

EQUITY AND DEBT FINANCING MODELS OF AGRICULTURAL ENTERPRISES IN UKRAINE: CHALLENGES AND PERSPECTIVES

Mirosław Wasilewski

Department of Economics and Organization of Enterprises
Warsaw University of Life Sciences – SGGW

Olena Oliynyk

Department of Finance and Credit
National University of Life and Environmental Sciences of Ukraine

Victor Adamenko

Department of Economics and Business Finance
Kyiv National University of Trade and Economics

Abstract. The essence of debt and equity financing models from a position of operational approach is defined. The use of debt and equity financing models by large and medium agricultural enterprises of Ukraine is analyzed. Significant growth of the role of debt financing model in terms of worsening self-financing of agriculture is revealed. The basic patterns of development of debt and equity financing models of Ukrainian agricultural enterprises are illustrated by using regression models.

Key words: debt financing model, equity financing model, operational approach, financial decision making at the enterprise, regression model, Lorenz curve, Ukraine

INTRODUCTION

Agriculture for Ukraine is considered due to natural agricultural factor endowments as the main driver of the national economy, capable of providing technology, investment and socio-economic recovery in the country. The share of agriculture in gross domestic product (GDP) of Ukraine is about 20%. The sector represents

more than 20% of the country's export. However, one of the essential factors, that are constraining the formation of an effective competitive, environmentally sound and socially aiming sustainable agriculture in Ukraine, is the presence of significant constraints of access to finance for agricultural producers.

This problem is also related to the imperfections of the existing financial system and financing models. It might be possible to overcome these imperfections through structural adjustment and innovation based agricultural financial system on appropriate scientific justification.

The financing models of agriculture are significant interests of practical experts. The example of that is the report "Innovative agricultural SME finance models" which tries to answer the question "What innovations can help bankers in developing countries who wish to finance agricultural small and medium enterprises (SMEs)?" by isolating promising cases of emergent and innovative financing, risk mitigation, and distribution models [IFC 2012].

The literature review showed there is lack of unified approaches to the nature and classification of financing models, but this concept is crucial for understanding the mechanisms of the financial system.

Some scientists even define the financing model as part of the financial system, along with the structure of the financial sector and the system of corporate governance in enterprises [Schmidt 2006].

This paper focuses on the challenges and perspectives of equity and debt financing models of agricultural enterprises in Ukraine, which is crucial in the context of the financial provision of the agricultural sector development in the country in terms of European integration.

MATERIAL AND METHODS

There are three main methodological approaches, which scientists use when they consider financing models: an approach from the perspective of the economic modeling theory, institutional and operational approaches.

Consideration of financing models as a variety of economic models implies that they are an abstraction of reality and reflect the idea of researchers (authors of these models) about the causal relationships regarding the movement of money and other financial instruments. Financing models as a form of economic models, obviously, can be of two types: symbolic or analog. The symbolic models are usually characterized by obtaining all concepts using quantified variables and representation of all relations in mathematical form, so such models is called mathematical [Moor 2001]. Analog models reflect connections, replacing real elements by other – those that are suitable for abstraction, and thus, despite the different nature and shape, they have similar properties and patterns. The charts,



graphs and diagrams are typical examples of analog models. Third type of models – physical models. They are characterized tangibility and it is problematic to build them for financing.

From position of the institutional approach, the financing model is a sustainable system of channels and institutions, providing movement of financial instruments within the financial system of country. This approach envisages the possibility the identification of only one (single) type of institutional financing models for individual country as one of the existing basic types or their combinations. The basic types of financing models are determined by different researchers in different ways, such as: bank-based and market-based models [Schmidt 2006], or models that are allocated depending on the role of the state – “the state regulator” and “investor-state” [Kirdina 2013].

From the position of operational approach, financing model is a certain set of actions due to external attraction or internal mobilization of funds to implement financial decisions by certain persons. The financing decision is the decision about which sources and ways of raising funds should be used to meet the needs in the formation of assets. This type of decision is traditionally considered the followers of financial neoclassical school as one of the main types of financial decisions for the enterprise [Brigham 1993, Brealey 2003, Van Horne 2007].

Operational approach, as opposed to the institutional approach, has a weighty practical value, so it often is used in practically-oriented research, for example „Innovative agricultural SME finance models” [IFC 2012]. In this case, it is possible to talk about a variety of financing models that can be used even individual enterprise in its activities and to illustrate each of them by constructing an analog economic model in the form of the respective scheme.

In this study, financing models of agricultural enterprises are considered from a position of operational approach.

The main types of financing models, which we offer to allocate within the proposed approach depending on the type of financial instruments used in mobilizing funds, are equity financing model and debt financing model. The first model assumes that the enterprise uses the equity instruments and free cash flow, which remain in the enterprise after the fulfillment of obligations to creditors. The second model foresees the use of liabilities.

Free cash flow of enterprise, which are considered within the equity financing model, is the sum of net income, depreciation of fixed assets and amortization of intangible assets. This amount is called “sources of funds from operations” according to finance scientific literature [Holt 1993]¹. We will also use this definition in the paper.

¹ As well, it should be called as “funds provided by operations” [Van Horne and Wachowicz 2007].



We made the comparisons of equity and debt financing models for agricultural enterprises in Ukraine using the coefficient of financial leverage. The coefficient of financial leverage is calculated as the ratio of total liabilities to equity, and it indicates the reliability of a business on its debts in order to operate.

We used the Lorenz curves, which were constructed according to traditional methods based on an appropriate ranking enterprises, to study uniform distribution of own financial resources and obligations among agricultural enterprises in Ukraine.

We used the Amadeus database for analysis of equity and debt financing models of agricultural enterprises in Ukraine [Amadeus].

RESULTS AND DISCUSSION

Dynamics of coefficient of financial leverage for a sample of large and medium Ukrainian agricultural enterprises illustrates the substantial changes in the ratio of debt and equity financing models for the sector. In particular, during the period from 2004 to 2013, as shown in Figure 1, this ratio has increased and exceeded "unit" in recent years, extending upward trend, also observed at the beginning of the period.

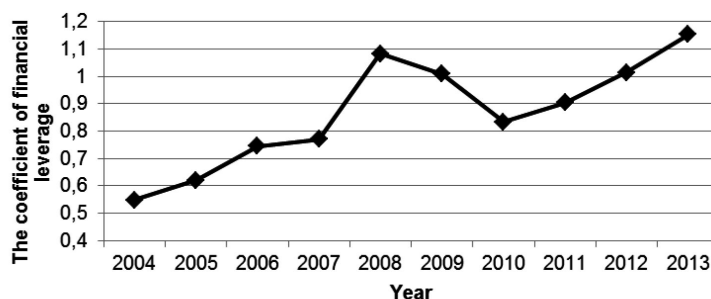


FIGURE 1. Dynamics of coefficient of financial leverage for a sample of large and medium Ukrainian agricultural enterprises, 2004–2013

Source: Authors' calculations based on Amadeus' data.

An abnormal growth of the coefficient of financial leverage, which is observed in Figure 1 in 2008 and 2009, is explained by the financial crisis in Ukraine. Despite the recovery of pre-crisis trends in 2010, the coefficient for the 10-year period has increased more than twice. This fact generally can be interpreted as negative and one that illustrates the significant decline of role of equity financing model for agricultural enterprises, as well as the loss of their financial stability and independence from external creditors.

However, the common value of the coefficient of financial leverage ratio not fully reflect the ratio between equity and debt financing models due to certain agricultural enterprises. We can see a wide range of ratios of debt and equity, and in some cases – even negative value of the coefficient of financial leverage. The distribution of values for individual enterprises at the beginning (2004) and at the end of the period (2013) is illustrated by histograms (Figure 2) and the data of Table 1.

The data from Figure 2 and Table 1 show that in 2013 there was a significant growth not only the total value of the coefficient of financial leverage but also

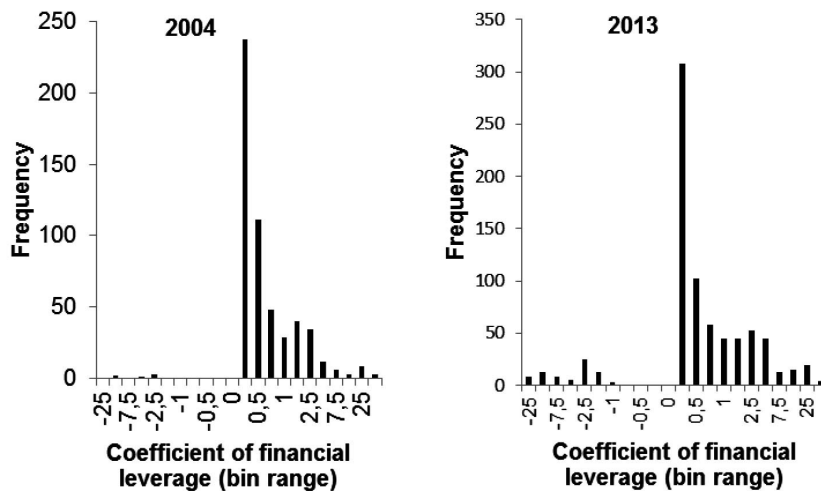


FIGURE 2. The distribution of values of the coefficient of financial leverage for a sample of large and medium Ukrainian agricultural enterprises, 2004 and 2013 (anomalous values deleted)

Source: Authors' calculations based on Amadeus' data.

TABLE 1. The indicators that characterize distribution of values of the coefficient of financial leverage for a sample of large and medium Ukrainian agricultural enterprises, 2004 and 2013

The indicator	2004	2013	The growth rate
The total (average for companies) value of the coefficient of financial leverage	0,549	1,154	2,102
The share of enterprises with negative value of the coefficient of financial leverage (%)	2,7	10,2	3,796
The share of enterprises with value of the coefficient of financial leverage above the total value or less 0 (%)	38,8	68,5	1,765

Source: Authors' calculations based on Amadeus' data.

the share of enterprises with negative value of the coefficient and with a value that exceeds the total (average for companies). This allows us to conclude that the role of equity financing model an increasing number of agricultural enterprises in Ukraine has reduced.

The reasons for this phenomenon, in our opinion related to the slowdown in growth of free cash flow of Ukrainian agricultural enterprises during the study period and as a result, the deterioration of conditions for self-financing. We also identified other problems of equity financing model at the level of individual companies. First, it is the problem of uneven distribution of volumes of sources of funds from operations between the companies. This unevenness illustrates the significant bulge down of the Lorenz curve, constructed according to data of enterprises that have positive volume of sources of funds from operations (Figure 3).

In particular, as shown in Figure 3, in 2013 the share of half (50%) of companies with the lowest volume of sources of funds from operations in the total amount of these resources was only 7.6%. As well, Lorenz curve's concavity in 2013 compared to 2004 increased, which is a negative (Figure 3). This allows us to conclude that the uneven distribution of the volumes of sources of funds from operations between agricultural enterprises has increased. For example, in 2004 the share three quarters (third quartile, 75%) of companies with the lowest volume of sources of funds from operations in the total amount of these resources was 33.6%, whereas in 2013 – only 22.7%.

Secondly, it is the problem of worsening of farm asset capacity to generate their sources of funds from operations. The worsening is confirmed by negative changes in the distribution of values of ratio the volume of sources of funds from

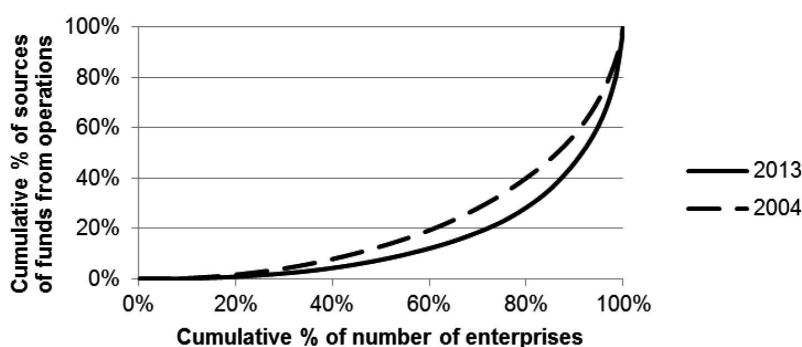


FIGURE 3. The Lorenz curves for volume of sources of funds from operations for a sample of large and medium Ukrainian agricultural enterprises in 2004 and 2013 (enterprises with negative values deleted)

Source: Authors' calculations based on Amadeus' data.

operations to total assets (Figure 4). Namely, we can observe that the overall (average) value of sources of funds from operations has diminished, and the standard deviation of sources of funds from operations has increased. As well, the asymmetry of distribution transformed from positive to negative.

In addition to Figure 4, we can indicate that the share of farms with negative value of sources of funds from operations in 2013 increased to 20.3% from 7.3% in 2004.

Thus, potential assets concerning the generation of sources of funds from operations by farms has decreased which was caused by the growth of debt financing model priority. This model, although associated with additional financial risk, is considered quite attractive for owners (shareholders) because it allows due to the effect of financial leverage to provide additional growth return on equity (ROE). However, it should be noted that the empirical data do not always confirm the expediency for owners of increasing financial leverage in dynamics. The last statement is true for Ukrainian agricultural enterprises (Fig. 5).

Although constructed regression model is not sufficiently strong (as the coefficient of determination is only 0.5733), it shows that the maximum ROE is achieved for value of coefficient of financial leverage, which is 0.829. This value corresponds to 40% share of liabilities in total assets, which is consistent with the classical scientific views due to the optimal capital structure for enterprises of such industries as agriculture [Barry 2000].

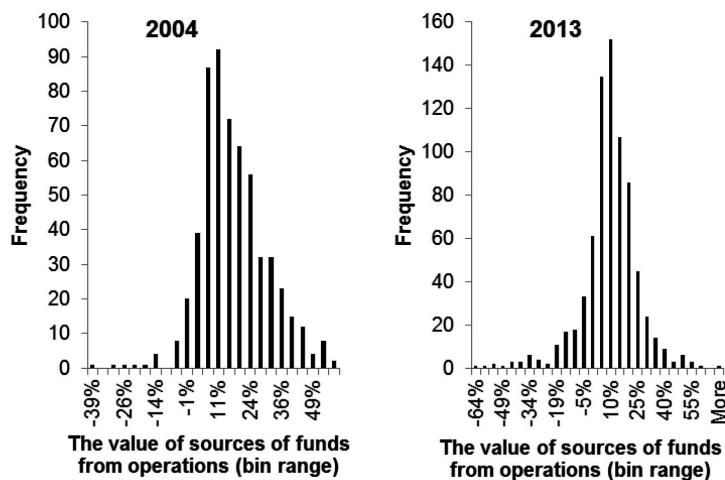


FIGURE 4. The distribution of ratio “the sources of funds from operations to total assets” for a sample of large and medium Ukrainian agricultural enterprises, 2004 and 2013 (anomalous values deleted)

Source: Authors’ calculations based on Amadeus’ data.

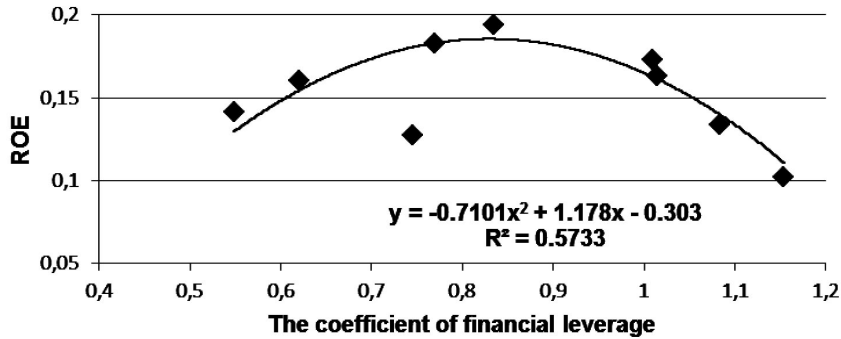


FIGURE 5. The regression model describing the interdependence between the total value of the coefficient of financial leverage and return on equity (ROE) for a sample of large and medium Ukrainian agricultural enterprises, 2004–2013

Source: Authors' calculations based on Amadeus' data.

Thus, concerning the model, which is illustrated in Figure 5, the total value of coefficient of financial leverage (1.154) achieved in 2013 is not optimal for the agricultural enterprises in Ukraine. Nevertheless, under present conditions, the artificial limitation of further growth of the financial leverage coefficient and braking of debt financing models should be recognized impossible, because it could affect adversely on the results of basic operating activities of these enterprises. We made this conclusion on the basis of identified dependencies between the general volume of the main results of operational activity and total assets, which cannot be fully provided when there is a limitation of debt financing. In particular, almost functional dependence is observed between total costs of goods sold and total assets of agricultural enterprises (Figure 6). The similar dependence is observed for operating revenue.

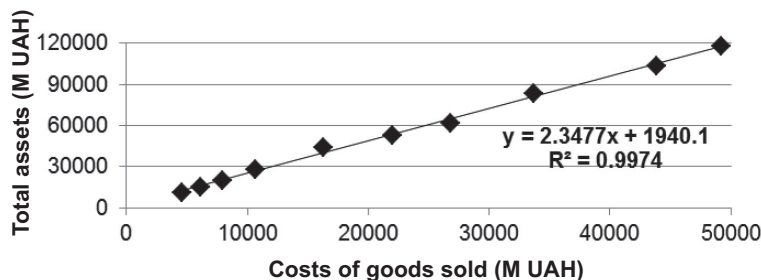


FIGURE 6. The regression model describing the interdependence between total assets and costs of goods sold for a sample of large and medium Ukrainian agricultural enterprises, 2004–2013

Source: Authors' calculations based on Amadeus' data.



Constructed regression models showed that growth of total volumes of operational activity of agricultural enterprises was accompanied by a significant growth of the total volume of assets. Thus, the growth of costs of goods sold on one hryvnia was accompanied the growth of asset by almost 2.35 UAH (Figure 6 – value of the slope coefficient of the regression line), and the growth of operating revenue (turnover) on 1 UAH was accompanied the growth of assets by almost 1.48 UAH. The latter pattern reflects the important economic aspect because it shows the stability of asset productivity of agricultural enterprises in Ukraine.

In turn, the total volume of assets is associated functionally with the total volume of liabilities of agricultural enterprises (Figure 7).

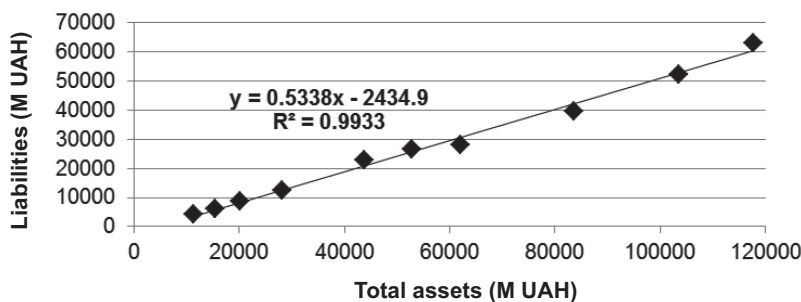


FIGURE 7. The regression model describing the interdependence between total assets and liabilities for a sample of large and medium Ukrainian agricultural enterprises, 2004–2013

Source: Authors' calculations based on Amadeus' data.

This model indicates that the absolute growth of total asset volume of agricultural enterprise in Ukraine is funded by liabilities an average of 53.4%². Since this percentage exceeds 50%, it is logical that the role of debt financing model has increased and it was accompanied by a corresponding increase in financial leverage coefficient. We can foresee that the continuation of this trend is quite probable in the future.

In contrast to the indicators which characterize total volume of operating results, assets and liabilities of all enterprises in the aggregate, indicators of individual enterprises do not show these explicit patterns and indicate the presence of some problems concerning the use of debt financing models by agricultural enterprises in Ukraine.

Just as the case with sources of funds from operations, even in even greater extent, the volume of liabilities is distributed between the agricultural enterpris-

² This conclusion allows to make the value of the slope coefficient in the regression model – 0.5338.



es in Ukraine very unevenly (Figure 8) and it reflects not only the existing differentiation of these enterprises, but also different access to borrowed funds. In particular, in 2013 the share of half (50%) of companies with the lowest volume of liabilities in the total amount of liabilities was only 3.6 and 15% the largest enterprises-borrowers accounted for over 70% of total amount of liabilities.

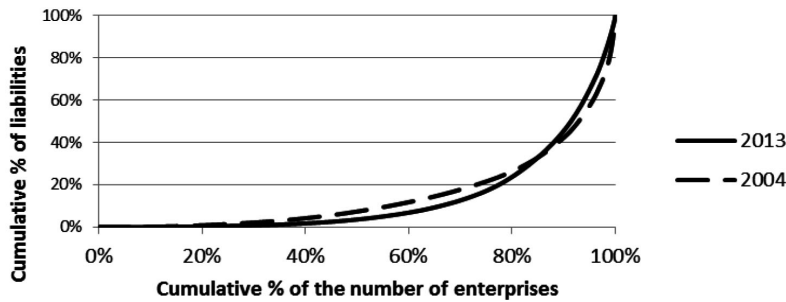


FIGURE 8. The Lorenz curves for volume of liabilities for a sample of large and medium Ukrainian agricultural enterprises in 2004 and 2013

Source: Authors' calculations based on Amadeus' data.

In contrast to sources of funds from operations, the difference in the distribution of liabilities in 2004 and 2013 is not significant. Moreover, for the largest enterprises-borrowers there is even some slight enhance distribution uniformity.

Besides a considerable differentiation in the volume of liabilities, it was observed slightly paradoxical pattern. Enterprises with small volumes of liabilities have obtained significantly higher volumes of operating revenue (turnover) per liabilities than enterprises with large volumes of liabilities (Figure 9).

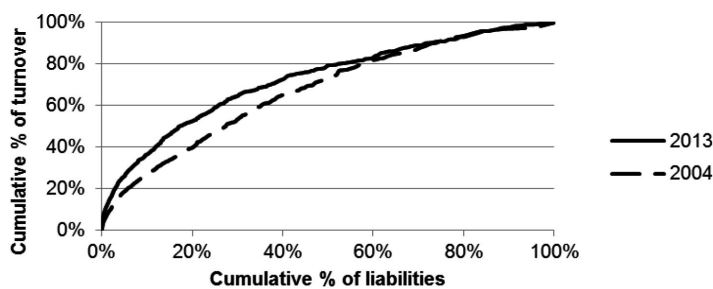


FIGURE 9. The relationship between cumulative percentage of liabilities and operating revenue (turnover) for a sample of large and medium Ukrainian agricultural enterprises in 2004 and 2013

Source: Authors' calculations based on Amadeus' data.

According to Figure 9, differentiation of liability return significantly increased in 2013 compared to 2004. For example, in 2004 a quarter (first quartile, 25%) of

companies with the lowest volume of liabilities accounted for 47% of total operating revenue (turnover) of all agricultural enterprises, and in 2013 – already 59%. In addition to this, it should be noted that a similar situation is observed regarding the return of assets.

Although the smallest enterprises-borrowers used the borrowed funds more productively, they pay a slightly higher interest rate compared to the largest enterprises-borrowers (Table 2).

TABLE 2. The indicators that characterize the distribution of volumes and values of the interest rate of liabilities for a sample of large and medium Ukrainian agricultural enterprises in 2004 and 2013

The indicator	2004	2013	The growth rate
The value of cumulative % of the interest paid: 1st quartile (25%) obligations	29.8	26.7	0.896
2nd quartile (50%) obligations	60	52.8	0.880
3rd quartile (75%) obligations	82.9	77.3	0.932
The total (average for enterprises) value of interest rate (%)	4.6	5.0	1.087
The share of enterprises with the value of interest rate, which does not exceed the average value (%)	49.2	46.5	0.945

Source: Authors' calculations based on Amadeus' data.

However according to the results 2013, we observed complete elimination of discrimination of small enterprises and the achievement of a situation where volumes of interest paid have almost perfect directly proportional ratio to the value of the liabilities. For example, the smallest liabilities that constitute 25% of the total liabilities of all enterprises accounted for nearly 25% of the total amount of interest paid (true value – 26.7%, see Tab. 2). We should also mention a rather low average level of interest paid for the agricultural enterprises³ and a slight asymmetry of value interest rate distribution.

We could not build a strong regression models similar to those that were built for common values (Figures 6 and 7), based on the totality of all data agricultural enterprises due to the uneven distribution of the liabilities and different returns of operating revenue (turnover) per liabilities and per assets. Instead, we found the strongest regression model, which illustrate by Figure 10.

Power function showed that sensitivity of total assets to changes in operating revenue (turnover) has been decreasing in the case of growth of the company, and

³ The highest level of interest paid was observed in 2010 – 6.1%, and the lowest – in 2008 – 4.5%.



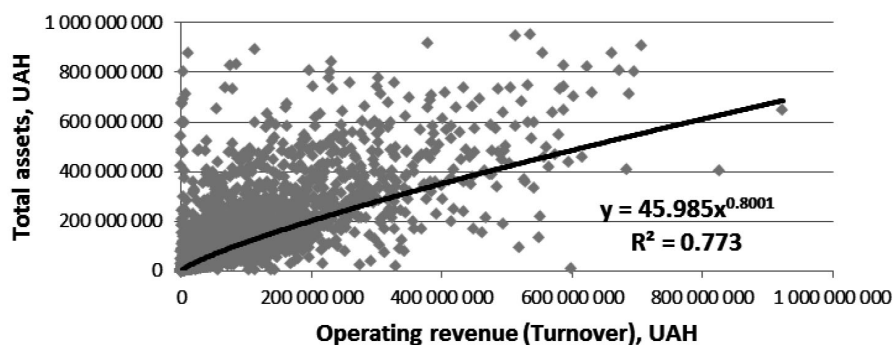


FIGURE 10. The regression model describing the interdependence between the operating revenue (turnover) and total assets for a sample of large and medium Ukrainian agricultural enterprises, 2004–2013

Source: Authors' calculations based on Amadeus' data.

it is adequately describes reality. For example, according to this model, growth of operating revenue (turnover) by 1 UAH will be accompanied growth of total assets in different sizes, depending on the initial volume of operating revenue (turnover).

- by 9.25 UAH if the basic amount of 1 thousand UAH;
- by 2.32 UAH if the basic amount of 1 M UAH;
- by 2.32 UAH if the basic amount of 100 M UAH.

We found that the most adequate for the volume of liabilities of agricultural enterprises is multiple linear regression model⁴ with independent variables that characterize the volumes of certain types of assets – fixed and current.

$$Y = 0.33227 X_1 + 0.68425 X_2 - 3,769,097 \quad (1)$$

where X_1 – the amount of fixed assets;
 X_2 – the amount of current assets.

According to formula (1), the amount of liabilities of agricultural enterprises of Ukraine is twice more sensitive to individual changes in the volumes of current assets than fixed assets (see the values of the regression coefficients of the independent variables).

⁴ The coefficient of determination (R-squared) for this model is 0.640; All regression coefficients are statistically significant; no residual autocorrelation; no heteroscedasticity.

CONCLUSION

In recent years, the role of debt financing model for agricultural enterprises in Ukraine significantly increased. It caused the loss of financial stability of agricultural enterprises and their independence from external creditors. The causes of this phenomenon associated with worsening conditions for self-financing, which appeared in slowing the growth of free cash flow of agricultural enterprises and reduction asset ability to generate the sources of funds from operations.

It is obvious that growing role of debt financing model for agricultural enterprises in Ukraine will continue in the future. It caused by fact that absolute growth of total assets in average of 53% is funded by growth of liabilities.

In 2013 the average value of the coefficient of financial leverage of the largest Ukrainian agricultural enterprises exceeds the optimal. However, the artificial limitation of further growth of debt financing models should be recognized impossible. It is caused by presence of functional dependence between total assets of agricultural enterprises and the results of basic operating activities of these enterprises. Insufficient funding of farm assets in connection with debt financing constraints could lead to significant loss of operating revenue (turnover).

The general growth of role of debt financing model is not so obvious for certain agricultural enterprises in Ukraine. In particular, the volume of liabilities is distributed between the agricultural enterprises of Ukraine very unevenly and it reflects not only the existing differentiation of these enterprises, but different access to borrowed funds. As well, it was observed significant differentiation of return in the form of operating revenue (turnover) per liabilities for certain enterprises. Moreover, enterprises with small volumes of liabilities have obtained significantly higher volumes of operating revenue (turnover) per liabilities than enterprises with large volumes of liabilities. Clarifying the reasons of such situation and the reasons why the volumes of liabilities of agricultural enterprises of Ukraine is more sensitive to individual changes in the volumes of current assets requires further research.

References

- Amadeus (Bureau van Dijk), Retrieved from www.bvdinfo.com/en-gb/products/company-information/international/amadeus.
- BARRY P., ELLINGER N., HOPKIN J., BAKER C. 2000: Financial Management in Agriculture, 6th edition, The Interstate Printers and Publishers, Danville, IL.
- BREALEY R.A., MYERS S.C. 2003: Principles of Corporate Finance, McGraw-Hill, USA.
- BRIGHAM E.F., GAPENSKI L.S. 1993: Intermediate Financial Management, 5th edition, The Dryden Press, USA.



- HOLT R.N. 1993: Fundamentals of Financial Management, M: Business.
- IFC 2012: International finance corporation, Innovative Agricultural SME Finance Models. Retrived from <http://www.ifc.org/wps/wcm/connect/55301b804ebc5f379f86b-f45b400a808/Innovative+Agricultural+SME+Finance+Models.pdf?MOD=AJPERES>.
- KIRDINA S. 2013: Institutional models of financing the real sector. Journal of the New Economic Association 2 (18), 129–155.
- MOOR J.H., WEATHERFORD L.R. 2001: Decisions Modeling with Microsoft Excel, Prentice Hall, USA.
- SCHMIDT R., HRYCKIEWICZ A. 2006: Financial systems – importance, differences and convergence, Working Paper Series 4, Institute for Monetary and Financial Stability, Johann Wolfgang Goethe-Universität, Frankfurt am Main.
- Van HORNE J., WACHOWICZ J. 2007: Fundamentals of Financial Management, 12 edition. Pearson Education Limited, Edinburgh Gate, Harlow, Essex CM20 2JE, England.

MODELE FINANSOWANIA KAPITAŁEM WŁASNYM I OBCYM PRZEDSIĘBIORSTW ROLNICZYCH NA UKRAINIE: WYZWANIA I PERSPEKTYWY

Abstrakt. W opracowaniu przedstawiono modele finansowania bazujące na zadłużeniu i kapitale własnym w podejściu operacyjnym. Korzystanie z finansowania obcego i własnego oparto na modelach skonstruowanych dla dużych i średnich przedsiębiorstw rolniczych prowadzących działalność na Ukrainie. Na podstawie przeprowadzonych badań zaobserwowano znaczący wzrost roli finansowania kapitałem obcym kosztem zmniejszenia roli samofinansowania w rolnictwie. Podstawowe wzory rozwoju ukraińskich przedsiębiorstw rolniczych w aspekcie finansowania obcego i własnego zilustrowane za pomocą modeli regresji.

Słowa kluczowe: modele finansowania obcego, modele finansowania kapitałem własnym, podejście operacyjne, decyzje finansowe, model regresji, krzywa Lorenza, Ukraina