most significant banking giants on the Ukrainian market.

References

- Answr. (2019, 17 July). *Stavka kapitalizatsii*. <https://answr.pro/articles/1908-stavka-kapitalizatsii>.
- Damodaran, A. (2004). *Investicionnaâ oçenka. Intrumenty i metody oçenki lûbyh aktivov* (L. Lipinskiy, Trans.). Al'pina Pablišer.
- Halafyan, A. (2009). *Statistica 6. Statističeskij analiz dannyh. Učebnik* (2nd edition). Binom.
- Ivçenko, G. I., & Medvedev, Ŭ. I. (2014). *Metemativeskaâ statistica. Učebnik*. Knyzhnyj dom «Lybrokom».
- Komsomolskaâ Pravda. (2022, 20 October). *Otsenka biznesa: podhody i metody opriedeleniâ stoimosti prieprijatiâ*. <https://www.kp.ru/guide/otsenka-biznesa.html>.
- Oschadbank. (n.d.). *Finansova zvitnist*. <https://www.oschadbank.ua/finansova-zvitnist>.
- Privatbank. (n.d.). *Finansovaja otchetnost*. <https://privatbank.ua/about/finansovaja-otchetnost>.