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Legal liability and consumer protection in the context of organic production

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Abstract. The study presents a model for forecasting business risk in organic walnut production. For this purpose, a technology from financial risk management known as cash flow at risk in its variant "Top-Down approach" was adopted. Empirical data from the electronic register of organic farming in Bulgaria were used. A detailed analysis of the organic walnut production sector was made regarding the surface in hectares and the production distribution. The empirical distribution of the area of organic nuts in hectares in Bulgaria shows that small farmers predominate in 2023, with up to 6 hectares representing 55% of all, and those up to 12 hectares are a share of 78%, with the average production per farm will be 1376.53 kg.

1 Introduction

Organic farming as a production method is associated with the protection of human health and sustainable use of the environment. Its main principles on the territory of the European Union are regulated by Regulation (EU) 2018/848. [1-3]. By implementing a system of promotion measures, the aim is to support farmers who want to apply organic production methods by covering the differences in additional costs and lost income in the organic way of growing agricultural products, compared to conventional production methods.

Bulgaria is traditionally one of the leading producers of nuts in Europe, ranking right after Spain, Turkey and Italy. Table 1 presents current Eurostat information for the last 10 years about organic walnut production kg/ha in Bulgaria.

The agricultural sector business anywhere in the world has always been characterized as high risk, due to a significant number of factors that remain outside the control of agricultural producers [4-6]. The most important of them are: changes in climatic conditions and other natural phenomena, the lack of sufficient irrigation water, the work with living organisms, pathogens, epidemics and diseases of plants and animals, etc.) According to modern capital standards, the amount of risk-weighted assets is formed by taking into account credit risk, market risk and operational risk [7]. Organic production faces additional challenges imposed by a number of legal restrictions and regulations [8-9].

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Table 1. Descriptive statistics of organic walnut production kg/ha in Bulgaria.

	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Belgium				28	85	88	147	124	171	
Bulgaria	198	505	850	1 430	1 140	1 798	2 198	1 972	2,400	1 486
Czech		47	26	95	50	55	60	71	75	58
Ireland			1	0		2	2	16	4	3
Greece	178	201	437	734	1 005	1,612	2 123	1,529		
Spain	41,772	33,423	50,006	33,315	59 132	68,557	79,643	71,965	85 112	83,937
Croatia	227	60	1 119	607	980	943	905	549	564	744
Italy		28 144	34 106	58,683	40,927					
Cyprus	273	180	170	170	195	195	518	520	512	499
Lithuania	2	4	2	3	3	4	2	2	3	5
Hungary	1 256	964	667	727	965	573	715	397	354	1 527
Poland	124	107	120	157	445	1 792	1 337	803	714	
Romania	271	106	108	202	98	674	367	825	2 109	
Slovenia	7	15	19	53	8	33	35	46		
Slovakia	3	1	10	1	0	231	13	6	26	
Turkey	14,252	17,020	11,579	12,890	42,096	46,827	49,756	45,234	57,014	56 431

Over the past decade, there has been an upward trend in the production of nuts, with walnuts accounting for the largest share (Fig.1).

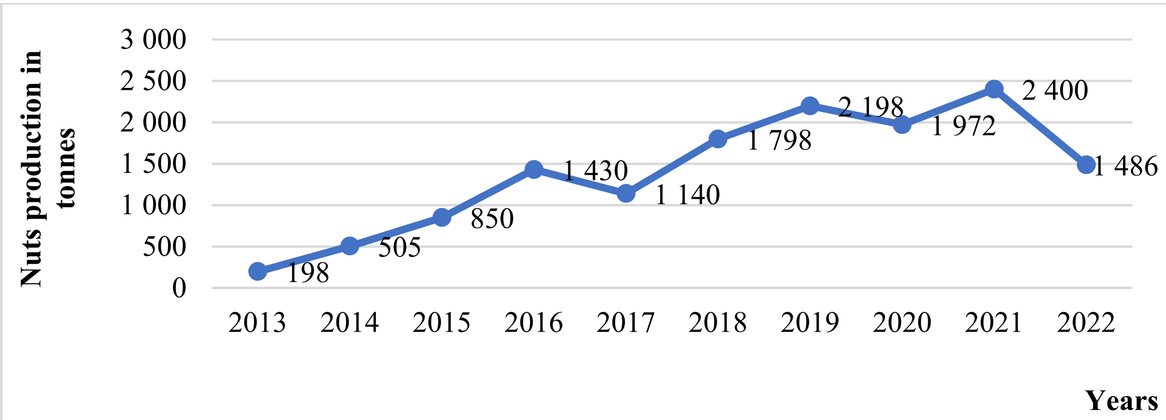

Fig. 1. Diagram of nut production for the last ten years in Bulgaria.

Until now, farmers have not had a reliable approach to measure the high business risk they face [10]. The Bulgarian organic walnut production sector has experienced many bankruptcies or has been redirected to other sectors. For these reasons, the purpose and motivation of this study is to present to the interested public an approach to measuring business risk in the organic walnut production sector.

2 Materials and methods

Banks and financial institutions, due to the specifics of their business at the moment, have managed to achieve the highest forecasting accuracy in terms of the assessment of various types of risks [11]. In this article, a model for risk assessment and forecasting has been created by adapting a technology from financial risk management known as “cash flow at risk” in its "Top-Down approach" variant. Cash flow at risk, known to risk managers with the abbreviation CfaR, is an analogue of on VaR (value at risk), established as an international standard for measuring market risk [12-14]. While VaR is suitable for financial institutions and banks trading on global stock markets and commodity markets, cash flow at risk (CfaR) is intended for small and medium-sized businesses.

Business risk assessment through the CfaR approach can be implemented using two methods - Top-Down approach and Bottom-up approach. Both approaches require a significant amount of historical data, which is often a problem in practice. Acceptable accuracy for risk assessment requires at least several hundred observations.

It is precisely from this point of view that the first approach (Top-Down approach) has been chosen in this study for assessing and forecasting business risk. A representative sample of 149 observations was selected using the database of the Electronic Register of Organic Agriculture in Bulgaria. The electronic register of organic farming is maintained according to the provisions of Art. 28, paragraph 5 of Regulation (EC) No. 834/2007 and Art. 16a, para. 1, item 1 of the Law on the Implementation of the General Organization of the Markets of Agricultural Products of the European Union (GAAP).

The essence of the cash flow at risk approach is to calculate the worst-case scenario of a decline in the firm's expected cash flow. For this purpose, it is necessary to construct the probability distribution of the expected cash flow for a given farmer. The "top-down" approach is applicable in the presence of detailed financial data on the business activity of companies from a specific sector of the economy.

It is usually applicable to well-developed economic sectors with a large number of competitors in a given industry. In order to be able to apply the method, a sample of at least 100 observations regarding the cash flows of the competing firms in the sector is required. Among enterprise risk management professionals, the most commonly preferred operating cash flows are Earnings Before Taxes, Interest, and Depreciation (EBITDA), Operating Profit, Earnings Before Taxes, Interest, and Depreciation (EBIT), etc. The probability distribution of the expected cash flow for a given agricultural producer is constructed based on the cash flows of direct competitors in the organic walnut production sector.

In addition, the selected producers in the specific case should be as similar and comparable as ppossible to the producer who intends to assess his business risk.

Table 2. Descriptive statistics of organic walnut production kg/ha in Bulgaria.

Production kg/ha	
Mean	154.60
Standard Error	14.80
Median	85,84
Mode	148.81
Standard Deviation	180.64
Sample Variance	32630.85
Kurtosis	8.08
Skewness	2.43
Range	1118.01
Minimum	0.00
Maximum	1118.01
Sum	23035.43
Count	149.00
Confidence Level (95.0%)	29,24

Table 2 presents descriptive statistics of organic walnut production kg/ha in Bulgaria.

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The table shows that the average yield of organic walnut production kg/ha in Bulgaria is 154 kg/ha, and the most common is about 148.81, which is much lower than conventional production according to the operational analysis of the Bulgarian Ministry of Agriculture and foods, where an average yield of 780 kg/ha is specified for 2023.

Table 3. Descriptive statistics of organic walnut surface in hectares in Bulgaria.

Surface in hectares	
Mean	10.389267
Standard Error	1.1994152
Median	4.63
Mode	1.68
Standard Deviation	14.689777
Sample Variance	215.78954
Kurtosis	10.347558
Skewness	3.0010218
Range	88.43
Minimum	0.1
Maximum	88.53
Sum	1558.39
Count	150
Confidence Level(95.0%)	2.3700603

Table 3 gives important quantitative information about the areas used for organic walnut production in Bulgaria. Quite large differences in the size of organic walnut surface in hectares at different farms in Bulgaria is observed.

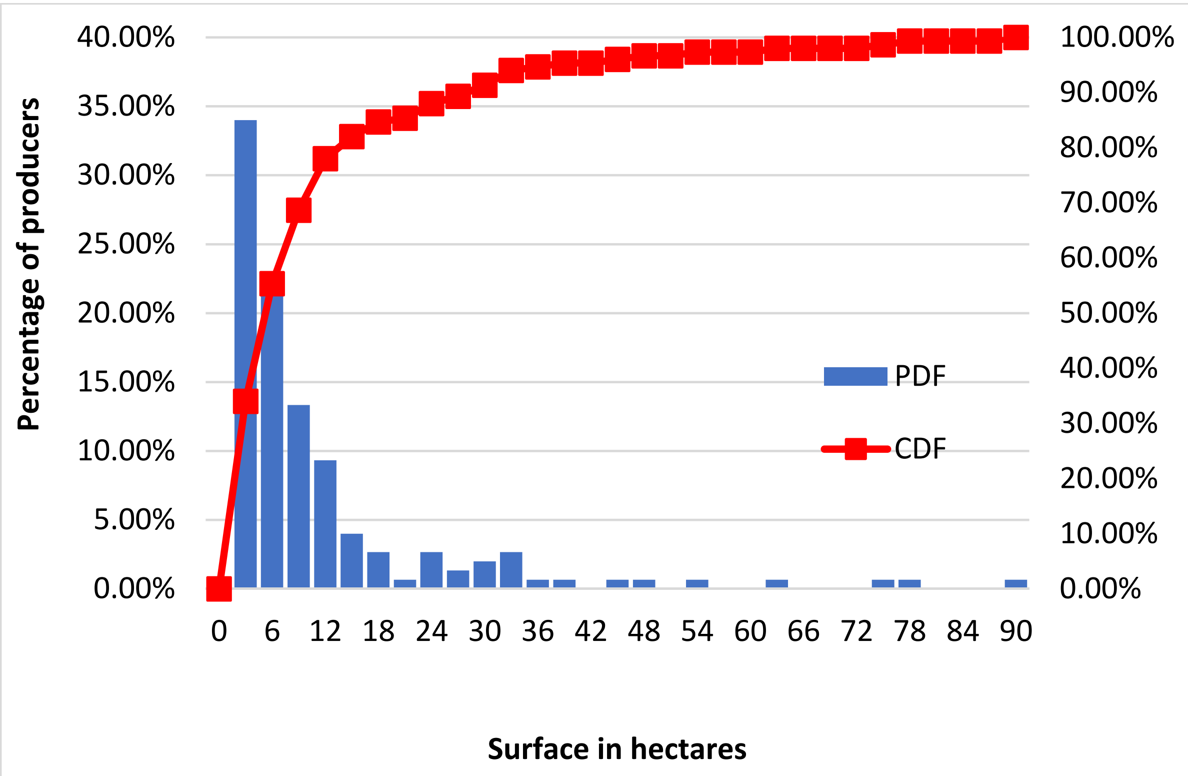

Fig. 2. Histogram and ogive of the distribution organic walnut surface in hectares in Bulgaria.

Figure 2 presents the empirical distribution of organic walnut surface in hectares in Bulgaria. It can be seen that small farmers predominate, as those up to 6 hectares represent 55% of all, and those up to 12 are a share of 78%.

Table 4 gives an idea of organic walnut production in kg in Bulgaria, which varies within quite wide limits and mainly depends on the size of the farm, the age of the trees, cultivated varieties, etc. For 2023, the average production per farm is 1376.53 kg.

Table 4. Descriptive statistics of organic walnut production in kg in Bulgaria.

Mean	1376.53
Standard Error	233.59
Median	330.00
Mode	100.00
Standard Deviation	2841.75
Sample Variance	8075538,11
Kurtosis	19.91
Skewness	4.05
Range	20989.00
Minimum	11.00
Maximum	21000.00
Sum	203727.00
Count	148.00
Confidence Level(95.0%)	461.63

From the histogram in Figure 3, it can be seen an extreme form of the right asymmetric distribution is observed with respect to the output produced in the sector. This means that over 80% of producers produce small quantities of up to 1690 kg per year.

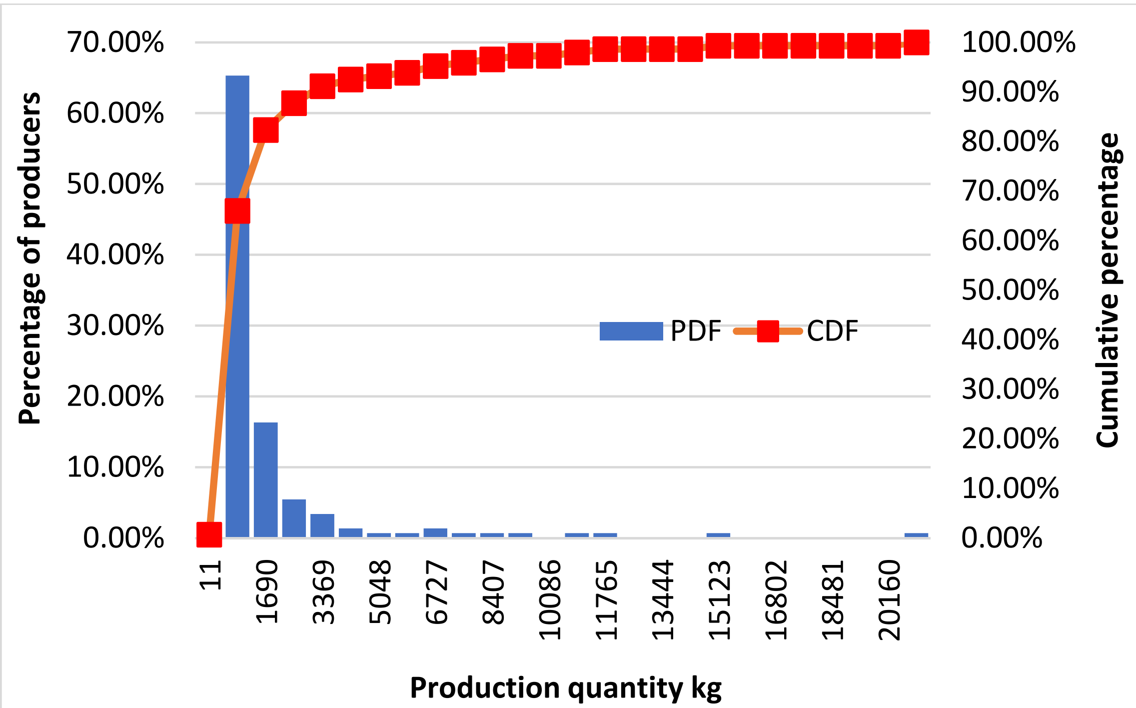

Fig. 3. Histogram and ogive of the organic walnut production distribution in kg in Bulgaria.

The cash flow at risk approach in its Top-Down variety will be demonstrated by using the financial data of the activity of an anonymous organic walnut producer.

Table 5 shows the necessary information from the Income statement for the last year for the manufacturer.

Table 5. Income statement for the last year.

	last year
Surface in hectares	17,27
Production quantity kg	3,057
Average selling price	€4.13
Sales revenue	€12,624.54
Subsidy income	€9,148.73
Total revenue	€21,773.28
variable costs	€2,766.00
fixed costs	€755.00
Total costs	€3,521.00
EBITDA	**€18,252.28**
EBITDA per ha	€1,056.88

From the data in Table 5, the key variable of interest to each producer is the expected earnings before taxes, interest and depreciation (EBITDA) as a result of the activity. This is precisely the indicator that will be forecasted with a certain level of probability. Here, the question usually arises, why EBITDA and not, for example: net profit, gross profit or another indicator of the financial result of organic production.

Practice shows that a significant part of financial results can be manipulated for tax purposes. This trend is particularly strongly observed in the net profit. The Bulgarian practice shows that due to the weak administrative cover of the National Revenue Agency, the official financial and accounting documents are massively manipulated in order to pay a lower corporate tax. A main advantage and disadvantage of the Top-Down approach is the use of official data.

The next step of the calculation algorithm of the Top-Down approach is to collect data on earnings before taxes, interest and depreciation (EBITDA) for a sufficient number of producers from the organic walnut production sector in Bulgaria (column 2 of Table 6). It is not advisable to use data from other countries because the economic conditions, tax regimes, accounting reporting are different and this would lead to a large forecast error.

In the next step, these earnings before interest, taxes, depreciation and amortization (EBITDA) figures need to be adjusted and made commensurate with the specifics of our business. This could be done by using different criteria such as: size of assets, number of shares (for joint-stock companies), number of fruit trees or, as in our case, surface in hectares (Table 6 column 3).

In column 4 of Table 6, the obtained EBITDA per ha in € is calculated for each organic producer from the sample. This data is necessary to adjust EBITDA to the specifics of our business. Adjusted EBITDA in € in column 5 is obtained by multiplying EBITDA per ha in € for each producer in the sample by the Surface in hectares of our organic production. In this way, was calculated 149 expected possible financial results of our business, ie. this will allow to get the distribution of expected cash flow for our business.

Table 6. Calculation of expected cash flow scenarios (38 scenarios from 149 total).

N	Organic production certificate number	EBITDA in €	Surface in hectares	EBITDA per ha in €	Adjusted EBITDA in €	Deviation in €
	1	2	3	4	5	6
1	BG-BIO-19.100-0001120.2023.001	2 179.84	1.68	1297.52	22408.20	4155.92
2	BG-BIO-19.100-0000854.2023.001	9 138.29	7.50	1218.44	21042,43	2790.15
3	BG-BIO-19.100-0000856.2023.002	6,571.04	9.38	700.54	12098.28	-6153.99
4	BG-BIO-19.100-0000857.2024.001	7,689.72	9.56	804.36	13891.37	-4360.91
5	BG-BIO-19.100-0000859.2023.001	12,889.41	4.97	2593.44	44788.76	26536.48
6	BG-BIO-19.100-0000869.2023.001	53,099.13	22.75	2334.03	40308.66	22056.38
7	BG-BIO-19.100-0000871.2023.001	12,878.96	21.60	596.25	10297.21	-7955.07
8	BG-BIO-19.100-0000874.2023.001	2,325.60	1.00	2325.60	40163.19	21910.92
9	BG-BIO-19.100-0000877.2023.001	1,998.78	2.77	721.58	12461.71	-5790.57
10	BG-BIO-19.100-0001516.2023.002	8,802.28	10.68	824.18	14233.65	-4018.63
11	BG-BIO-19.100-0000881.2023.002	1,209.24	1.30	930.18	16064.24	-2188.04
12	BG-BIO-19.100-0000883.2023.001	2,025.64	2.82	718.31	12405.22	-5847.05
13	BG-BIO-19.100-0000884.2023.001	1,192.82	1.65	722.92	12484.88	-5767.40
14	BG-BIO-19.100-0001773.2023.002	1,483.16	1.81	819.43	14151.47	-4100.80
15	BG-BIO-19.100-0000890.2023.001	7,367.52	12.29	599.47	10352.89	-7899.39
16	BG-BIO-19.100-0000893.2024.002	22,055.66	31.55	699.07	12072.94	-6179.34
17	BG-BIO-19.100-0000899.2023.001	37,293.83	62,68	594.99	10275.44	-7976.84
18	BG-BIO-19.100-0000905.2023.002	1,695.69	1.73	980.17	16927.51	-1324.77
19	BG-BIO-19.100-0000906.2023.001	3 171.92	2.10	1510.44	26085.27	7832.99
20	BG-BIO-19.100-0000929.2023.001	22,876.32	14.05	1628.21	28119.15	9866.88
21	BG-BIO-19.100-0000932.2023.001	21,039.42	10.63	1979.25	34181.64	15929.37
22	BG-BIO-19.100-0000933.2023.001	2 101.58	2.01	1045.56	18056.86	-195.41
23	BG-BIO-19.100-0000935.2023.001	12,552.65	9,10	1379.41	23822.45	5570.18
24	BG-BIO-19.100-0000938.2023.002	23,977.39	16.10	1489.28	25719.84	7467.57
25	BG-BIO-19.100-0000943.2023.002	6,909.30	3.35	2062.48	35618.99	17366.72
26	BG-BIO-19.100-0000948.2023.001	8,205.34	10.52	779.98	13470.18	-4782.10
27	BG-BIO-19.100-0000955.2023.001	6,178.09	2.94	2101.39	36291.01	18038.74
28	BG-BIO-19.100-0000956.2023.001	2,590.35	2.92	887.10	15320.30	-2931.98
29	BG-BIO-19.100-0000958.2023.002	11,417.29	19.83	575.76	9943.35	-8308.93
30	BG-BIO-19.100-0000959.2023.001	9,669.39	16.10	600.58	10372.07	-7880.21
31	BG-BIO-19.100-0003161.2023.001	7 108.15	10.38	684.79	11826,37	-6425.91
32	BG-BIO-19.100-0000966.2023.001	564.71	0.10	5647.10	97525.50	79273.22
33	G-BIO-19.100-0000967.2023.002	1,869.42	3.10	603.04	10414.51	-7837.77
34	BG-BIO-19.100-0000969.2023.001	3,629.21	2.00	1814.60	31338.22	13085.95
35	BG-BIO-19.100-0000973.2023.001	1,781.63	1.89	942.66	16279.74	-1972.53
36	BG-BIO-19.100-0000975.2023.003	4,313.70	7.08	609.28	10522.26	-7730.01
37	BG-BIO-19.100-0000976.2023.003	2,897.25	2.54	1140.65	19698.99	1446.72
38	BG-BIO-19.100-0000989.2023.001	3,030.92	3.55	853.78	14744.80	-3507.48

The values of deviation in € in the last column 6 are calculated by subtracting the current EBITDA for our business from each scenario of Adjusted EBITDA in €.

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3 Results

Another view of risk is that it represents a deviation from a certain value. In the specific case, business risk can be represented as a deviation from the last financial result (EBITDA) for our business.

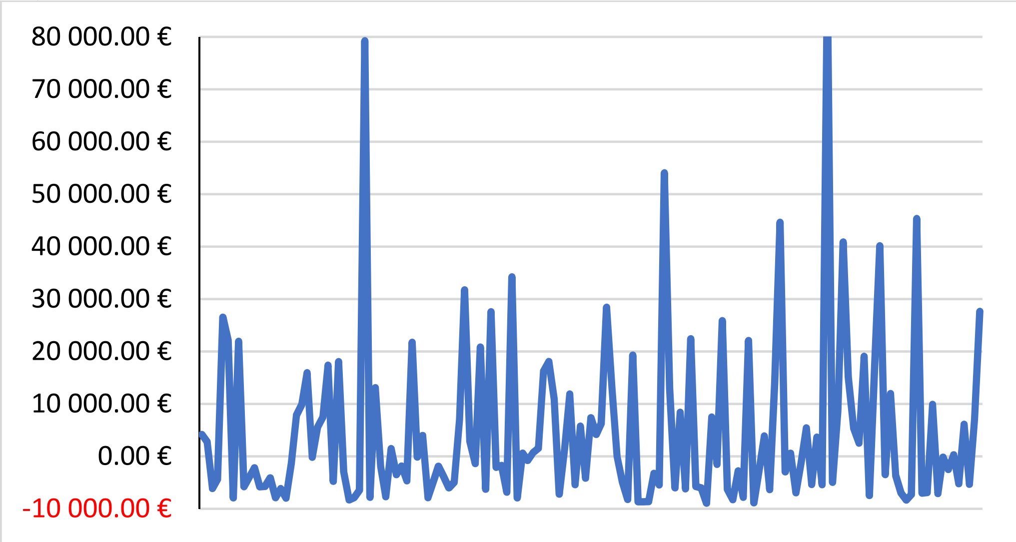

Fig.4. Diagram of the cash flow deviation to EBITDA.

Figure 4 gives a visual idea of the deviations in the expected cash flow compared to the actual EBITDA of our business

Table 7. Descriptive statistics of expected cash flow deviation.

Mean	€4,666.94
Standard Error	€1,305.97
Median	-€1,401.40
Mode	€4,155.92
Standard Deviation	€15,941.44
Sample Variance	€254,129,356.18
Kurtosis	8.07677978
Skewness	2.429021845
Range	€98,664.26
Minimum	-€8,976.48
Maximum	€89,687.78
Sum	€695,374.51
Count	149
Confidence Level (95.0%)	€2,580.76

Table 7 presents detailed statistical information regarding the deviations in the expected cash flow compared to the current EBITDA. It can be seen that the standard deviation is almost three times greater than the arithmetic mean. Thus, high volatility is always associated with high levels of risk. Other indicators that lead to the conclusion of high levels of risk are the negative value of the Median (-€1,401.40) and the high values of Range and Kurtosis.

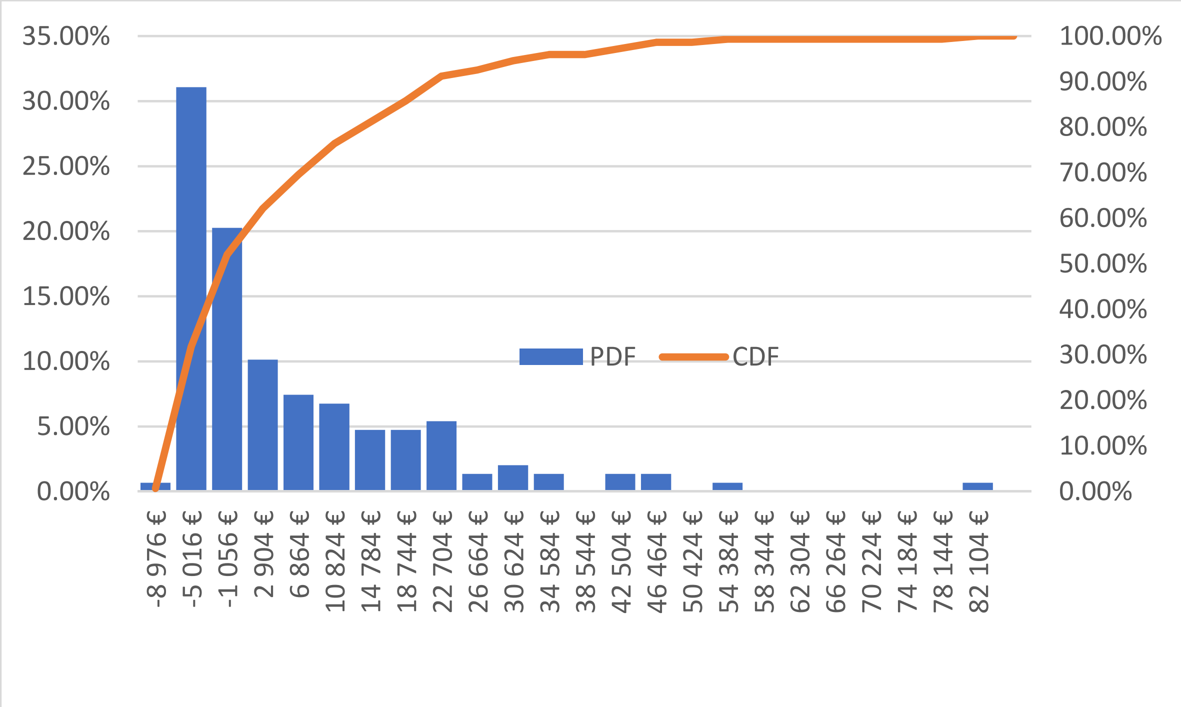

Fig. 5. Histogram and ogive of the cash flow deviation distribution.

From the histogram in Figure 5, it can be seen that again an extreme form of right-skewed distribution is observed with respect to business risk. If a similar shape of the distribution is observed in the future, it is important to perform additional statistical tests. They must determine which known probability distribution best fits our data.

Table 8. Risk evaluation final results.

CfaR 95%	-€8,277.57
CfaR %	-45.35%
P (CfaR < 0)	55.03%
CfaR 99%	- €8,782.09
CfaR 99%	-48.12%

Table 8 shows the final results of the business risk assessment. The worst-case scenario cash flow values at risk are calculated at 95% and 99% probabilities. It can be seen that in our organic walnut production business, the expected cash flow (EBITDA) could decrease by -€8,277.57 or we risk losing -45.35% of our gross income in the worst case scenario, calculated with a probability of 95%. Accordingly, with a probability of 99%, the risk values are -€8,782.09 and -48.12%. The probability of realizing a bad financial result compared to the last year is 55.03%. Risk evaluation final results confirm that the organic production of walnuts is a sector with relatively high levels of business risk.

4 Conclusions

The main advantage of the CfaR "Top-Down approach" is that it is not necessary to identify the key variables and factors that will affect the company's cash flows in the future. In contrast to "bottom-up" approaches, such as the "value at risk" VaR calculation methods, where some important risk factors may be omitted, misinterpreted, quantified, etc. in the "top-down approach" these disadvantages are avoided.

Due to the fact that this approach relies on historical data on the firm's operating cash flows and/or on comparable competitors in the same sector, it is not necessary to identify and evaluate the risk factors that affect the firm's cash flows because these factors are already used to calculate cash flows. Precisely, for this reason, it is not necessary to create a mathematical model and generate Monte Carlo simulations.

A disadvantage of the Top-Down approach is the use of official data that is real and not manipulated for tax purposes. The precision of the method could be increased if more than one criteria were used in the calculation of adjusted EBITDA, such as average tree age, average yield for a specific region, tree density, etc.

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