Valuatum Platform

Efficient tools for Credit Risk Analysis



1. Overview of the platform Introduction of the Valuatum platform.

2. Credit risk introduction & our solution Introduction of our machine learning model and comparison to regression models.

3. Visualizations and automatic text examples Visualizing the bankruptcy risk results and showcasing automatic text generation.

4. Performance of our	model		
Reporting results with	comparisons to	o other	models

	Payment behaviour data
5. Additional improvements to the Valuatum credit risk model	 Integrated into our machine learning model Information on how the company pays their bills (related to Popsible shifts for secree (more payments overdue) usually financial status -> higher credit risk.
Explaining how the model can benefit from payment behavior and PSD2 data.	 The inclusion of pupping did has improved the performance of the performance

6. Loan process example	
One example of how our system can be used to review loan applications.	

7. Other functionalities Further information related to our system and credit risk offering.



Slides:

3

18

19-22









Eredit and Default Risk: Over-

Credit risk visua

Ь.

Valuatum platform overview

- > Automatic bankruptcy forecasts and credit risk reports
- Access to historical financial statements, provided by external data providers, integrated in the system.
- Standardized data enables comparisons and sophisticated estimations for credit risk evaluation
- Visual and verbal explanations for the given bankruptcy estimations
- Our system can support multiple languages: Finnish, English, Swedish and German

External data providers

Valuatum

database

Image: Constraint of the system can be used both in Excel and via a web-interface.

Overview of the company with the option for automatically integrated financial statements



Compare how the company of interest is situated to its peers or any group of companies



Bankruptcy and default risk measures are calculated with the help of machine learning



1. Overview of the platform

Create an automated credit risk report based on the company's financial information



2. Credit risk introduction & our solution (1/4)

History of credit and default risk assessment

- Credit and bankruptcy risk predictions have usually been based on simple linear statistical models that use a few financial ratios such as ROA, Debt to Equity and Quick ratio
 - The Altman Z-score is a famous method that uses five explanatory variables to calculate the probability of bankruptcy
 - One of the most well-known methods is the logistic regression
- Logistic regression-based models remain one of the most widely used methods for bankruptcy risk prediction even today
 - Based on regression of defaults and several key figures
 - Often used because of its simplicity and efficiency
 - The decision of the model is also easy to interpret as the model coefficients provide the relative importance of the variables
 - Gives a polynomial function $1/(1 + e^{-X})$ that tells the probability of default, where for example:
 - X = -0.112 * Equity ratio + -0.081 * ROA + -0.054 * Quick ratio + ...+ 0.124 * IF(Industry A, 1, 0) + 0.056 * IF(Industry B, 1, 0) + ... + -0.321 * IF(StDev(ROI) < 0.05, 1, 0) + 0.167 * IF(StDev(ROI) > 0.20, 1, 0) + ... + If(Nutreales + 2) = 0.051 + 0.051 + ... + If(Nutreales + 2) = 0.051 + 0.051 + ... + If(Nutreales + 2) = 0.051 + 0.051 + ... + If(Nutreales + 2) = 0.051 + 0.051 + ... + If(Nutreales + 2) = 0.051 + 0.051 + ... + If(Nutreales + 2) = 0.051 + 0.051 + ... + If(Nutreales + 2) = 0.051 + 0.051 + ... + If(Nutreales + 2) = 0.051 + 0.051 + ... + If(Nutreales + 2) = 0.051 + 0.051 + ... + If(Nutreales + 2) = 0.051 + 0.051 + ... + If(Nutreales + 2) = 0.051 + 0.051 + ... + If(Nutreales + 2) = 0.051 + 0.051 + ... + If(Nutreales + 2) = 0.051 + 0.051 + ... + If(Nutreales + 2) = 0.051 + 0.051 + ... + If(Nutreales + 2) = 0.051 + 0.051 + ... + If(Nutreales + 2) = 0.051 + 0.051 + ... + If(Nutreales + 2) = 0.051 + 0.051

IF(Net sales < 3 mEUR, (1 - (Net sales / 3)), 0) + IF(Net sales > 30 mEUR, log(Net sales) / log(30) - 1, 0) + ...



2. Credit risk introduction & our solution (2/4)

Logistic regression problems

Each variable has a constant weight, i.e., it has the same importance for every firm

- Some variables might be less important in credit risk assessment for some company A than for company B
- Hard to segment data so that varying weights could also be allowed in logistic regression
 - Possible to make IF-statements which can segment data into different groups
 - For example:
 - ROA-% > 10 % 10 % > ROA-% > 0 % ROA-% < 0 %
- → "-0.224 * ROA_percent"
 → "-0.162 * ROA_percent"
 → "-0.024 * ROA_percent"
- Very hard to find the correct thresholds and makes the formula very complex very quickly

Increasing the number of explanatory variables can lead to more unstable predictions

Possible outliers can have a big influence on the final regression formula

Machine learning solutions

> Allows for automatic segmentation with varying weights

- Tree-based machine learning models split up the company data into hundreds or thousands of segmented end groups
- Each small end group has their own set of weights for the variables
- > The number of explanatory variables does not affect machine learning models as much
 - While each variable is considered in the estimation, it is possible that some variables are not even used in the final credit risk assessment reducing the number of final explanatory variables
 - Can automatically eliminate the least important variables from the evaluation
- Possible outliers do not influence the model as much
- Outliers are usually segmented into their own end group
- Most academic studies have also shown that AI-based methods outperform classical statistical methods

XGBoost (eXtreme Gradient Boosting)

- We have utilized machine learning methods in the development of our bankruptcy risk model
 - Data with hundreds of thousands of data points from different companies is provided to the machine learning algorithm.
- The best results have been achieved with an algorithm called XGBoost
 - Well-suited for classification problems such as bankruptcy risk
 - Better and faster performance than other methods
- Our XGBoost model generates a decision tree with tens of thousands of nodes, each describing a unique combination of key figures and empirically assigning a characteristic probability of default



Bottom 20%
 Bottom 20-40%
 Middle 20%
 Top 20-40%
 Top 209



Groups of companies are very intertwined. Contours added to help visualize areas where most of the observations for each company group lie

-> visualizations can be utilized in automatic text generation (see slides 9 & 10)

2. Credit risk introduction & our solution (4/4)

Machine Learning: Advantages

- The advantage of machine learning models is their ability to make use of dynamic weights for different variables.
 - Whereas a simple regression model is a polynomial equation, a machine learning model consists of a large amount of decision trees, from which the correct choice of a decision tree branch is made according to the situation.
- Machine learning algorithms support the use of a considerably larger number of variables.
 - The current model used by Valuatum consists of some 30 explanatory variables.

Example: Company A has a very good solvency and profitability. Company B on the other hand has very poor solvency and it is unprofitable. When assessing their credit risk, these companies should have different weights for the explanatory variables like liquidity.

Here, Company A doesn't need to have good liquidity since it is able to fund itself through its operations or by loaning money. On the contrary, Company B is losing money and can't raise loans. The most important feature it has is its liquidity.

It can be clearly seen that varying weights are necessary for succesful credit risk assessment. Logistic regression has constant weights and thus it is unable to account for these firm-specific characteristics. Machine learning algorithms on the other hand can recognize that the significance of liquidity becomes larger with unprofitable companies and will adjust its credit ratings accordingly.



Credit risk visualization

Example of an outlier/anomaly

- Visualization graphs can be used to find outliers in the data, e.g., high credit risk companies with ROA & Equity ratio similar to low credit risk companies
 - A "bad apple" -> high bankruptcy risk despite of being surrounded by top companies
- Allows for examination of these "bad apples" are located with the top 20-40%, when they belong in bottom 20%?
 - Most common reason for this is a weak balance sheet, e.g., high level of receivables in the balance sheet or low cash reserves
 - In our report, the reasons can be generated with automatic text (see next slides)



3. Visualizations and automatic text examples (1/3)

8

3. Visualizations and automatic text examples (2/3)

Example: visualization & automatic text (1/2)

A) Good company in good area





The company has been excellent in terms of profitability and solvency. For example, in 2020, the ROA-% of Company X was 39.0 % and the equity ratio was at 80.9 %. The net sales in 2020 were 1,020 kEUR which represents a growth of 11.5 % from the year before. Based on these factors and many others, our credit risk model has assessed that the company has a very low bankruptcy risk of 0.14 %, which corresponds to a credit rating of AA (excellent).



The company has been very weak in terms of profitability and solvency. For example, in 2020, the ROA-% of Company X was -17.3 % and the equity ratio was 7.9 %. The net sales for 2020 were 2,275 kEUR which represents a decline of -13.9 % from the year before. Based on these factors and many others, our credit risk model has assessed that the company has a very high bankruptcy risk of 10.434 %, which corresponds to a credit rating of B&C (very poor).

Both cases are straightforward: bankruptcy risk estimate correlates with placement in the chart (ROA, Equity ratio) However, sometimes the cases might not be as simple, and they might need further explanation (see next slide)

3. Visualizations and automatic text examples (3/3)

Example: visualization & automatic text (2/2)

C) Bad company in good area



When our XGBoost model identifies a bad apple – a company with high bankruptcy risk in a green zone - automatically generated description is supplemented with key reasons for high bankruptcy risk (can be generated with our own system or with ChatGPT via an API)

Performance evaluation

 All recent academic research that we have found has shown that machine learning (ML) models tend to outperform traditional regression-based methods in bankruptcy risk estimation *

We have also conducted a study to compare our model to multiple benchmark models

- Studied models include XGBoost, random forest model, artificial neural networks, an ensemble method and logistic regression
- Results are also compared to the results obtained by Altman et al. (2014) **
- A total of approximately 170 000 Finnish companies and 30 input variables were used in the training of the models
 - Half of data was used for the training set and half for the testing set

Our XGBoost model outperforms all benchmark methods in our study.

• For example, in ROC – AUC metric our model (0.9066 or 0.9110) beats the logistic regression model (0.895) and Altman's Z-score (0.894) with a clear margin

The maximum value for ROC-AUC is 1.0. ***

ROC-AUC of 0.8 can be considered good, while values exceeding 0.9 are excellent. A random model has a ROC-AUC of 0.5.

	Our XGBoost model	Our model w/ payment behavior data	Random forest (RF)	Artificial neural network (ANN)	Ensemble method (RF & ANN)	Logistic regression	Altman et al. (2014)
ROC – AUC**	0.9066	0.9110	0.904	0.880	0.902	0.895	0.894

* See, e.g., Ciampi, Francesco & Gordini, Niccolò (2013) "Small Enterprise Default Prediction Modeling through Artificial Neural Networks: An Empirical Analysis of Italian Small Enterprises" & López Iturriaga, Félix J. & Sanz, Iván Pastor (2015) "Bankruptcy visualization and prediction using neural networks: A study of U.S. commercial banks"

** Altman et. al. (2014), "Distressed Firm and Bankruptcy prediction in an international context: a review and empirical analysis of Altman's Z-Score Model", Available [online]: https://pdfs.semanticscholar.org/257c/b4227101b4da636e90b323736c68c0653a4f.pdf

*** More information on the metric and how to interpret it can be found from the following link: ROC-AUC curves

Model comparison

Key ratios	Idan.fi (kEUR)	Jujo Thermal (mEUR)
Net sales	1 046	112
Balance sheet (total)	583	56
Short-term receivables	541	24.8
Cash & cash equivalents	36	1.2
ROA %	83.4 %	-2.8 %
Equity ratio	43.6 %	52.5 %
Quick ratio	1.7	1.0
Log. reg. bankruptcy risk	A (0.74 %)	A (0.37 %)
Valuatum bankruptcy risk	B&C (1.93 %)	B&C (3.59 %)

Explanation of the model comparison example:

In these two cases, the calculated bankruptcy risks differ a lot between our model and the logistic regression model. Let's investigate the details.

The financial situation of Idan.fi seems to be excellent based on ROA and equity ratio. Jujo is making a loss, but it still has a good equity ratio. However, if we take a closer look at the assets, logistic regression model misses something that the machine learning model notices immediately. A large amount of the balance sheet total (583kEUR & 56mEUR) consist of short-term receivables (541kEUR & 24.8mEUR). Moreover, the companies have very little cash on their balance sheet. The companies' own equity is quickly gone if some part of these receivables are not valid.

Our model acknowledges and includes above in the calculation of the bankruptcy risk as an increase in short-term receivables does often tell of some financial struggles. Models based on logistic regression do not notice this as an important warning signal since the weights for each variable are constant. This is where the logistic regression model fails. It doesn't factor in the short-term assets when calculating bankruptcy risk – even when it should.

Valuatum model



Logistic regression - based model



4. Performance of our model (2/4)

Accuracy of our XGBoost model

- Table on the right demonstrates how firms that have gone bankrupt were positioned according to the risk estimate made by ValuBooster model
 - Comparisons were done for companies available in our database (data from the years 2017-2018)
 - Companies have been sorted according to our bankruptcy risk scores and then divided into 10 equally large groups (Group 10 comprises of companies that have the highest 10 % of bankruptcy risk scores)
- In general, the results show that the higher the bankruptcy estimate given by the model was, the more bankruptcies happened

Not convinced?



The same comparison can be done for any group of firms

- It is also possible to compare how the firms are ranked according to our metrics and yours
 - Provide us with the data (hundreds or thousands of previously rated potential clients) and we will generate, e.g., the probability of bankruptcy within the next two years based on the financial information available at the time of the original rating

	2017	4.1 61101	4. Performance of our mc (3/4)		
Group number (sampled according to bankruptcy risk)	# of bankruptcies in the group	% of whole sample that have gone bankrupt	Highest bankruptcy risk in the group		
1	6	< 0.01 %	0.0015		
2	11	0.01 %	0.0016		
3	19	0.01 %	0.0018		
4	30	0.02 %	0.0023		
5	26	0.01 %	0.0030		
6	43	0.02 %	0.0039		
7	71	0.04 %	0.0052		
8	126	0.07 %	0.0081		
9	253	0.14 %	0.0162		
10	1054	0.57 %	0.6667		
Total	1640	0.89 %			
	2018				
Group number (sampled according to bankruptcy risk)	# of bankruptcies in the group	% of whole sample that have gone bankrupt	Highest bankruptcy risk in the group		
1	2	< 0.01 %	0.0015		
2	2	< 0.01 %	0.0016		
3	13	0.01 %	0.0018		
4	13	0.01 %	0.0023		
5	7	0.00 %	0.0029		
6	12	0.01 %	0.0038		
7	23	0.01 %	0.0051		
8	43	0.02 %	0.0080		
9	93	0.05 %	0.0165		
10	563	0.29 %	0.6858		

Model accuracy comparison

On the right is a comparison that includes 50 companies from a comparison we made for 6000 companies who applied for a loan from our customer. The companies are sorted based on their bankruptcy risk, highest bankruptcy risk companies are on top.

Our model has given a higher risk score for each company that has gone bankrupt than our customer's own model.



In the comparison, our customer's results are on the left column and our results are on the right column

- The companies are sorted according to their bankruptcy risk, so ٠ that the companies with highest risk are on the top
- Explanations of the squares: ٠
 - Each square equals 50 companies
 - A red square means that at least one company in the group has gone bankrupt
- -> the higher in the model the red squares = the more accurate ٠ the model is

The risk scored have been determined in 2018. The companies have gone bankrupt either 2018 or 2019



Payment behavior data

Information on how the company pays their bills (related to the due date)

- Integrated into our machine learning model
- Data provided by collection agencies etc.

Possible shifts for worse (more payments overdue) usually indicates a weaker financial status -> higher credit risk

The inclusion of payment data <u>has improved</u> the performance of our credit risk model in our tests according to statistical metrics**

- ROC AUC: <u>0.9066 -> 0.9110</u>
- PR AUC: <u>0.1765 -> 0.1823</u>



5. Additional improvements to the Valuatum credit risk model (1/3)

PSD2 data

- PSD2 is a directive to regulate payment services and the transparency of payment information by requiring banks to open payment infrastructure to third parties
- Implemented separately into the credit risk decision
- Can allow access to the account transaction information of a specific company from the past 12 months
 - The company in question must approve of their data being used
- Our machine learning based bankruptcy risk is adjusted by estimating new key figures with the PSD2 data and by comparing median risk of companies with similar figures



Effects of PSD2 implementation:

Blue company (class Top 20%): PSD2 data shows declining net sales and significantly negative cash flows and therefore the credit risk is adjusted from "Top 20%" to class "Bottom 20-40%".

Yellow company (class Bottom 20%): PSD2 data shows notable improvement in net sales and significantly positive cash flows and therefore the credit risk is adjusted from "Bottom 20%" to class "Bottom 20-40%".

PSD2-based adjustment in practice



Based on PSD2 data, the company in dark blue has worse explanatory variables (ROA and equity ratio) than its place on the graph suggests and it should be located where the light blue dot is. To adjust its credit risk, we calculate the median credit risks of the areas around dark blue and light blue. If, for example, the median risk in dark blue area is 0.2 % and the median of light blue area is 0.5 %, the credit risk of the dark blue company is adjusted by increasing its credit risk by the difference of the two medians, i.e., 0.3 %.

Similarly, the orange company has better characteristics than its current placement dictates and based on PSD2, it should be located where the yellow dot is. Thus, its credit risk is reduced by the difference of risk medians in the areas where orange and yellow are.

NB! We are able to customize this process in

Loan process example with Valuatum system



tell why they did not qualify. Naturally, the lender also instantly receives the loan application in the form of an automatically generated report that displays the financial state of the company with text and visualizations. After this the lender can continue the evaluation on their own as they see best. 7. Other functionalities (1/4)

Company Views

- Company Views is our web interface that gives a comprehensive outlook into the financial position of a company
 - Layout of Company Views can be modified to fit customer needs
 - Select pages that you want (e.g., Financial ٠ statements, Cash flow statements, Valuation)
 - Choose which figures and graphs you want to ٠ display
- System is developed for financial statement analysis:
 - System can generate estimates automatically or user can make own estimates
 - User can create multiple scenarios for the ٠ company
 - User can also adjust historical figures ٠



Credit score 91 C B B B B B B B B B B B B B B B B B B B	Bankruptcy Ri Bankruptcy risk for Bankruptcy risk Credit score (0-10 Credit rating
	Credit limit (kD
0 100 🗖 🗛	Income staten (kDKK)
EBIT % Net sales	Net sales Gross profit EBITDA EBIT Pre-tax profit (I Net earnings Pre-tax profit with items
2014 2015 2015 2019 2019 2019 2020 2020 20216 20226 20226	See the entire incom
Gross profit EBIT	Balance sheet
	Tangible assets to Shareholders equi Interest bearing li Balance sheet tota
	Net Debt See the entire balan
	Volume
2016 2016 2016 2016 2016 2016 2016 2016	Net sales Net sales growth Gross profit Gross profit growt Employee growth Balance sheet totz Balance sheet totz Balance sheet totz Added value Added value % Investments

Gearing % Equity ratio %

Bankruptcy Risk 2015 2016 2017 2018 Bankruptcy risk for industry Bankruptcy risk for industry Credit sore (0:100) 0.5% 0.3% 0.3% 0.4% Credit sore (0:100) 53 51 51 42 Income statement (kDKK) 97.9 107.6 129.7 100.0 Income statement (kDKK) 2015 2016 2017 2018 Income statement (kDKK) 2015 2016 2017 2018/12 2016/12 Income statement (kDKK) 2015/12 2016/12 2017/12 2018/12 201 Net ales Gross profit 0.00 0.0 0.0 0.0 0.0 0.0 EBIT 3,533 3,503 2,823 1,421 2016/12 2017/12 2018/12 201 Pre-tax profit (PTP) Pre-tax profit without non-rec. 1,489 2,115.6 1,764.3 411.7 Stare baanting income statement 1489 2,515 21.33.4375 2018/12 2018/12 2018/12 2018/12 2018/12 2018/12 2017/12	ankruntau Diak 🛛 🚽					
Barkupty risk for industry Barkupty risk Credit score (0:100) 0.8% 0.3% 0.3% 53 0.8% 0.3% 53 0.3% 53 0.3% 53<	ankruptcy kisk 🔹	2015 2015/12	2016 2016/12	2017 2017/12	2018 2018/12	2019 2019/12
Bankrupty risk Credit sore (0:100) 0.3% 53 0.3% 51 0.4% 51 Credit limit (kDKK) 7.01 2015 2016 2017 2018/12 201 Income statement (kDKK) 2015/12 2016/12 2017/12 2018/12 201 Ret sales Gross profit Cross profit (PTP) 1,488.8 2,116.6 1,764.3 411.7 Pre-tax profit (PTP) 1,488.8 2,116.6 1,764.3 411.7 Net earnings Frampolie assets total 2,015/12 2016/12 2017/12 2018/12 2017/12 2018/12 2017/12 2018/12 2017/12 2018/12 2017/12 2018/12 2017/12 2018/12 2017/12 2018/12 2017/12 2018/12 2017/12 2018/12	Bankruptcy risk for industry	0.8%	0.8%	0.6%	0.8%	0.69
Credit score (0-100) 53 credit score (0-100) 53 credit score (0-100) 51 credit score	Bankruptcy risk	0.3%	0.3%	0.3%	0.4%	0.19
Credit rating BBB BBB BBB BBB BBB BBB BBB BBB Cedit limit (kDKK) 97.9 107.6 129.7 100.0 Income statement KDKK) 2015/12 2016/12 2017/12 2018/12 201 2018/12 201 2018/12 201 2018/12 201 2018/12 201	Credit score (0-100)	53	51	51	42	9:
Credit limit (kDKK) 97.9 107.6 129.7 100.0 ncome statement KDKK) 201512 2016/12 2017/2 2018/12 201 Net sales Gross profit EBITO EBITO EBITO Her tax profit (PTP) Her tax profit (PTP)	Credit rating	BBB	BBB	BBB	BBB	AA
Income statement KDKK) 2015 2016 2017/12 2018/2 2015/12 2016/12 2017/12 2018/2 20 2018/2 20	Credit limit (kDKK)	97.9	107.6	129.7	100.0	63.1
Income statement (kDKK) 2015 2016 2017 2018 2017 2018/12 2017/12 2018/12 2017/12 2018/12 2018/12 2017/12						
KDRK() 2015/12 2016/12 <t< td=""><td>come statement</td><td>2015</td><td>2016</td><td>2017</td><td>2018</td><td>2019</td></t<>	come statement	2015	2016	2017	2018	2019
Net sales Gross profit 3,931 0.0 3,932 3,926 3,932 3,946 3,930 3,936 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	DKK)	2015/12	2016/12	201//12	2018/12	2019/12
Gross profit 0.0 <	Net sales	3,931	3,926	3,946	3,930	4,000
EBITDÀ 3,053 3,503 2,823 1,421 Pre-tax profit (PTP) 1,488.8 2,116.6 1,764.3 411.7 Net earnings 1,488.8 2,116.6 1,764.3 411.7 Pre-tax profit (PTP) 1,488.8 2,116.6 1,764.3 411.7 Pre-tax profit without non-rec. 1,489 2,117 1,764 412 Balance sheet (kDKK) 2015 20161 2017/12 2018/12 20 Tangible assets total 45,969 45,758 45,092 10,940 158.8 16,436 18,158 21,609 17,093 17,093 Thragible assets total 45,969 45,758 45,092 10,940 16,436 18,158 21,609 17,093	Gross profit	0.0	0.0	0.0	0.0	0.0
EBIT Pre-tax profit (PTP) Net earnings 3,134 1,488.8 3,778 2,116.6 1,764.3 411.7 Net earnings Items 1,488.8 2,116.6 1,764.3 411.7 Net asnings 1,489.8 2,116.6 1,764.3 411.7 Items 1,489.8 2,116.6 1,764.3 411.7 Items 1,489 2,117 1,764.3 411.7 Items 1,489 2,117 1,764.3 411.7 Items 1,489 2,117 1,764.3 411.7 Balance sheet (kDKK) 2015/12 2016/12 2017/12 2018/12 201 Tangble assets total 45,959 45,758 45,052 10,940 Shareholders equity total 16,456 15,555 32,655 32,475 32,475 Balance sheet total (assets) 55,211 71,421 58,284 53,270 31,336 Net bale 2015/12 2016/12 2017/7 2018/12 2018/12 2017/7 2018/12 2017/7 2018/12 2017/12 2	EBITDA	3,053	3,503	2,823	1,421	2,79
Pre-tax profit (PTP) Net earnings Pre-tax profit without non-rec. 1,488.8 1,488.8 1,489 2,116.6 2,116.6 1,764.3 411.7 1,764. Pre-tax profit without non-rec. Items 1,489.8 1,489 2,117 1,764. 412 Balance sheet (kDKK) 2015 2016 2017 2018/12 2018/12 2018/12 2018/12 2018/12 2018/12 2018/12 2018/12 2018/12 2018/12 2018/12 2018/12 2018/12 2018/12 2018/12 201 2018/12 201 2018/12 201 2018/12 201 2018/12 201 2018/12 201 2018/12 201<	EBIT	3,134	3,378	2,823	1,421	2,793
Net earnings Items 1,488.8 2,116.6 1,764.3 411.7 Items 1,489 2,117 1,764 412 Salance sheet (kDKK) 2015/12 2016/12 2017/12 2018/12 20 Tangble assets total 45,969 45,758 45,052 10,940 15,435 15,153 32,475 Balance sheet total (sessets) 55,311 71,421 58,284 53,270 13,346 Net Delt sests total (sessets) 56,311 71,421 2018/12 2017/12 2018/12 2017/12 2018/12 201 Net tales growth 56,331 51,754 32,132 31,336 1,336 Ket ales growth -6,656 -0.1% 0.5% -0.4% 0.0% 0.0% 0.0% 0.0% 0.0% 0.0% 0.0% 0.0% 0.0% <td>Pre-tax profit (PTP)</td> <td>1,488.8</td> <td>2,116.6</td> <td>1,764.3</td> <td>411.7</td> <td>2,301.0</td>	Pre-tax profit (PTP)	1,488.8	2,116.6	1,764.3	411.7	2,301.0
Pre-tax profit without non-rec. 1,489 2,117 1,764 412 ate the entire income statement	Net earnings	1,488.8	2,116.6	1,764.3	411.7	2,301.0
Items 21.23 21.23 21.04 11.24 as the entire income statement 3alance sheet (kDKK) 2015/12 2016/12 2017/12 2018/12 20 Tangible assets total 45,959 45,758 45,092 10,940 20 20 2015/12 2016/12 2017/12 2018/12 20 Tangible assets total 45,959 45,758 45,092 10,940 20 20 10,940 20 20 10,940 20 20 10,940 20,940 10,940	Pre-tax profit without non-rec.	1,489	2.117	1.764	417	2,30
te the entire income statement Balance sheet (kDKK) 2015 2016 2017/12 2018/12 201 Tangible assets total 45,969 45,758 45,092 10,940 Shareholders equip total 16,436 18,158 21,609 17,093 Interest baring liabilities 39,556 52,955 35,213 33,475 Balance sheet total (assets) 56,311 7,421 58,284 53,270 Net Debt 36,334 51,754 32,132 31,336 folume 2015 2016/12 2017/12 2018/12 20 Net tales growth -6,656 -0.156 0.55 -0.4456 Gross profit growth 0.0% </td <td>tems</td> <td>1,-105</td> <td></td> <td>2// 04</td> <td>-712</td> <td>2,30,</td>	tems	1,-105		2// 04	-712	2,30,
Angible assets total 45,969 45,758 45,092 10,940 Shareholders equity total 16,436 18,158 21,609 17,093 Interest barring liabilities 35,556 52,555 35,213 33,475 Balance sheet total (assets) 56,311 71,421 58,284 53,275 Net Debt 86,334 51,754 32,132 31,336 Volume 2015 2016 20177 2018/12 2018/12 2017/12 2018/12 2018/12 2017/12 2018/12 2017/12 2018/12 2017/12 2018/12 2017/12 2018/12 2017/12 2018/12 201 2017/12 2018/12 201 2017/12 2018/12 201 <t< th=""><th>alance sheet (kDKK) 🖪</th><th>2015/12</th><th>2016/12</th><th>2017/12</th><th>2018/12</th><th>2019/12</th></t<>	alance sheet (kDKK) 🖪	2015/12	2016/12	2017/12	2018/12	2019/12
Shareholders equity total Interest baring labilities 16,436 18,158 21,609 17,093 Balance sheet total (assets) 39,556 52,955 35,213 33,475 Balance sheet total (assets) 56,311 71,421 58,284 53,270 Net Debt es the entire balance sheet 30,334 51,754 32,132 31,336 Volume 2015 2016 2017 2018/12 2018/12 2017/12 2018/12 201 Net tales 3,931 3,926 3,946 3,930 3,946 3,930 3,946 3,930 5,946 3,930 3,946 3,930 3,946 3,930 3,946 3,930 3,946 3,930 3,946 3,930 3,946 3,930 3,946 3,930 3,946 3,930 3,946 3,930 3,946 3,930 3,946 3,930 3,946 3,930 3,946 3,930 3,946 3,930 3,946 3,930 3,946 3,930 3,946 3,930 3,946 3,930 3,940 3,930 <td>Tangible assets total</td> <td>45,969</td> <td>45,758</td> <td>45,092</td> <td>10,940</td> <td>7,843</td>	Tangible assets total	45,969	45,758	45,092	10,940	7,843
Interest bearing labilities 39,556 52,955 35,213 33,475 Balance sheet total (assets) 55,311 71,421 58,284 53,270 Net Debt te the entire balance sheet 38,334 51,754 32,132 31,336 /olume 2015 2016 2017/2 2018/12 2017/12 2018/12 20 Net taskes 3,931 3,926 3,946 3,930 Net alse sproth 0.0% <td>Shareholders equity total</td> <td>16,436</td> <td>18,158</td> <td>21,609</td> <td>17,093</td> <td>9,53</td>	Shareholders equity total	16,436	18,158	21,609	17,093	9,53
Balance sheet total (assets) 56,311 71,421 58,284 53,270 Net Debt 38,334 51,754 32,132 31,336 Tolume 2015 2016 2017 2018/12 20 2015/12 2016/12 2017/12 2018/12 20 Net sales growth 3,931 3,926 3,946 3,930 Net sales growth 0,0% 0,0% 0,5% 0,04% Gross profit growth 0,0% 0,0% 0,0% 0,0% Employee growth% 0,0% 0,0% 0,0% 0,0% Employee growth% 0,0% 0,0% 0,0% 0,0% Balance sheet total (assets) 56,311 71,421 58,284 53,270 Balance sheet total (assets) 56,311 71,421 58,284 53,270	interest bearing liabilities	39,556	52,955	35,213	33,475	0.0
Net Debt te the entire balance sheet 38,334 51,754 32,132 31,336 /olume 2015 2016/12 2017/12 2018/12 20 2018/12 20 Net sales Gross profit Gross profit Gross profit growth 3,931 3,926 3,946 3,930 Net sales Gross profit growth 0.01 % 0.01% 0.04% 0.05% -0.44% Employee growth% 0.0% 0.0% 0.0% 0.0% 0.0% 0.0% 0.0% Balance sheet total (assets) 56,311 7.1421 58,284 53,270	Balance sheet total (assets)	56,311	71,421	58,284	53,270	10,110
Adume 2015 2015/12 2016 2016/12 2017/2 2017/12 2018/12 201 Net sales Gross profit Gross profit Gross profit growth 3,931 3,926 3,946 3,930 3,940 3,930 3,940 3,940 3,930 3,940 3,930 5,960 5,960 5,960 5,960 5,960 5,960 5,960 5,2606 5,264 53,270 3,270 3,247 3,247 3,247 58,496 4,656 58,596 58,496 58,496 58,496	Net Debt a the entire balance sheet	38,334	51,754	32,132	31,336	-2,25
Continue 2015/12 2016/12 2017/12 2018/12 20 Net sales 3.931 3.926 3.946 3.930 Net sales growth -6.65% -0.1% 0.5% -0.4% Gross profit 0.0 0.0 0.0% 0.0% Gross profit growth 0.0% 0.0% 0.0% 0.0% Employee growth% -7.6% -1.7% -36.5 -34.7 Balance sheet total (asset) 56.311 71.421 58.244 53.270 Balance sheet total (asset) 56.311 71.421 58.494 53.270	olumo d	2015	2016	2017	2018	2019
Net sales 3,931 3,926 3,946 3,930 Net sales growth -6.6% -0.1% 0.5% -0.4% Gross profit 0.0 0.0 0.0 0.0 0.0 Gross profit growth 0.0% 0.0% 0.0% 0.0% 0.0% Employee growth% 0.0% 0		2015/12	2016/12	2017/12	2018/12	2019/12
Net sales growth -6.6% -0.1% 0.5% -0.4% Gross profit growth 0.0 0.0 0.0 0.0 Gross profit growth 0.0% 0.0% 0.0% 0.0% Employee growth% 0.0% 0.0% 0.0% 0.0% 0.0% Employee growth% 0.0%	onume					
Gross profit 0.0 0.0 0.0 0.0 Gross profit growth 0.0% 0.0% 0.0% 0.0% Employee growth% 0.0% 0.0% 0.0% 0.0% 0.0% Employee growth% 2.76.2 178.2 356.5 -334.7 Balance sheet total (asset) 56.311 71.421 58.284 53.270 Balance sheet total (asset) 6.0% 0.0% 6.6% 6.6%	Vet sales	3,931	3,926	3,946	3,930	4,00
Gross profit growth 0.0% 0.0% 0.0% 0.0% Employee growth% 0.0% 0.0% 0.0% 0.0% Employee expenses -276.2 -178.2 -356.5 -334.7 Balance sheet total (assets) 56.311 71.421 58.284 53.270	Net sales Vet sales growth	3,931 -6.6%	3,926 -0.1%	3,946 0.5%	3,930 -0.4%	4,00
Employee growth% 0.0% 0.0% 0.0% 0.0% Employee expenses -276.2 -178.2 -356.5 -334.7 Balance sheet total (assets) 56,311 71,421 58,284 53,270 Balance sheet change% -0.0% 26,8% -18,4% -8,6%	Net sales Vet sales growth Gross profit	3,931 -6.6% 0.0	3,926 -0.1% 0.0	3,946 0.5% 0.0	3,930 -0.4% 0.0	4,000 1.89 0.0
Employee expenses -276.2 -178.2 -356.5 -334.7 Balance sheet total (assets) 56,311 71,421 58,284 53,270 Balance sheet change% -0.0% 26.6% -18.4% -8.6%	Net sales Vet sales growth Gross profit Gross profit growth	3,931 -6.6% 0.0 0.0%	3,926 -0.1% 0.0 0.0%	3,946 0.5% 0.0 0.0%	3,930 -0.4% 0.0 0.0%	4,000 1.89 0.0 0.09
Balance sheet total (assets) 56,311 71,421 58,284 53,270 Balance sheet change% -0.0% 26.8% -18.4% -8.6%	Vet sales Vet sales growth Gross profit Gross profit growth imployee growth%	3,931 -6.6% 0.0 0.0% 0.0%	3,926 -0.1% 0.0 0.0% 0.0%	3,946 0.5% 0.0 0.0% 0.0%	3,930 -0.4% 0.0 0.0% 0.0%	4,00 1.89 0.0 0.09 0.09
Balance sheet change% -0.0% 26.8% -18.4% -8.6%	Vet sales Net sales growth Gross profit Gross profit growth imployee growth% imployee spenses	3,931 -6.6% 0.0 0.0% 0.0% -276.2	3,926 -0.1% 0.0 0.0% 0.0% -178.2	3,946 0.5% 0.0 0.0% 0.0% -356.5	3,930 -0.4% 0.0 0.0% 0.0% -334.7	4,000 1.89 0.0 0.09 0.09 -222.5
	Vet sales Vet sales growth Gross profit growth Employee growth% Employee expenses Jalance sheet total (assets)	3,931 -6.6% 0.0 0.0% -0.0% -276.2 56,311	3,926 -0.1% 0.0 0.0% -178.2 71,421	3,946 0.5% 0.0 0.0% -356.5 58,284	3,930 -0.4% 0.0 0.0% -334.7 53,270	4,00 1.89 0.0 0.09 -222.1 10,110
Added value 3,410.2 3,556.4 3,179.6 1,755.4	Vet sales Vet sales growth Sross profit Sross profit growth Employee growth% Simployee expenses Jalance sheet total (assets) Jalance sheet total (assets)	3,931 -6.6% 0.0 0.0% -276.2 56,311 -0.0%	3,926 -0.1% 0.0 0.0% -178.2 71,421 26.8%	3,946 0.5% 0.0 0.0% -356.5 58,284 -18.4%	3,930 -0.4% 0.0 0.0% -334.7 53,270 -8.6%	4,00 1.89 0.0 0.09 -222.9 10,110 -81.09
Added value % 86.7% 90.6% 80.6% 44.7%	Vet sales Vet sales growth Gross profit growth Employee growth% Employee expenses Jalance sheet total (assets) Jalance sheet total (assets)	3,931 -6.6% 0.0 0.0% -276.2 56,311 -0.0% 3,410.2	3,926 -0.1% 0.0 0.0% -178.2 71,421 26.8% 3,556.4	3,946 0.5% 0.0 0.0% -356.5 58,284 -18,4% 3,179.6	3,930 -0.4% 0.0 0.0% -334.7 53,270 -8.6% 1,755.4	4,000 1.89 0.0 0.09 -222.9 10,110 -81.09 3,019.0
Investments -9,858 -211 -666 -34,153	Net sales Wet sales growth Gross profit Gross profit growth Employee growth% Employee growth% Employee spreases Balance sheet total (assets) Balance sheet total (assets) Salance sheet total (adset) Udded value Vided value %	3,931 -6.6% 0.0 0.0% -276.2 56,311 -0.0% 3,410.2 86.7%	3,926 -0.1% 0.0 0.0% -178.2 71,421 26.8% 3,556.4 90.6%	3,946 0.5% 0.0 0.0% -356.5 58,284 -18,4% 3,179.6 80,6%	3,930 -0.4% 0.0 0.0% -334.7 53,270 -8.6% 1,755.4 44.7%	4,000 1.89 0.09 0.09 -222.1 10,111 -81.09 3,019.4 75.59
Net sales trend -1.0 -2.0 1.0 -1.0	Net sales Yet sales growth Tross profit growth Employee growths Employee expanses Jalance sheet total (sesets) Jalance sheet total (sesets) Jalance sheet total Vided value % Neestments	3,931 -6.6% 0.0 0.0% -276.2 56,311 -0.0% 3,410.2 86,7% -9,858	3,926 -0.1% 0.0 0.0% -178.2 71,421 26.8% 3,556.4 90.6% -211	3,946 0.5% 0.0 0.0% -356.5 58,284 -18,4% 3,179.6 80,6% -666	3,930 -0.4% 0.0 0.0% -334.7 53,270 -8.6% 1,755.4 44.7% -34,153	4,000 1.89 0.1 0.09 -222.5 10,116 -81.09 3,019.4 75.59 -3,096
EBIT trend 4.0 5.0 5.0 5.0	Net sales Vet sales growth Gross profit Gross profit growth Employee growth% Employee expenses Salance sheet change% 4dded value % Investments Vet sales trend	3,931 -6.6% 0.0 0.0% -276.256,311 -0.0% 3,410.2 88,7% -9,858 -1.0	3,926 -0.1% 0.0 0.0% -178.2 71,421 26.8% 3,556.4 90.6% -211 -2.0	3,946 0.5% 0.0 0.0% -356.5 58,284 -18,4% 3,179.6 80,6% -666 1.0	3,930 -0.4% 0.0 0.0% -334.7 53,270 -8.6% 1,755.4 44.7% -34,153 -1.0	4,000 1.89 0.1 0.09 -222.3 10,114 -81.09 3,019.4 75.59 -3,099 1.1

Overview

	Fir	ancial st	atemer	nts		
		2019	2020e	2021e	2022e	2023e
come statement (kDKK)	4	2019/12	N/A	N/A	N/A	N/A
Fiscal year (months)		12	0	0	0	0
Net sales		4,000	4,027	4,077	4,116	4,195
Mapufacturing for enterprise's own use		0.1	0.1	0.0	0.2	0.2
Other operating income		0.0	0.0	0.0	0.0	0.0
External services		0.0	0.0	0.0	0.0	0.0
Administrative expenses		-222.9	-285.1	-314.0	-342.6	-375.4
Gross profit Net Income from Arrocister		0.0	3,231	3,200	3,159	3,147
Wages and salaries		0.0	0.0	0.0	0.0	0.0
Other operating expenses		-580.4	-742.2	-817.5	-892.0	-977.3
Reduction in value of non-current assets		0.0	0.0	0.0	0.0	0.0
EBIT		2,796.7	2,488.4	2,382.1	2,266.5	2,169.2
Other financial income		0.0	0.0	0.0	0.0	0.0
Uther financial expenses Pre tax profit less extra ordinaries		2 301 6	1 993 4	1 887 0	1 771 4	1 674 1
		2,50210	1,000.1	1,00710	1,77111	2,07.112
Pre-tax profit (PTP)		2,301.6	1,993.4	1,887.0	1,//1.4	1,6/4.1
Income taxes		0.0	-398.7	-377.4	-354.3	-334.8
wet earnings		2,301.6	1,394.7	1,505.6	1,417.1	1,339.3
		2010	2020-	2024-	2022-	2022-
ssets (kDKK)		2019	20206	ZUZ TE N/A	NIA	2023e
		2015/12	11//4	N//A	N//A	N//A
Intangible assets total		0.0	0.0	0.0	0.0	0.0
Buildings		7,843.2	9,056.7	9,168.3	9,256.1	9,434.9
Tangible assets total		7,843.2	9,056.7	9,168.3	9,256.1	9,434.9
Other receivables		0.0	0.0	0.0	0.0	0.0
Investments total		0.0	0.0	0.0	0.0	0.0
Other stocks		0.0	0.0	0.0	0.0	0.0
Current assets total		0.0	0.0	0.0	0.0	0.0
Long term receivables total		0.0	0.0	0.0	0.0	0.0
Current trade debtors		0.0	0.0	0.0	0.0	0.0
Current other receivables		12.6	12.7	12.8	13.0	13.2
Prepayments and accrued income		1.4	1.4	1.5	1.5	1.5
Short term receivables total		14.0	14.1	14.3	14.4	14.7
Cash equivalents total		0.0	0.0	0.0	0.0	0.0
Cash and bank deposits		2,258.8	2,274.2	2,302.2	2,324.3	2,369.2
Cash (generated)		0.0	472.7	583.3	696.0	704.3
Balance sheet total (assets)		10,116.0	11,817.7	12,068.2	12,290.7	12,523.0
		2019	2020e	2021e	2022e	2023e
quity and liabilities (kDKK)		2019/12	N/A	N/A	N/A	N/A
Share emilal		76.4	76.4	76.4	76.4	76.4
anare capital Retained earnings		8,630,6	8.795.7	9.114.6	9.416.5	9.69
Profit of the financial year		825.1	1,594.7	1,509.6	1,417.1	1,339.3
Shareholders equity total		9,532	10,467	10,701	10,910	11,116
Appropriations total		0	0	0	0	0
Non-current loans from credit institutions						
(Estimate years generated)		0.0	0.0	0.0	0.0	0.0
Non-current liabilities total		0	0	0	0	0

			Va	alua	tior	1							
DCF Valuation (kDKK)	2018 2018/12	2019 2019/12	2020e N/A	2021e N/A	2022e N/A	2023e N/A	2024e N/A	2025e N/A	2026e N/A	2027e N/A	2028e N/A	2029e N/A	TRM N/A
EBIT + Total depreciation	1,421	2,797	2,488	2,382	2,266	2,169	2,080	1,992 0.00	1,898	1,797	1,688	1,571	1,619
- Paid taxes - Tax, fin. expenses + Tax, fin. income	0.00 0.00 0.00	0.00 0.00 0.00	-399 -99.0 0.00	-377 -99.0 0.00	-354 -99.0 0.00	-335 -99.0 0.00	-317 -99.0 0.00	-299 -99.0 0.00	-281 -99.0 0.00	-260 -99.0 0.00	-239 -99.0 0.00	-215 -99.0 0.00	0.0
Operating cash flow + Inc. in nib. I-t liab.	-28,840 -27,420 0.00	40,855	2,758	1,922	1,826	1,762	1,700	41.5 1,635 0.00	43.9 1,562 0.00	45.4 1,483 0.00	46.8	48.2 1,305 0.00	0.0
- Gross capex Free oper. cash flow +/- Other items	34,153 6,733 0.00	43,952 0.00	-1,213 1,545 0.00	-112 1,810 0.00	-87.7 1,738 0.00	-1/9 1,583 0.00	-243 1,457 0.00	-281 1,354 0.00	1,265	-308 1,176 0.00	5 1,081 0 0.00	-326 979 0.00	-33 0.0
Free cash flow Discounted FCFF	6,733	43,952	1,545 1,931	1,810 2,016	1,738 1,724	1,583 1,398	1,457 1,146	1,354 948	1,265 789	1,176	1,081 534	979 431	10,85 4,78
Cum. disc. FCFF - Int-bear. debt + Cash at bank + Market value of associated companies - Market value of minorities - Prev. year paid dividends			16,349	14,418 0.00 2,747 0.00 0.00 0.00	12,403	10,679	9,281	8,136	7,188	6,399	5,746	5,211	4,78
Value of equity / No of shares (m) Fair value DCF				18,937 0.00 0.00									
EVA Valuation (kDKK)	2018 2018/12	2019 2019/12	2020e N/A	2021e N/A	2022e N/A	2023e N/A	2024e N/A	2025e N/A	2026e N/A	2027e N/A	2028e N/A	2029e N/A	TRM N/A
EBIT - Taxes on EBIT	1,421	2,797	2,488 -498	2,382 -476	2,266 -453	2,169 -434	2,080	1,992 -398	1,898	1,797	1,688	1,571 -314	1,61

Company Views: Estimates and Adjustments

Income statement (EURm)	•	2017 N/A	2018 2018/12	2019 2019/12	2020e N/A
Fiscal year (months)		0	12	12	0
Net sales		<u>9,116</u>	<u>9,071</u>	<u>9,382</u>	þ, 518 💛
Net sales growth		7.5%	-0.5%	3.4%	1.4%
Other operating income		0.0	22.0	22.8	23.1
Other operating income / Net sales		0.0%	0.2%	0.2%	0.2%
Purchases during the financial year		0.0	<u>-3,614.4</u>	<u>-3,739.7</u>	-3,799.1
Purchases during fiscal year / Net sales		0.0%	-39.8%	-39,9%	-39.9%
Wages and salaries		0.0	-2,818.4	<u>-2,916.1</u>	-2,962.4
Wages and salaries / Net sales		0.0%	-31.1%	-31.1%	-31.1%
Other operating expenses		<u>-7,755.6</u>	<u>-1,498.6</u>	<u>-1,550.5</u>	<u>-1,575.2</u>





- Adjustments to historical figures and estimates can be made on the web interface
- Adjustments can be made in two different ways:
 - 1. Changing the values in tables
 - 2. Dragging the bars or lines in charts (see the picture on the left!)
 - After adjustments, the financial statements and key ratios are updated accordingly
 - Estimates can be input either as absolute or relative values (e.g., net sales or net sales growth-%)

Adjustments and estimates can also be easily edited in the Excel model

Comparisons: Lists and Scatters

- The user can either make comparisons in a scatter or list form.
- The comparison group can be narrowed to any industry or list of user's choice.

Colu	Columns and criteria (Show/hide)										
Var	iable	Minimum	Maximum	Significant	digits						
Equ	ity ratio % (2021)	50	100	3		×					
EBI	T % (2021)	10	50	3		×					
ROA	A % (2021)	20	50	3		×					
Add	new criteria App	ly filters Save c	urrent criteria								
Resu	lts: 13656 100	~									
	Compa	any	Equity ratio %	6 (2021)	EBIT % (20	021)	ROA % (2021)				
1	Oy PaStra Ab			50.0 %		10.0 %	20.0	96			
2	Oy Transientti Radi	o Ab		50.0 %		11.1 %	20.0	96			
3	Pekosa Oy			50.0 %		15.2 %	20.0	96			
4	KRK Huoltopalvelut	t Oy		50.0 %		23.1 %	20.0	96			
5	RantaOksa Oy			52.3 %		10.8 %	20.0	96			
6	MindMaker Oy			53.3 %		11.8 %	20.0	96			
7	Tretekno Oy			58.5 %		19.3 %	20.0	96			



Automatic financial reports with XBRL

- XBRL is a standardized format that enables efficient exchange of financial information through digital means
- Possible to upload XHTML-type financial reports into our system which then automatically completes the financial statements for analysts
- Useful if data can't be automatically found from an external data provider. This can happen with e.g. foreign companies.
 -> financials can then be uploaded through XBRI



3. Analyst can now focus on what matters the most – the complete data is already available!

Х

More information about our services

Overview of our credit risk services: <u>https://www.valuatum.com/credit-risk/</u>

Our bankruptcy risk model (includes a technical white paper): https://www.valuatum.com/credit-risk/bankruptcy-risk/

Our other methods for risk estimation:

https://www.valuatum.com/credit-risk/bankruptcy-risk/machine-learning-in-risk-estimation/

Example of how our system can be used in practice for credit risk assessment: <u>https://www.valuatum.com/credit-risk/credit-risk-in-practice/</u>

Contact information

Customer support <u>contact@valuatum.com</u> +358 45 123 0308

