

TALLINN UNIVERSITY OF TECHNOLOGY

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**PLANNING AND IMPROVEMENT OF DEMAND
FORECASTING PROCESS IN AN EXAMPLE OF COMPANY
X**

Bachelor's thesis

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I hereby declare that I have compiled the thesis independently and all works, important standpoints and data by other authors have been properly referenced and the same paper has not been previously presented for grading. The document length is 8796 words from the introduction to the end of conclusion.

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Abstract

Forecasting and planning the demand and continuous improvement of it, is one the basic starting points of the successful enterprise. The aim of the study was to conduct a fully automated forecasting model for the international company X. There were two main research questions for the current thesis: 1) What could be the optimal forecasting model used for different distribution channels? and 2) Identification of all important factors that may contribute to Sales forecasts. The forecasting method should consider not only the historical data of the business, but also taking into account different factors that have an impact on the sales such as promotional activities and market category growth. The forecasting model was tested out on brand Y and three markets data, it showed a great performance, reporting +3% to the actual sales result for 2019. Through increasing the accuracy of the forecast, companies are able to improve the financial performance of the company due to the minimization of costs and unneeded promotional activities. Therefore, company increases the attractiveness as there will be more free cash available. Another important factor is linking the forecasted values with the market share reflection. Using that approach enables users to see, where to expect the growth of category and whether the business is growing faster or lower compared to the whole group. As a result, there will be clear and full overview of the company's performance and according to it management team can propose plans for the upcoming periods.

Keywords: Forecast, Planning, Market Share, Financial measurements

Introduction

Throughout the year's companies are searching for the success model which will help to grow continuously, reporting higher profits and lower costs. Businesses are seeking for opportunities to increase the profitability and efficiency of the firms. There could be a superior and high-quality product, but without a proper manager leading and well-thought logistics management it will not bring as much profits as it could. As a result it is important to start from the basics and move to the ideal model of success.

Company X is a big international company that operates worldwide, it is gaining more and more markets with strengthening the relationship with the final consumer. The aim of the company is to grow continuously and provide better quality products to its customers. As it is mentioned before, it is important to focus on the basics firstly and then making improvements on the business model. Today, the company is lacking detailed analysis of the results and it affects the future planning process and the final forecast, and as a result financial part of the company is experiencing negative effects of the poor management. There is a target given by the head of the company for each geographical position, but there is no actual plan for achieving the goal. As a result two main research questions are phrased as follows 1) What could be the optimal forecasting model used for different distribution channels? and 2) Identification of all important factors that may contribute to Sales forecasts.

Aim of the research is to develop a fully automated forecasting model in order to increase the accuracy of planning or demand forecasting. There are several advantages of the model usage such as allocation of the money used to finance different promotional activities and extra placements. In addition, better organised supply chain performance, the effects of the new products distribution and a clearer understanding of the demand planning within the product portfolio.

The concept of the current thesis is to conduct a demand forecasting model for different channels of distribution based on both quantitative and qualitative studies that have been done before. As a result, the company will see the stock movement and will control the sales better, so that there is no overstocking or destocking problems. Therefore, the model will support both sides and will minimize some costs for parties. Moreover, the combination of models will be used to achieve the best scenario taking into account the needs of the company and the goal. In order to test out the forecasting model, the author will collect the data from different wholesalers and will review the literature to find the most suitable method for the particular company's data considering its goal. In addition, there will be a discussion about market share and how it reflects the plans of the company. Also, the author will represent macro environmental factors of the Baltics region that influence the target of the company.

The model will be based on the MAPA method, which was emphasized by the Kouretznes (2016). It consisted of three main parts : 1) Transforming data into different frequencies; 2) Preliminary forecast for each SKU, transfer data to same frequencies; 3) Adding extra variables and conducting an overall forecast. Also, the final analysis will compare the actual sales, target of growth given by the company and also the forecasted values for 2019.

The structure of the thesis is divided into three parts: 1) Theoretical background; 2) Data and Methods; 3) Results and main findings. First part consists of profitability indicators and the determining of them into the market share. In addition, literature review of the forecasting model and previous empirical studies that have been done before. Second part is observing the data and methods that is used in the thesis, macro environment of each country and Baltics overall performance. There is also a description of company X, the specification of the business and the main focus for the current thesis. Third part describes the reflection of the market share on the promotional activities and plans of the firm. The final step is to analyse the results of the model proposed.

The main goal of the study is not the academic part, but the importance of practical usage and a well thought model plus materials for students and companies that seek for the proposal on improvement of the forecasting process and other factors which are directly connected to that.

The research takeaway is very important as the company vision and mission is to provide a cleaner and healthier world. Even though the company operates in many countries, the company has a target of growth and each subgroup has to follow the plan in order to reach the goal. Today, the problem is that there is no exact plan by the stock keeping unit(SKU). The target is given to each brand separately. That approach does not give an overview which product contributes the most to the growth and where to put more effort.

1.THEORETICAL BACKGROUND

1.1 Indicators of profitability

Financial management is a key objective to achieve the goal of the company through planning, directing, organizing and managing financial activities of the company. One of the best criterias to rate company's success is the profitability ratios, which are used to see the returns of the investments and also determine overall performance of the company. There are several indicators of profitability of the company such as size, age, growth, lagged profitability, productivity and industry affiliation (Margaretha and Supartika, 2016).

Firstly, the size of the enterprise is directly related to profitability of the company. Larger firms tend to have more sales and therefore they report higher profits. Moreover, big companies control better their economies of scales. (Vijayakumar, 2011) which means that they usually have larger substantial savings than their competitors. Another factor is the age of the company, Margaretha (2016) emphasizes that there is a negative correlation between the firm's age and profitability. As when the new trademark appears in a market, there is higher interest in the product. While age has a negative impact on profitability, the opposite happens with the growth as it is increasing profitability. There is a strong interaction between sales growth and profitability as additional demand from sales shows an important indicator for increasing profits (Lazar, 2016).

One more indicator is lagged profitability, Margaretha (2016) has examined that there is a contrary effect to previous year results on generating profit. The result of the study showed that lagged profitability influences the level of profitability of the company. She also emphasizes the strongest factor for profitability is the productiveness of the business. Therefore, through increasing the level of labour productivity, firms are able to boost the sales in parallel. Another positive tendency is seen from the industry affiliation point of view (Ngo, 2019). Vertical integration is one of the ways

to reduce costs acquired in the market, increase the quality and also increase efficiency of the delivery. Those aspects make the business more effective and productive, so it will increase the profitability of the company.

One of the main factors for determining the profitability of the company is market share. There is a strong correlation between return on investments (ROI) and a market share. Through gaining greater market shares companies are strengthening the relationship between the brand and the final consumer. Thereby, it decreases the risk of switching a company's product to its competitor and as a result increases the revenue without an extra marketing from the firm's side. There are several benefits that come with having the majority of the segment.

The first one is the economies of scales, large-share companies tend to have larger substantial savings than its competitors (Buzzel 1975). Larger retailers usually have higher profit margins than their competitors. Therefore, they find it profitable to give higher discounts in order to have better stock movement and higher market share. It will have a positive impact on markups of purchasing economies, but it will lead to lower margins compared to smaller firms. At the same time company's total expenses will be reduced due to the company- and store-level substantial savings, better inventory management and additional consumer flow affected by the lower prices. However, company will have a negative impact on the gross margins, they may still have higher net margin (Scott, 2018).

Second advantage is the market power of the brands with larger proportions of the market share. There is a belief that large-scale firms are having higher demand on the products. Firstly because of the name, since the trademark has already gained some popularity in a segment. People are more likely to choose the good in comparison to its competitor. Therefore, the size of the market share directly affects the ability and aggressiveness of the bargaining (Buzzel 1975). However, as the market power the overhead of the company increases in parallel, the margins that are set up by the company still exceeds the ongoing business expenses (Eeckhout, 2020).

Moreover, due to the higher sales companies are making more money and accordingly having higher profits. ROI results are also better in large-scale companies, as the sales are growing faster

than the investments which were made into specific activity. In comparison smaller firms may spend relatively similar amount to participate in a campaign period, but the sales that they will make would bring them smaller return than if the same procedure is held by the company which has larger market share.

One more advantage of the market share is the impact for the better performance of businesses in mature or seasonal industries where the growth is not significant. Economic factors have a greater impact on the cyclical industries, where the variance of margins, earnings and turnover play a huge role. Due to the high competition companies may lower down the margins, increase the expenses through investments made to marketing activities or even sell goods in so-called loss-leader to stimulate growth of the customers and sales. In such industries, businesses tend to lose money due to the strong competition. However, when the companies gain larger shares, they increase the prices of the goods and start to earn profits (Hayes, 2019).

Thereby it is very important to forecast the demand and activities in advance. There is strong correlation in actual sales and market share performance, as they are acting as a mirror effect. While one company is making promotional activities or extra placements, the demand for the products are growing and other way around. Also, in market share data is visible, where is the season for particular goods, therefore company can follow the activities plan of the competitors and make plans with consideration of that. Moreover, through forecasting process companies are able to predict when will the category grow and make promotional activities according to that schedule.

1.2 Forecasting models for retail companies

Forecasting is one of the tools for retail companies to meet their goals and see which part of the variation of goods will contribute the most to the growth. There are plenty of variations of models

available, some of them are based on the overall brand growth and others go deeper and that makes the process more complex.

Nowadays, the market needs and expectations are changing heavily, because of the fast-changing environment and trends. Companies are seeking opportunities how to meet new challenges and react quickly on the changes (Hofmann, 2018). It is very crucial to build up the system which will show accurate results taking into account different scales that affect the data. Depending on the company industry some forecasting models are working well for the fashion industry and will not work out for the food industry for example. Choosing the right model will bring more accuracy to the forecast which will lead to the more efficient use of the warehouses and service levels.

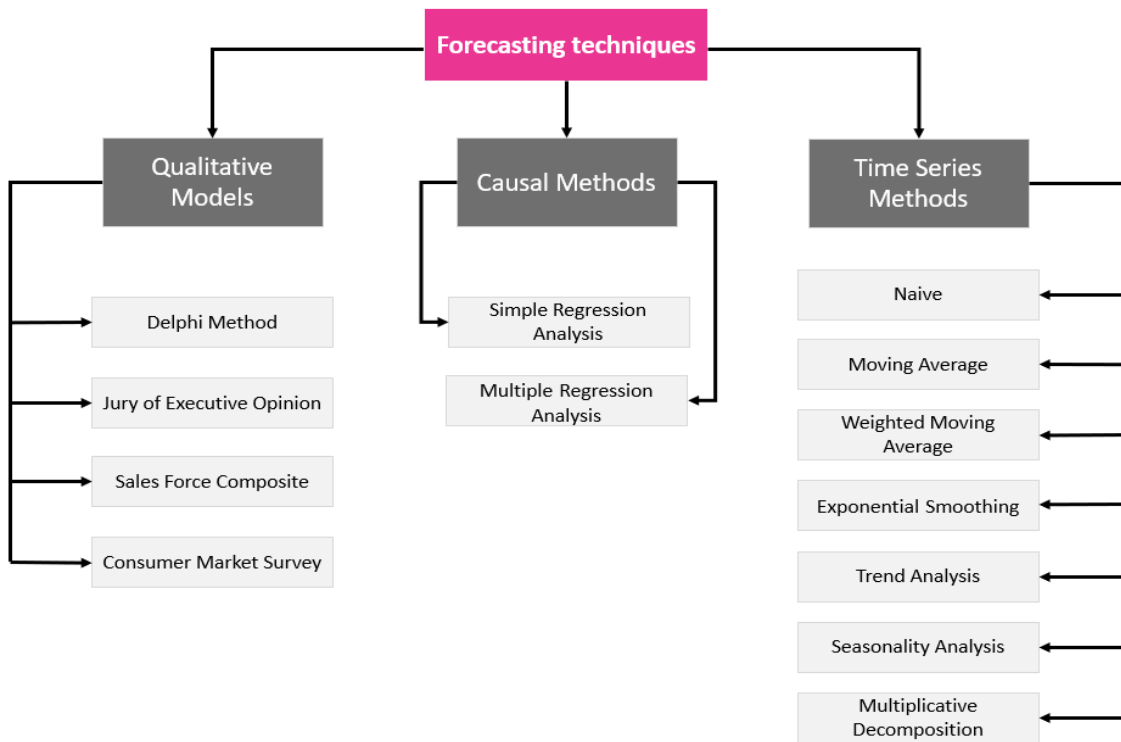


Figure 1. Forecasting models

Source: Adapted from Singleton, 2016

Figure 1 represents the main division for forecasting techniques that are divided into 3 subgroups which are Qualitative, Causal and Time Series Methods. According to the company’s aim and the data available the method is chosen respectively.

One way to forecast demand is to use a quantitative method that works the best where there is no interruption with the environmental factors. In that case no fluctuations occur, if the changes take place then there is no use of such model. On the other hand, a qualitative method which in that case is superior over the quantitative. This method identifies changes quicker and interprets the effect of that to the future (Attest). Combination of two methods may increase the reliability and also develop new look at the problem. Both analyses will support each other and decrease the weakness of the method and therefore there will be more consistent and significant interpretations of the results (Benetka, 2008)

Another approach is that the accuracy of the forecast can be increased by gathering the information from sales representatives of the company. Salespeople have direct communication with stores and customers, therefore they have a good intuition and insights. One more benefit is the bonus system which usually is held by the company in order to keep the interest of the representatives and boost the sales. On the other hand, due to the high interest and belief which is a common human judgement, salespeople could be either too optimistic or other way around too pessimistic about the product sales (Lamarco, 2018).

Snapp(2012) emphasizes naive method as this model overperforms other more complex forms for a 50% of the product files. The Naive method is also one of the most simple forecasting methods as it based purely on the last month results, average sold-out data or last year results which are left without any changes. That method enables to understand how much value is added to the forecasting process. On the other hand, the prognosis is being made on the sales, marketing and statistical forecasts at the very basic level without going deeper into the topic. As a result, in most cases it is impossible for the companies to measure errors (Snapp, 2012).

Another group of the forecasting techniques is causal methods, which consists of two main methods. First method is simple regression analysis, where the aggregation of observations differ only by one unit of explanatory variable. This approach is mostly used in the researches, where only the value of descriptive variable differs across experimental treatments. While multiple regression analysis determines direct outcomes of different variables. That enables to see variation of effects depending on the exact element (Morrisey, 2018).

One of the most commonly used methods are simple models such as Exponential Smoothing Models, they are usually abbreviated as (ETS) Error, Trend and Seasonality (Kourentzes, 2018). In the ETS method the data is given as weighted averages of past observations which is later used to forecast new values (Daiton, 2009). There is a variety of 30 different methods which fall into ETS group, one of those methods is flat forecasting method which works the best for the data where no trend and seasonality occurs (Hyndman, 2008).

Nevertheless, the exponential smoothing models are the most used, for the simple models could be also applied to Weighted Maximum Likelihood. Method allows users to estimate dynamic factor model that concentrates more on the key factors rather than other variables, which are used to facilitate the forecast of the main variables or analyzing of them (Blasques , 2016)

The more complex models bring more accuracy to the forecasting process and makes them outperform the simple models (Kourentzes, 2018). The idea behind using more compounded combinations is to decrease level of modelling uncertainty and avoid planning forecasts on the single model (Kourentez, 2018). For the more complex models, the combination of forecasting methods is used. In that case easier models can be improved as on the example of Bagging of time series is upgrading already known Exponential Smoothing Method by maintaining trend and seasonal elements untouched (Bergmeir, 2018).

One more advanced model is Multiple Aggregation Prediction Algorithm (MAPA) which is superior over the ETS model, because of the different time-series components that are strengthened at non-identical aggregation level, which as a result gives a fuller overview of the structure of time series and also increase the accuracy of process (Kourentez, 2014). Despite the fact that this approach already has some advantages over other methods named earlier, it is still lacking the part of the additional information as promotions which is a very crucial part in retail business.

As a result, author will use the method which combines the Exponential Smoothing Method, that is known as a simple and reliable model together with judgmental and robustness benefits of Multiple Aggregation Prediction Algorithm (Kourentez, 2016). The integration of the method will allow to build up a fully automated promotional model.

1.3 Previous empirical studies

A vast amount of research and studies have been done to find the best solution for the companies to minimize the effort and costs that comes with planning the demand. The accuracy is one the most important tasks while creating a forecast for product portfolio. Since when increasing correctness of the data, companies are able to lower down the risks which comes with it such as overstocking of warehouses and not supporting the manufacturers.

Kourentez (2016) emphasizes the MAPA method that overperforms benchmarks in forecasting the sales including extra factor which is promotion activities. The research was made based on the data given by one of the leading cider brands in the United Kingdom. Aim of the study was to increase efficiency of the inventory planning and support manufacturers in the production cycle. For the case study 12 SKUs were chosen, having different measurements and also flavours. Goods were sold to multiple retailers and each of them have its own schedule for promotions. The requirement for a successful trial was to know promotional plan in advance and that each product can be in a campaign up to 6 times any time. Only while following all the requirements, the successful forecast could be proposed.

While looking at the statistics across the product portfolio, they were able to see the impact of the discounts in a given period. Also it is visible on which products company concentrates the most as those items were highly promoted. Data consisted of the factors such as date of the sale, exact SKU and periods where promotion activities took place. Since there were several wholesalers, the model for time series were chosen separately as each retailer has different input on the data.

Case study tested out different scenarios and the accuracy of each forecasting method. In the research they have used 6 methods: Naive; Exponential Smoothing Method; Multiple Aggregation Prediction; Regression; ETSx; MAPAx. Each of the methods were implemented into different horizons $t+4$, $t+8$ and $t+12$ months. The analysis showed that models where promotional activities are included are superior over the ordinary forecasting models. The methods were ranked based on the mean forecasting bias.

The lowest reported rank performs the best in the given periods. MAPAx shows the biggest improvements over its counterparties. The analysis shows the advantage of inserting promotional information into the models. However, the MAPAx has shown a good performance, the Naive model in the longer-term $t+8$ and $t+12$ and when medians are considered to work better. Nevertheless, the results were fluctuating upon different horizons, MAPAx model is more accurate and shows less errors across SKUs than its counterparties. Therefore, the success of the MAPAx model is behind the combination of extra variables in terms of promotions and also the quality of the method itself. (Kourentez 2016).

Another study based on the MAPA method was conducted for bank branches in Greece, each of them represented three level hierarchies which were connected to the energy needs of the bank. Aim of the research was to provide a decent and automatic solution to the practical setting as . Assimakopoulus (2020) has tried out four different forecasting models: MAPA.D (MAPA method with removed seasonality); MAPA; MAPA.W(Added weighted scheme) and MTA model. The last one did not perform well, so it was decided to removed from the overview.

Evaluation of the methods named earlier was made considering both bias and accuracy of the forecast. Due to the small amount of data available, original time series were transformed into training set. Depending on the perspective of the forecast, they have chosen the period of one week and two-week set. Moreover, there was a division for forecasting models where first one considers all horizons in all levels and second one examine each level separately.

Using benchmarking Assimakopoulus (2020) has rated different methods. MAPA method performed the best for the case study as there was no strong highlighted trend and as a result it affected the temporal aggregation method. However, both MAPA.D and MAPA.W outperformed MAPA method in the face of considering the high frequency of the seasonality, but due to the small sample available, it is not accurate and therefore there is no use of such models. As a result, MAPA worked the best at the longer horizons and minimal trend.

2. DATA AND METHODS

2.1 Macro environment of Baltics 2019

There are a lot of factors which affect the markets, one of those is macro environment. Consumer behaviour is quite volatile on the changes of the environment. Therefore, there is a direct impact of the economy on the sales (Glandon PJ, 2018). In the best scenario while the market is growing then the company's performance and sales should also grow in parallel. One of the factors which reflects the economy of the country is gross domestic product (GDP) that shows monetary value of the finished goods, size and growth rate of the economy. Another term which would be used in a thesis is the consumer price index (CPI) which shows the average price of the consumer's basket of goods and services, also known as inflation (Chen 2020).

According to the OECD statistics, for the recent 4 years Baltics region has been showing a good growing tendency. GDP factor of each country has been stable or without big drops during the years analysed. However, the economy was growing during the recent years, growth is slowing down...2019. Based on Figure 2, the best timeframe for Baltics were the second and third quarter during 2017 and the last highest result was in the fourth quarter in 2018. After that period economy started to slow down each period.

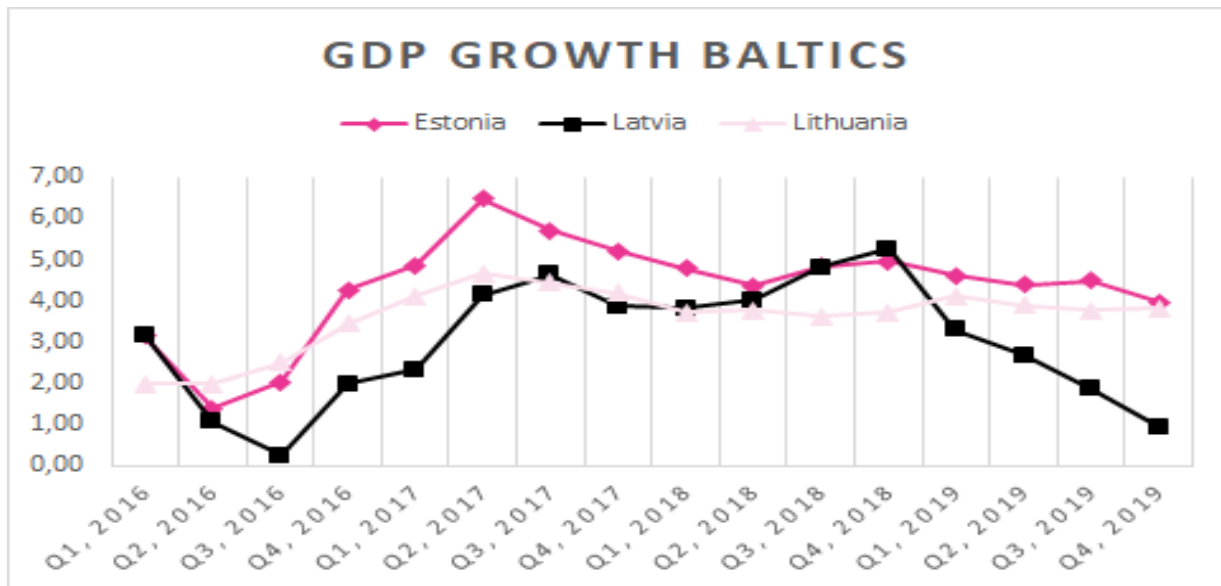


Figure 2. Real GDP Growth in Baltics

Source: (2020), Author's calculation

Estonian economy has been growing for several years in a row. In 2018 gross domestic products increased 3.9% compared to 2017. Wholesale and retail contributed 0.09% to the total increase. Imports of goods and services had increased by 6.1% and had experienced the fastest growth for the last 6 years, main drivers for the growth were import of machinery and equipment, basic and pharmaceutical products and pharmaceutical preparations (Statistic Estonia, 2020). As it is visible from the Figure 2, the most growth happened during the second quarter in 2017, later the result started to drop slowly.

According to Statistics Estonia, the GDP of Estonia had experienced a growth of 4.3% in 2019. Where 0.7% were contributed by the wholesale and retail sector. 2019 has not been the best year from the point of growth and economic factors as each quarter rates were becoming more negative.

Latvian economy has grown since 2011 - some years were more productive and others less, but overall the country is showing a really good tendency. In 2018 Latvia showed the biggest growth for the last 6 years +4,6%. However, the whole economy was growing, trade experienced a negative balance between import and export of goods according to the Central Statistical Bureau (CSB).

In 2019 GDP has grown by 2.2% versus 2018 result. There was a notable increase in non-food products which grew by 4.2% in 2019. Latvian GDP has been the most fluctuating during the years presented. The best period for the Latvian economy was third and fourth quarter of the 2018, where the highest rates were reached.

Lithuania has shown a good growing tendency since 2015, although the economy had an uplift, it was slightly slowing down each year. In 2018 the GDP increased by 3.4%, robust growth was driven by rise of wages, increase of employment rate and also high consumer confidence indicators. Moreover, the Lithuanian economy was the most stable throughout the period 2016-2019, there was no extreme upwards or downwards (Lietuvos Bankas, 2019). In 2019 GDP grew 3.9% which means that it outperformed the figures of 2018. The growth was supported by low unemployment rate, reduction of wages and even bigger increase in consumer confidence.

Moreover, the CPI level was also stable without big fluctuations in rates during the years. In the last two years, the average factor stayed around 2.6. The highest rates were recorded during 2017 and 2018, in 2019 it started to go down as the economy started to expect a negative sloping line. During those years, the prices were growing, and the living life was also increasing in parallel. Also, the economic growth is recognizable at unemployment rate, where Baltics showed a good downward sloping line. According to OECD each country has decreased the rate by 2 basis points and at the same time the average wages were increasing. Lithuania has experienced the most growth in that field, for the last 4 years the average salary has grown by 611€ (Trading economy, Lithuania). Estonia and Latvia have grown by 381€ and 287€ respectively.

All the factors named earlier have a great impact on the overall company's performance, so that while the economy is growing, businesses should also expect an increase in the sales. As a result it is very crucial to take the indicators into account while making plans for the next period. According to European Bank (2019) forecast, during 2019 Baltics region has already experienced a downward sloping line in growth and in 2020 it will become even less, from 3,8% to 3,2% respectively. Together with the GDP factor, there is expected to be slower growth in export demand. Those factors have to be considered not only for planning process, but also for the continuous improvements during the whole process.

2.2 Description of a company X

Company X is a big international company which deals with consumer goods such as health, hygiene and home products. The company operates in more than 60 countries worldwide that are split into smaller groups based on the geographical location in order to have a better control and understanding of the local markets. This approach also helps to meet the market's needs as native characteristics play a huge role while selecting assortment and brands.

Moreover, the company has 2 head departments: 1) Healthcare; 2) Hygiene and Home and deals with 20 world famous brands. Some of the trademarks are having the majority of the market shares in different countries in their group and are experiencing faster growth than the category overall. First department distributes the goods via two main channels: 1) Mass-market; 2) Pharmacies. While, Hygiene and Home division uses mainly mass-market to deliver goods to the final consumer. Each department has a separate annual plan of growth which is split into territorial subgroups and different channels that are later summed up to the main overall company's target. The goal is supported by the marketing team, television support, promotions and distribution. In order to focus on the right things management team together with marketing have created an approach of must stock list (MSL). The aim of the MSL is to concentrate more on the specific products, therefore higher priority items are listed in more stores and pharmacies. The reason behind it is to navigate consumers to the correct goods. The path is also reinforced by the fact that top products are placed on the higher or eye level of the customers, items are supported by television commercials and also the promotional activities.

Current thesis is focusing on the Baltics region (Estonia, Latvia and Lithuania), which is also known as conservative and brand loyal market. In order to narrow down and test out (all possible effects) on the forecast model, the author will build up the thesis based on the Healthcare department and brand Y, which is sold in both pharmacies and mass-markets. Also, that approach will show the accuracy of the method as it will be run based on three markets data. Since the company X's goal is to grow continuously and be more efficient, the author will work out the fully automated model which could be used afterwards with other brands and as a result will help to

improve the efficiency of the company X overall performance. The forecasting model will enable managers to see on which periods they should concentrate the most as the majority of the sales will happen during that time. As a result, in that time frame marketing team should support the brand Y the most through different advertisements, television campaigns, extra placements and promotions. Moreover, that approach will help to follow up the trends in the stock movement of the goods and it will minimize destocking or overstocking problems that may occur.

2.3 Method description

Multiple Aggregation Prediction Algorithm (MAPA) is a superior model which allows to benefit from transformation of time series that can be reached by non-overlapping temporal aggregation (Kourentzes, 2016). That approach enables more or less outstanding different components of data which has a direct impact on estimation and identification of the model, and also allows to consider multiple views of data during the whole process of forecasting. Combining MAPA with Exponential Smoothing Model (ETS) concedes to separation of time series into subgroups of level, seasonal components and trend.

First step is to combine original data into multiple aggregation levels applying non-overlapped means of length k , the advantage of using the means as it absorbs series across different aggregation levels. Formula together with time series Y , observations y^t and $t=1, \dots, n$, is performed as $y_i^{[k]} = k^{-1} \sum_{t-1+(i-1)k}^{ik} y_{t-}$. In order to have a smoother time series, the original data is splitted into subgroups, in that case the lower and higher frequency elements are more visible. As a result, the starting frequency is connected to the sampled raw data, while upper level of combinations have to be at least on the same level as annual, where seasonality is filtered out and lower level components and trend have to dominate. Therefore, the output of that step is a set of sequences which are based on the data, but transformed into different frequencies.

Second step is to make a forecast based on the different aggregation levels. Since the distinctive approaches are used during the process, the contrasting components are dominating while making other elements impossible to discover. In order not to run over the sampling to be able to combine forecast results, MAPA method allows to link time series elements. Using ETS approach, the data

is smoothed and controlled by the parameters: level(l_t), trend(b_t) and seasonality (s_t). Therefore, the smoothed elements are easily combined to make a forecast. For MAPA method the focus is on the last state vector $x_i^{[k]}$ of the ETS model with included trend, seasonal and error factors: $x_i^{[k]} = (l_i^{[k]}, b_i^{[k]}, s_i^{[k]}, s_{i-1}^{[k]}, \dots, s_{i-m+1}^{[k]})'$. Final step of the method is connecting components at the diverse aggregation level. To be able to transfer elements to one forecast, the data should be relocated to the original frequency using domain of $z_t = \sum_{j=1}^k \omega_j z_i^{[k]}$, the $z_i^{[k]}$ vector is returning data to original time domain, where $t=1,2,\dots,n$ and $i=[t/k]$. The advantage of the method is that $\omega_j = k^{-1}$, which was found to perform well. After all forecasts are made in the second step, are transferred back to the original frequency the final forecast is done. Each element is using : 1) $\bar{l}_{t+h} = K^{-1} \sum_{k=1}^K l_{t+h}^{[k]}$; 2) $\bar{b}_{t+h} = K^{-1} \sum_{k=1}^K b_{t+h}^{[k]}$; 3) $\bar{s}_{t+h} = K' - 1 \sum_{k=1}^{K'} s_{t+h}^{[k]}$, if $(\frac{m}{k}) \in Z$ and $k < m$. In that case K is considered as the maximum aggregation level and K' is identified as the number of accumulation where seasonality exists. Therefore the final formula is adding together all assumptions made before, $y_{t+h}^{[1]} = \bar{l}_{t+h} + \bar{b}_{t+h} + \bar{s}_{t-m+h}$. The advantage of that method is that MAPA allows to keep the information from all aggregation levels and that means that forecasts are already temporally reconciled (Kourentzes, 2016).

3. RESULTS AND MAIN FINDINGS

3.1 Reflection of the market shares

Company X is a big international enterprise, which goal is to grow continuously and adapt to the changes and trends quickly. Therefore it is important to follow market share and category overall performance. While looking at the linear movement of the market share, it is clearly visible what is the season period for the brand and where is the growth sectors for the company, as a result company will make plans with reflection of the market share.

Brand Y is a world-famous consumer good trademark. Market share of the current label is 66,7% in Baltics region and it continues to grow (Nielsen, 2019). Brand B which has the second biggest share in a market, it has only 19,5% of the total market. Total category is 610 basic points and it is growing though the data analyzed +3,97%, where brand Y has 406 bp and it is growing 12,3%. That means that trademark Y is growing four times faster than the whole category of consumer goods.

Due to the large market share company is the main player in the category. Since the trademark has over 50% of the total segment, the brand is not reacting that much on the promotional and seasonal effects. Although, the small fluctuations are still visible, as it was mentioned before the main season for the brand Y is February, summer season and Christmas period. During those times, there is slight uplifts in the market share. Moreover, it is clearly noticeable that while trademark Y is gaining extra parts of the market, competitors are behaving as a mirror and are going down in the same percentage change as brand Y increasing.

Moreover, large-scale on the market share also means higher profit margins for the company. ROI rates are also more attractive than the competitor ones, which means that company X spends less money on marketing activities while it does not affect sales in a negative way, but vice versa it enables to increase net revenue. In addition, the company saves cash as it is not investing heavily in promotional activities, as a result there is an increase in cash. That directly affects the attractiveness of the company, as higher the money could be spent on the dividend payments which therefore expand the interest of the shareholders to invest into the current business.

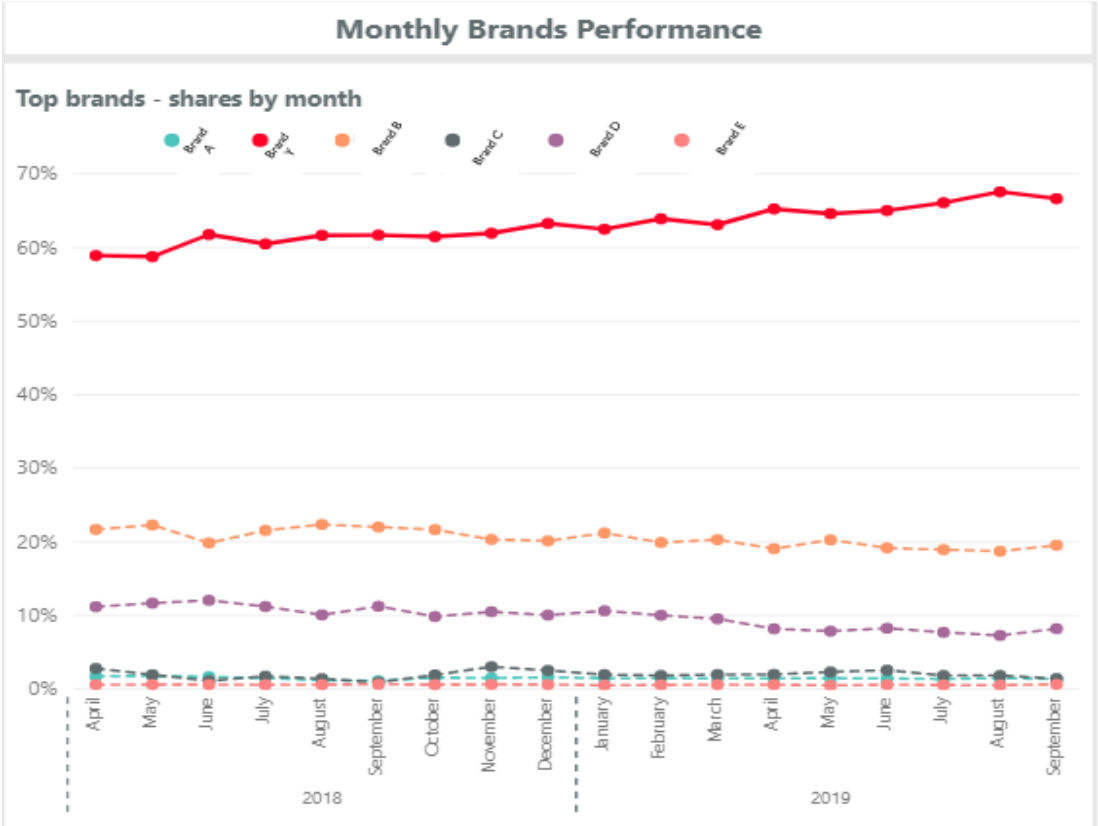


Figure 3. Baltics market share

Source: (2019), Nielsen data

Due to the strong activities such as promotions, television support and good distribution, brand Y has gained a high position in all three markets. In Estonia products have the strongest position, the market share is recorded at 78,1% of the total category. Interpretation of the following rate could be that every eighth customer would choose the Company X. Estonia is also known as one the most brand loyal markets in the Baltic region. Therefore, it is very important to gain customer’s

trust and make close relationships with them. In that case customers will follow the brand in implementing a new product, increase of the prices and in some bigger changes. Moreover, the brand is growing faster than the whole group, 2,78% and 1,69% respectively. That means that the trademark is taking not only all the new part of the category, but also competitors shares of the market. Since, the author is observing two channels, it is important to mention that both distribution channels are having a good growing tendency. Pharmacies have the biggest proportion of the market share 83,3% of total, but also there are less competitors comparing to the mass-markets.

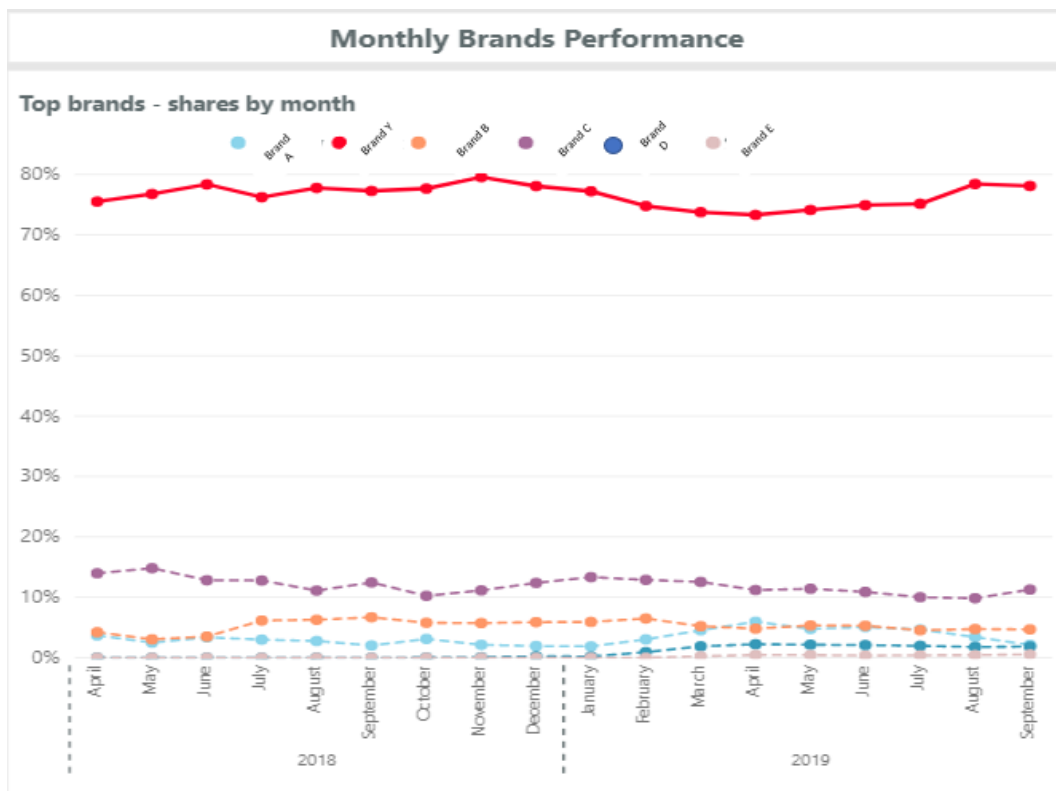


Figure 4. Estonian market share

Source: (2019), Nielsen data

Latvian market is more competitive compared to Estonia, the brand shares are recorded at 56,3% of the total group. The category is also growing +5,14%, where trademark is growing more than three times faster. The most growth is reported in pharmacies, where the brand Y is increasing the weight for five times comparing to market growth, 15,05% and 2,8% respectively. It is also clearly visible that Latvian market is more volatile on promotional activities. Linear line of the brand Y

acts as a mirror with Brand A, while label Y is growing opposite happens with brand A. The biggest growth took place in December 2018, where the goods were highly promoted in both channels. As a result, the author can conclude that company X are investing into promotional activities according to the MSL model. Throughout non-promotional periods trademark is having a positive growing tendency.

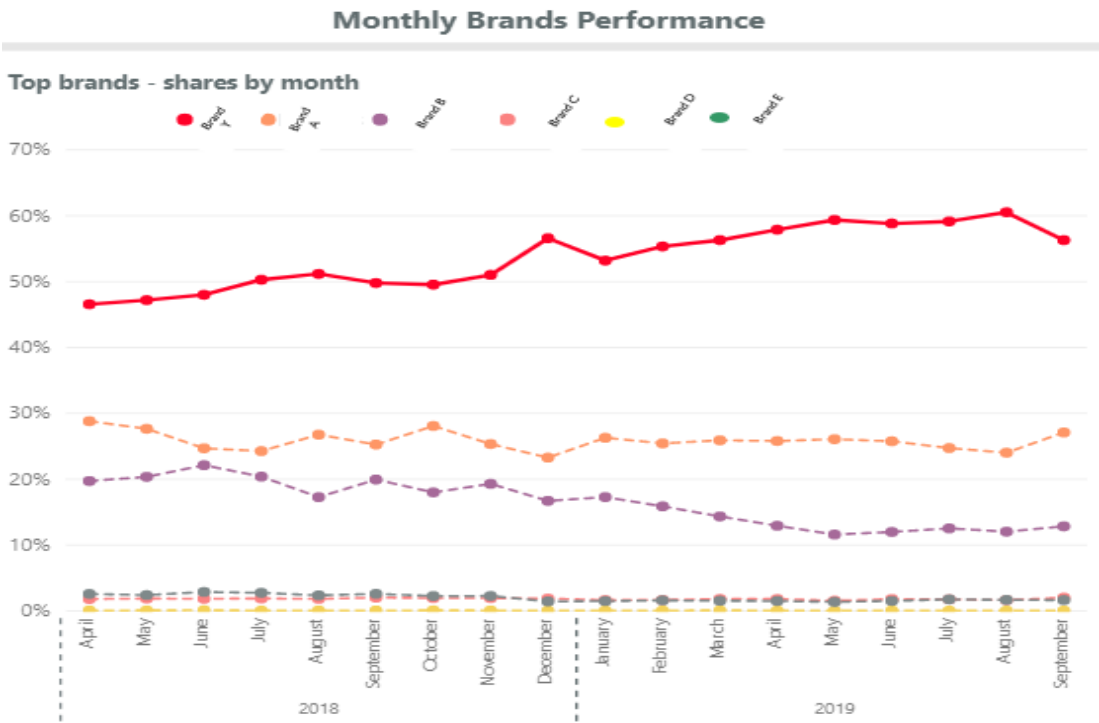


Figure 5.
Source: Latvian market share (2019), Nielsen data

Lithuania has also strengthened the position of the brand Y, share was recorded at 67,4%. The same situation as with other countries happens in Lithuania, trademark Y is growing faster than the Lithuanian market category, the trademark is overperforming market growth three times +15,54% versus 4,47% of total group. Since the market share in Lithuania is less than 3/4 of total, it reacts more on the different changes and promotional activities. The biggest competitor is Brand B which performance depends on the Brand Y activities, while competitor is having a promotional period, label Y is moving down and the same happens in an opposite way. Moreover, in addition to the promotion periods that were given by the company, brand Y has an extra placement in April

that increased the market share to the highest rate in the years analysed. As it was discussed before that could happen if there is an extra placement in the face of high quality display.

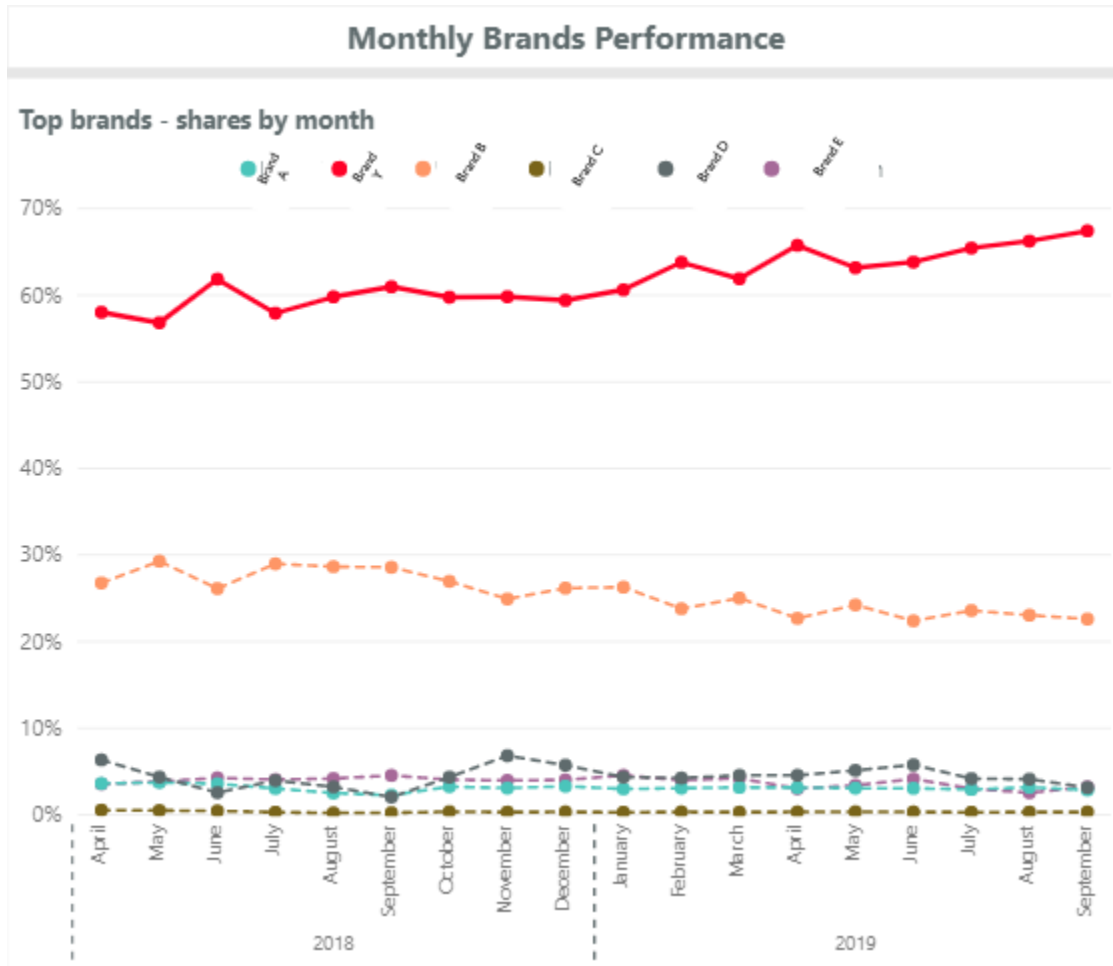


Figure 6.

Source: Lithuanian market share (2019), Nielsen data

Despite the fact that all three countries are gaining extra share in the market, company X has still some place for growth. Estonia in that case has the best position as due to the majority of the category is driven by brand Y. Through increasing the proportion of market share, the company is able to become more attractive. As a result there is a positive impact on the operational cash flow as the expenses are decreased, ROI as the returns will be much higher than the investments and also the net profit margin since the net profit will be higher. Moreover, the inventory turnover will also become better as there will be a clearer understanding which quantities to expect in the specific

time frame. Therefore, it is very crucial to have an accurate forecasting model and link it to the market share results.

3.2 Analysis of the results

Evaluation of the model will be based on the MAPA model that should outperform its competitors with increased accuracy and added extra variables to forecast. Data is collected from one of the leading companies of healthcare brands. Demand forecast is useful tool for a company X to support logistics as goods are coming from a different country, financial part in the face of investments and expenses, and inventory management such as problematic stock movement. Moreover, the model will support the goals of the company in reaching the targets on the SKU level.

The data consists of one brand and 48 variations of products with different flavour, size and usage. Products variability differs upon the countries and the channels, where they are distributed. Also, the data is transformed to the monthly frequency as wholesalers have individual reports which are later summed up together. Note that all assumptions are based on the value and in order to keep confidentiality, barcodes and product names are hidden as well as the company and brand name.

Firstly, the author have collected information from different reports and put it together into one review. In order to be able to see the similarities, data was transformed into monthly frequency and therefore depending on the usage and size of the product divided into three main group: 1) Group 1; 2) Group 2; 3) Group 3. As a result data consisted of six main division, mass-market and pharmacies for each of the market. To be able to get smoother data author removed seasonal effects from the sales (Appendix 1). For the further calculations, the author has used Power BI application to make forecasts including extra variables.

After all data was collected and transformed into similar frequencies, then using (ETS AAA) formula in the application each SKU has been given a forecast. In the original formula the forecast is calculated based on the seasonal, trend and error effects. Since, the data was transformed into monthly frequencies, the seasonal effect should be readable from that perspective, which means

that forecast should consider 12 different forecasted values (Appendix 2). In addition to that the author used promotional plans for each distributor and has separated the promotional sales from regular ones. In that case, the promotional effects are more visible. In order to be more accurate the author has evaluated the extreme values and replaced them with an average for the rest months, in that case too optimistic forecast was exclusive. That procedure was held for all SKUs and each wholesaler separately.

Next step was to add extra variables into the forecast. As it was required in the original method, all promotions periods are known in advance. What makes the forecast easier in that specific case is the MSL model, which managers have to follow. Therefore the products that have to be in promotion are known in advance and also the periods. Brand Y has to be promoted three times per year, during February, summer season and Christmas period. There could be some exceptions in case of extra placement on high quality displays. As a result the author calculates the average increase of the sales volume during the promotion period and adds this as a multiplier in the specific time frame. In addition to that author added the target for each market and distributor. Since the research is based on three markets which differ a lot from each other, each market has its own goal, also as it was discussed before channels are contrasting on the values and as a result the target is set individually. The aim of that procedure is to follow the goal that was given by the company and take it into account while making plans for 2019.

Final step was to collect all forecasts into one main estimation (Appendix 3). In order to see different effects the author has conducted a graph with three linear lines representing: 1) Actual Sales in value; 2) Forecast including promotional factor and target; 3) Target of growth. The third linear is based on the company's vision of growth purely, so there is a simple calculation by multiplying last year sales of the distributor with the target that was set up to the particular channel. The method is close to the Naive method approach, that has overperformed more complex methods. The advantage of creating three different scenarios is the ability to see visual interpretation of different factors that may affect the sales. Also, it gives the ability to see how optimistic or pessimistic was the approach.

MAPA method was chosen to be the most suitable for the case study of company X and brand Y. It is worth to be mentioned that several factors such as distribution channels, company industry,

availability of the data, customer segment and promotional periods had a huge impact on decision making. One of the most important factors while selecting the model was ability to add extra variables into the forecast and manipulate the value with those. The process of the named method consisted of three main parts: 1) Transforming data into different frequencies; 2) Preliminary forecast for each SKU, transfer data to same frequencies; 3) Adding extra variables and conducting an overall forecast.

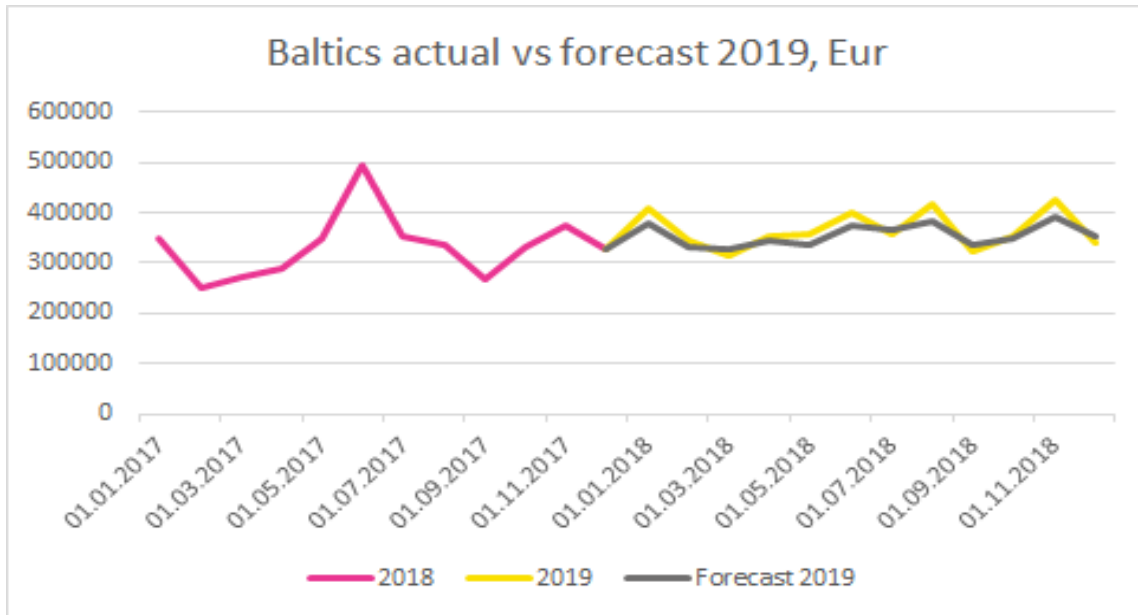


Figure 7. Baltics actual sales vs forecasted values

Source: (2020), Author's calculation

Forecasted values showed a really good performance for a period 2019. Nevertheless, the prediction line is smoother than the actual sales, the total result is close to the reality and stayed around +3% versus the actual sold-out value. According to the graph, it is visible that promotional activities take place during February, summer season and November. This is the main season for brand Y and through those periods company earns the most and as a result this is the timeframe where the company invests the most into different activities to drive the sales. In other periods, there is a decreased demand for the products so factor of promotional activities play a huge role in the forecasting process.

It is very crucial to meet the demand from the chains and keep the stock levels in parallel to the request. In some cases the destocking affects only the sales that the company could not earn due

to the inability to provide the good. On the other hand, there are some stricter restrictions which can follow with non-delivery of an item, several chains write out the fees that affect in a negative way the cash that the company usually uses to reinvest it into different activities. Moreover, the opposite effect of overstocking the warehouses will impact the balance sheet in a negative way as well as the destocking, in that case the company pays extra money to the wholesaler, who keeps the products. Therefore it is very important to remove problematic stock without extra expenses in the face of placement cost. In addition, the company would face another problem which occurs with the cash balance, as due to decrease in it, business becomes less attractive to the new shareholders. As a result, less investments are made into the company.

In addition to that there is a risk of manipulating the sales in account of orders coming from wholesalers, as it might seem to be a good idea but just for a short-term solution. The problem in that case is the inability to meet demand in a second year or in closest months as warehouses will be overstocked. In Figure 7 there are three periods when sales are higher than average sales per specific time frame. After high demand from wholesaler, there is a drop in the sales for approximately two months in a row. In the specific case, the overstocking is causing promotional activity that happened during those periods, where shops have extra placement and therefore they are ordering more goods than usual.

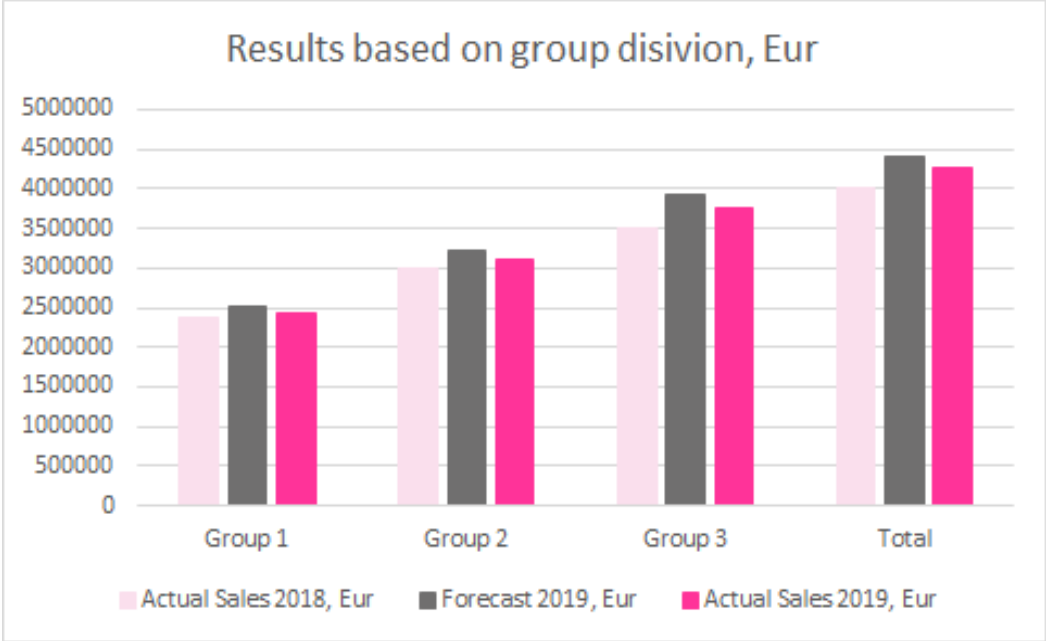


Figure 8. Results based on Group division

Source: (2020), Author calculation

Author has divided the products into three main groups, as it is visible from Figure 8, the most sales come from the third group. During the promotion period the company's sell-out increases to almost 60% of the total sales made. Based on the forecasting model, the author expects the highest growth for the third sub-group products, +12% to the sell-out in 2018. First subgroup should have had the smallest growth of 6% versus the actual sales in 2018. Brand Y's total was expected to increase by 10% compared to previous year results.

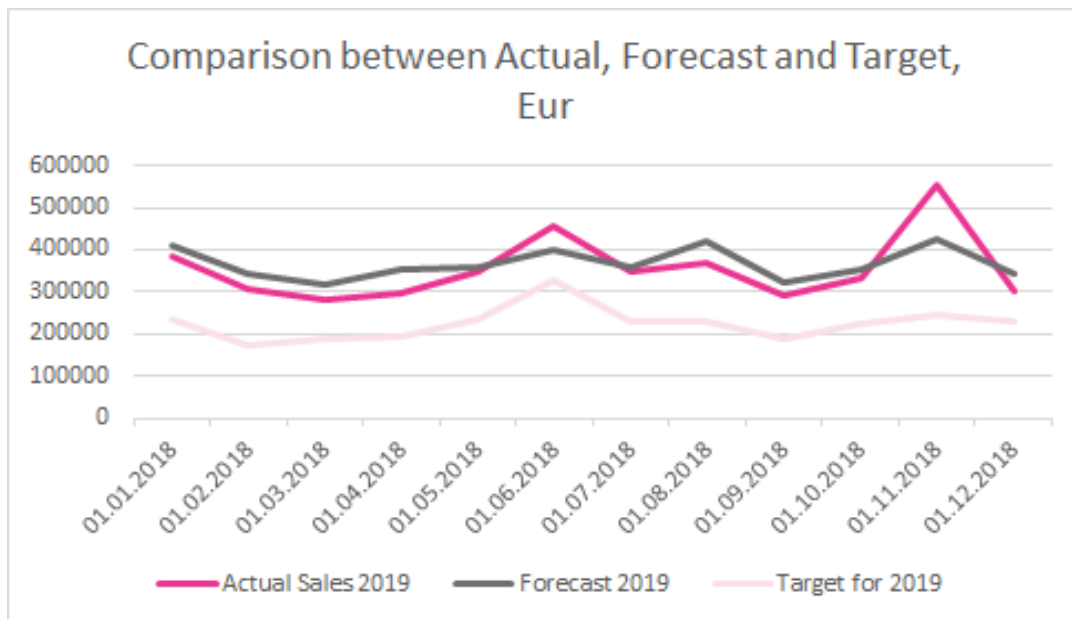


Figure 9. Comparison between Actual, Forecast and Target

Source: (2020), Author's calculation

Figure 9 represents the comparison between actual, forecast and targeted sales for 2019. The forecasted values are smoother than the actual or targeted sales for the period. Despite that fact, it is still visible that the author kept the main seasonal periods for the brand Y, so that before February we see an increase in sales as usually shops are preparing for the promotion in advance. The same situation happens during the summer and before Christmas. Author has conducted a forecast based on the combination of elements such as promotions, target of growth, seasonal effects, trend and error. It enabled to be as close to reality as it was possible. The forecast accuracy stayed around

103%, the lowest value was -29% of the actual sales and the highest prediction was +21% of the sell-out in 2019.

Targeted sales were based on the big growth of 2018 when the economy was booming. The management team added an extra rise factor to the actual sell-out data. That method is close to the Naive approach, which was named as one of the most realistic and accurate ones. In Figure 2 it is also noticeable that the GDP factor started to drop slightly throughout the year. Due to that, company X was not able to meet growth as much as it was expected. However, the result for 2019 was still positive and brand Y ended up with +7% versus the actual sales for 2018.

For the future prospect company X is now able to predict more accurately the demand for each period. Due to that there will not be any unneeded promotional activities and therefore it will have a positive impact on the cash outflow of the company. Combination of the forecast and market share reflection gives a proper overview, what is the best timing for the investments that will later give higher returns and markups. This will also influence cash balance of the company, as there will be less expenses and cash will be increased, making company more attractive for the new shareholders. Moreover, company can count on the product demand and will not provide too optimistic or pessimistic forecasts for the warehouses. As a result, there will be no extra costs for placement in a wholesaler's warehouses and also no fees will be written from the stores. One of the main advantages of the forecasting model is that finances will be allocated in a more accurate way with less costs and which will reflect in a higher net revenue as a result.

Conclusion

The aim of the study was to conduct a fully automated demand forecasting model for international company X. In order to narrow down the topic consumer good brand Y was chosen to be analysed based on the three markets (Estonia, Latvia and Lithuania) data, that are therefore divided into two main distribution channels. Based on the quantitative and qualitative analysis of the current topic, the forecasting method was chosen, taking into account different aspects that affect the planning process. There was two main research questions for the current thesis: 1) What could be the optimal forecasting model used for different distribution channels? and 2) Identification of all important factors that may contribute to Sales forecasts. The research consisted of reviewing previous studies made and find the best solution for the case, implementing the model to the particular data and adding extra variables to increase the accuracy of the model and finally analyzing the results and making conclusions.

Overall performance of the method was quite positive as the performance of the model stayed around +3% versus the actual sell-out data for 2019. It is clearly visible from the Figure 9 that method, when the promotional effects are removed in the first stages of the forecast and later on added together with the target for the year is performing better as it stays closer to the actual sell-out data for 2019.

The research takeaway is very important as the company vision and mission is to provide better quality products to the final customer and meet their demand. Therefore, it is very crucial to start from the basics and plan the activities and investments needed in advance and improve them continuously. Through increasing the accuracy of the forecasting, the company is able to minimize the costs due to the better inventory management and greater promotional activities plan. Considering the best periods for brand Y, company X will invest money based on a combination of market share reflection and forecasted values for the future period. In that way, the company

will reflect the timing of growth of the category and will gain extra market share and sales, which will later have a positive impact on the financial measurements of the company.

The next step of the author will be implementing the forecasting model to other brands of the company X and continuously improve the planning process. Moreover, one of the limitations was the data availability for the market share of the brand Y. In future, the company will receive newer report so the assumptions will be more accurate. Another potential of the thesis is to relate costs to the forecasting model, so there will be clearer understanding which seasons have the highest return on investments (ROI), margins and what are the growth sector for the company.

To conclude, the topic has a huge potential in ongoing improvements not only for company X but also for other companies, who are seeking opportunities for growth and wants to meet the challenges, and adapt quickly to the new trends and environmental changes. As the simple things are the most genius ones, so that it is important to start from the basics and then moving to other aspects for the success.

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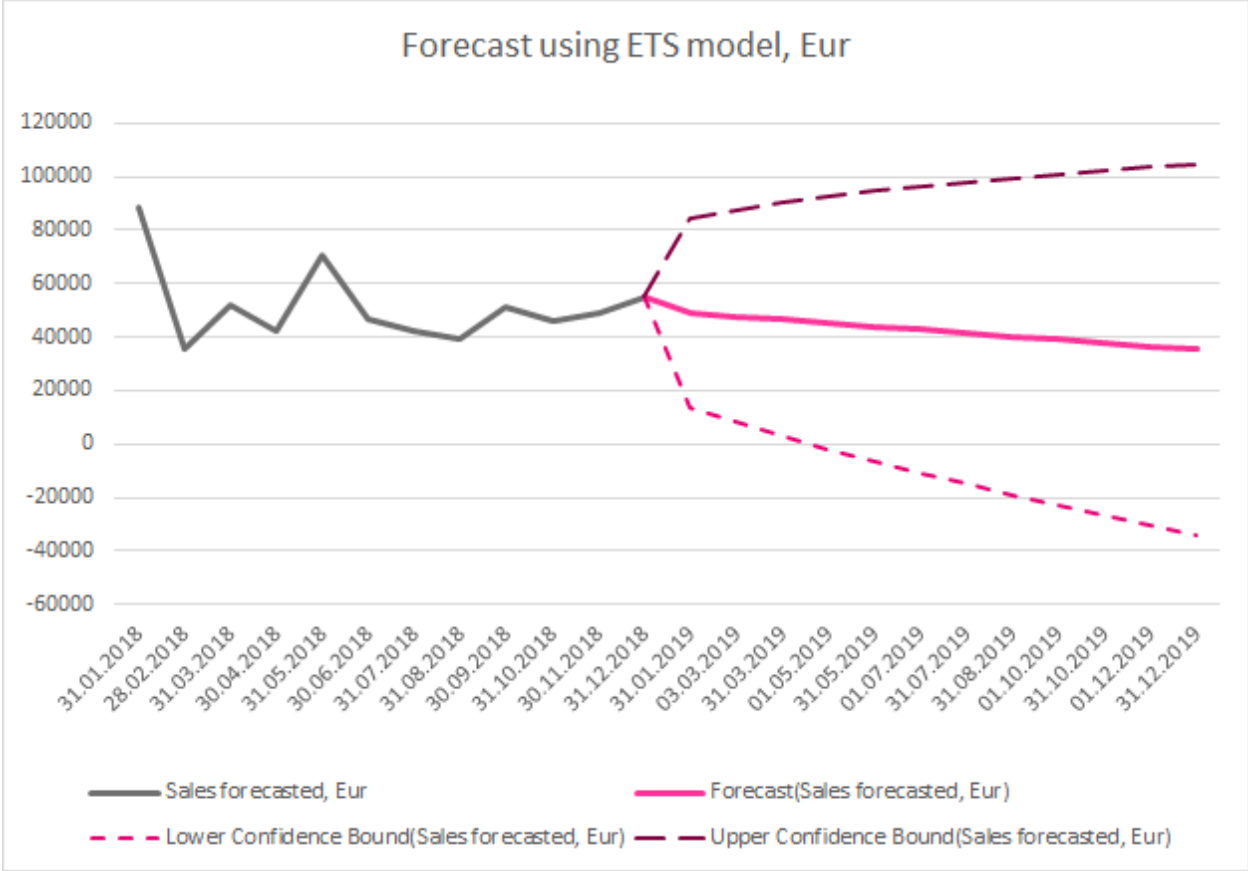
Appendices

Appendix 1. Sell-out data based on channels with promotional remarks

WHSL	GROUP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	2018 Total
EstoniaMM	Group 1	15413	18446	17539	13884	20434	18071	18034	22566	14783	18461	26232	26938	230800
EstoniaMM	Group 2	26054	26022	29244	24912	19875	37071	19175	29832	25073	28942	17139	30283	313621
EstoniaMM	Group 3	14564	9943	13543	11685	21393	20924	11650	17626	21305	14594	12740	15794	185761
EstoniaMM	Total	56032	54411	60326	50481	61702	76065	48858	70023	61161	61997	56111	73015	730182
EstoniaPH	Group 1	3003	2854	4164	2467	4833	6558	3089	3199	1847	4316	5524	2212	44065
EstoniaPH	Group 2	4331	2426	3946	2271	6730	6468	2143	1247	6031	6224	4429	1054	47300
EstoniaPH	Group 3	4230	4474	5505	4982	9357	6979	5186	3786	2061	6209	6504	2918	62191
EstoniaPH	Total	11564	9754	13614	9720	20920	20005	10418	8232	9939	16749	16457	6184	153556
LatviaMM	Group 1	8701	8504	10496	6054	9631	24972	10782	9842	8271	13290	19551	15951	146046
LatviaMM	Group 2	6397	16348	11151	8366	5848	40490	8523	12218	7508	9070	13790	15672	155381
LatviaMM	Group 3	8963	13358	11987	10254	8576	16598	13012	12784	9102	9932	10698	13332	138596
LatviaMM	Total	24061	38210	33634	24673	24055	82060	32318	34844	24882	32291	44039	44955	440023
LatviaPH	Group 1	4547	3400	4098	1380	3010	4236	3072	3668	2050	4234	3609	2617	39921
LatviaPH	Group 2	6547	5077	4272	913	3547	5964	4657	4760	3243	5539	5899	2077	52495
LatviaPH	Group 3	8054	6234	9157	3221	5018	5864	6170	9768	4068	7062	7050	3052	76717
LatviaPH	Total	19148	14711	17526	5513	11575	16065	15899	18196	9360	16835	16559	7746	169133
LithuaniaMM	Group 1	32433	7105	16465	35361	33845	26853	41236	19833	20617	21387	28343	20311	303789
LithuaniaMM	Group 2	11326	4476	8642	19508	21241	21422	24849	13222	8764	22871	19749	13408	189479
LithuaniaMM	Group 3	8923	1597	3682	6191	6596	12611	8800	11183	6326	8394	11978	7539	93820
LithuaniaMM	Total	52682	13178	28789	61060	61682	60886	74885	44239	35707	52652	60069	41258	587088
LithuaniaPH	Group 1	13753	6415	5052	6802	13088	7233	6493	8448	7031	6087	8352	7513	96266
LithuaniaPH	Group 2	13561	4825	2984	6073	4527	8282	6487	6828	5287	4899	5718	6020	75490
LithuaniaPH	Group 3	11356	11547	4354	4721	8662	15271	5489	11360	11102	5992	9104	12893	111652
LithuaniaPH	Total	38670	22787	12389	17596	26278	30786	18468	26635	23420	16978	23174	26426	283608
Baltics Total	Group 1	202158	153051	166279	169043	206212	285868	200845	202169	164469	197503	216410	199585	2363590
Baltics Total	Group 2	264595	181328	206553	221106	270619	355721	265517	247160	204285	246817	281789	248188	2993677
Baltics Total	Group 3	306758	214480	237547	258237	312513	438347	312176	285433	235118	295420	331373	286419	3513822
Baltics Total	Total	348284	251691	272231	287605	350722	495670	352833	334314	267778	333009	376708	326154	3996999

Source: Company X (2020), Author's calculation

Appendix 2. Preliminary forecast for 2019



Source: Company X (2020), Author’s calculation

Appendix 3. Final forecast including all factors

WHSL	Group	Forecast1	Forecast2	Forecast3	Forecast4	Forecast5	Forecast6	Forecast7	Forecast8	Forecast9	Forecast1	Forecast1	Forecast1	ForecastTotal	Difference Forecast/Actual
Baltics Total	Group 1	240927	197365	182460	199418	200990	231201	208254	241205	182935	197386	238595	196171	2516906,283	103%
Baltics Total	Group 2	303529	251484	232667	257922	258446	296124	263356	308990	236542	258315	309656	252336	3229366,046	104%
Baltics Total	Group 3	364131	304688	280598	312973	314921	358245	317297	374941	288252	316589	379205	306442	3918282,428	104%
Baltics Total	Total	410332	345029	316604	351905	356434	400577	356623	419245	324470	354107	425062	342153	4402541	103%

Source: Company X (2020), Author's calculation

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