POLITECNICO DI TORINO

Master's Degree in Engineering and Management

Master of Science Thesis

Automotive Independent After-Market.

Product Category Revenues Variances Analysis and Competitive Positioning

2016-2019

Supervisors:

Prof. Silvano Guelfi
Ing. Paolo Saluto

Candidate:

Mariana Stefani Zanier

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*First of all, my thanks go to my **family** who always supported me, in all the possible meanings of the word. For giving me always the freedom to decide my way on my own but raised me with the principles and values I have been always proud to carry.*

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Consciously, without any of them, I am not sure if I would have been able to reach this point, in the way I have reached today.

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"If you want to go fast, go alone. If you want to go far, go together"

(African Proverb)

ABSTRACT

My personal interest on the Automotive Market which started at my early twenties and the lack of economic/financial basis I have noticed I had when starting my studies at Politecnico di Torino, have been the main reasons that challenged me and made me decide to search a thesis proposal grouping these characteristics; therefore I contacted professor Silvano Guelfi. It was after our first meeting that I started collaborating with the university observatory "IAM Italia", which gave me the chance of finally developing and working on my final project with him, his right-hand Paolo Saluto and the rest of the team.

The first objective of the following thesis is the analysis of the revenue's variances, during the time period 2016-2019 of a selection of product categories sold by the Italian Automotive Independent After Market distributors. This market has been an object of study since 2010 by the Market observatory "IAM Italia, which has been set up by the Research Centre Competitive Risk and Enterprise Value (CREV) of the Polytechnic University of Turin.

For the variances analysis there will be presented and confronted two different models (Classic vs. New) which are going to be developed, including a brief description of the theoretical/analytical background and then the results of these models to the aforementioned market. The classic model takes into account four determinants affecting the revenues variances while the new model will be presenting six; with the main objective of addressing the perplexities and misleading results the Classic Model has shown to present regarding the presence of New and Disused products. Their respective results will be compared, and the misleading indications of the classic model will be highlighted.

The second objective of the following thesis is related, according to the accurate previous achievement of the revenue's variances and the respective determinants, to the competitive positioning of the same selection of product categories. Always considering the same time period as considered for the revenue's variance analysis, 2016-2019.

The reason of the chronology of the aforementioned objectives has nothing to do the importance of the thesis analysis, but with the fact that the variance analysis technique brings out the essential data taken as a tool at the time of developing the mapping of the competitive positioning.

Contents

1. Introduction

In order to get the reader familiarized with some terms, and make the reading of this thesis more bearable and clearer, it has been included this first section. In this part, a general introduction will be done to some concepts and fields that have been considered essential to understand the analysis developed in the following chapters; and even more the conclusions derived from this analysis. The main reason why it has been considered useful to include these clarifications is the fact that there were fields and concepts that I, as international student, have not even known by myself before I have started researching. In order to make the following analysis clear, it has been tried to be the most explicative as possible so that any kind of reader can get the overall concept of this final work.

1.1 Automotive Italian IAM

When we talk about automotive industry all it might come to our mind is a new car in exhibition or all the processes involved for designing and producing a car. But the production and then the commercialization of a car is just a single step of the its life-cycle; and the purchase of it the first and not last money disbursement a car owner will face. Then, after the ideal situation of a new car being sold is where the aftermarket (post-sales business) starts to participate in this life-cycle product, connected mainly with the repair and maintenance of it. Now, making reference to some sustainability concepts, it is not a minor detail to highlight that the use-life phase of a car is the longest lasting one; and therefore, the importance of the aftermarket industry should not be underestimated.

Figure 1 -Symbolic image of a car composed by spare parts (Bostik, 2018)

For a better understanding of what the life-cycle makes reference to, the “Annex 1” has been added.

“The automotive aftermarket is that part of the automotive industry concerned with the manufacturing, re-manufacturing, distribution, wholesaling, and retailing of all vehicle replacement parts, accessories, tools, equipment, chemicals and services, except those products that are used as original equipment to manufacture new vehicles.

Any product or service that a vehicle may need after it is assembled by the Original Equipment Manufacturers (OEM) is an aftermarket product or service.” (Aia Canada, 2020)

It is important to mention that the complex after-market chain concerns the participation of various actors as multi-brand repairers, providers of technical information, parts distributors, tools manufacturers, parts manufacturers, between others. (FIGIEFA, 2020)

It is not a minor detail to mention that currently the Italian Automotive Aftermarket has presented to be in a continuous growth. At least in Italy, as shown in “Figure 2”, the circulating car fleet it has presented a linear growth since it has been studied by the Italian IAM observatory of Politecnico di Torino. The facts show that more cars are being registered and therefore more assistance, maintenance and spare parts are consequently being needed.

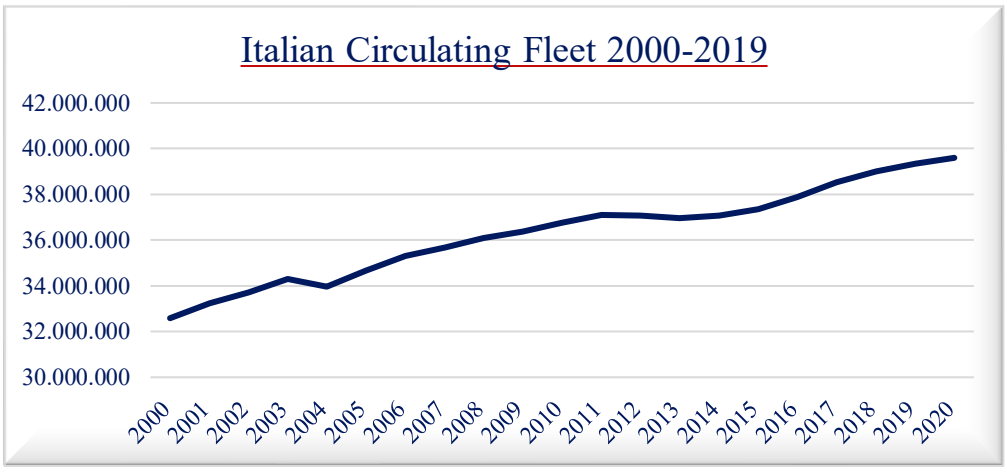


Figure 2 – Graph showing the linear growth the Italian Circulating Fleet has presented since 2000. Data analysis done with official data provided by Italian IAM Observatory.

Moreover, as it will be explained in detail through the analysis chapters, the facts show not only that the circulating fleet is increasing but at least in Italy even the average age of the circulating cars is increasing as well. This, will also have a positive effect in the growing possibilities for the automotive after-market players.

By having a look on the figure that is shown below we can see how, as the average age of the circulating fleet increases, the IAM subtracts market share to the OE.

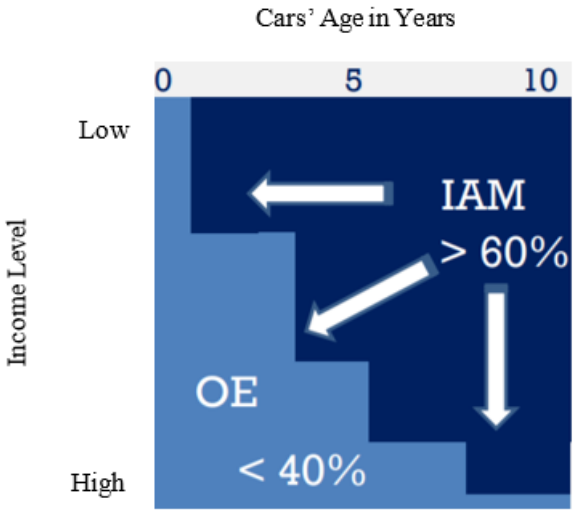


Figure 3 - Graph showing the Market share between IAM and OE depending on the cars age. (Guelfi, IAM TREND ITALIA., 2015)

Even though this situation might give an idea that the market is in an advantageous position, it is important to be aware of the dynamics of the automotive sector and therefore, far from relaxing, it is always suggested to be prepared for the disruptive changes that could be coming ahead.

According to McKinsey & Company, the automotive aftermarket currently is and will continue to face significant changes in the following years.

Regarding the future trends of the automotive aftermarket it is expected to keep annually growing, presenting a business value increase of a 60% respect to the current value. Although the aforementioned increase, the expected entry of new players in the aftermarket is willing to cause a shift of the profit pools along the value chain. Ten years from now, it is also expected that new digital players (as Amazon, Google, between others) will gain significant share of the revenues of the automotive aftermarket.

The proliferation of electric vehicles might also have a negative growth effect on aftermarket revenues. Autonomous Vehicles (AV), are expected to make the crash repair decrease but on the other hand to shorten the maintenance intervals. Anyway, ADAS (advanced driver-assistance systems) and AV are expected to cause a negative growth effect on aftermarket revenues. Digitalization, meanwhile, is expected to disrupt the traditional way of operating of the distributors business; so it is an actual challenge for them to adapt to these conditions and intensify their digital service offerings. On the other hand, due to the increasing complexity of the next generation vehicles; workshops will be also challenged to increase their professionality in order to cope with it.

As software is becoming a core for vehicles, software expertise is becoming a must competency; therefore mechanics-based workshops are facing a real risk of disappearing if they do not adapt. As it has been presented to be in the last years, the future landscape for Distributors in Europe is to be, in a high percentage, affected by a A&M activity. (McKinsey&Company, 2018)

1.2 Market observatory IAM Italia

It is from the year 2009 that the Research Centre of Competitive Risk and Enterprise Value (CREV), performs and analyses the Italian Market through the IAM Observatory. And, specifically from September 2012 that the observatory provides to the IAM Operators which are subscribed to the IAM TREND ITALIA Project[1], outputs regarding the Market Analysis. These outputs are carried out by specific methodologies of the observatory; including Algorithms, Models, Indicators, Matrices, etc; which are permanently updated and improved.

The IAM Observatory team, every month, collects and analyses Italian IAM Distributors sell-out. The percentage of the Market share the observatory started with at September 2012 was about 19,2% and it raised progressively year by year up to what represents nowadays the 62,06% of the total Italian IAM Distributors sell-out; and it is actually expected to still grow.

According to this data collected and the proper management of it, the performance and dynamics of the market can be analysed. Trends can therefore be recognized and

[1] This is just one of the many projects in which the Observatory is involved.

estimated, and economic and financial data can be extracted in order to, at the same time, reach conclusions about the market positioning of the different companies, of the different product categories and the market behaviour as a whole.

These analysis aforementioned are also part of regular Performance Reports the observatory is responsible of carrying out, as for example Reports regarding the competitive performance of the company respect to the market, Reports regarding the performance of the different brands of the IAM, Reports regarding the performance of the different product categories of the IAM (on which this thesis is focused), between others. (Guelfi, IAM TREND ITALIA., 2015)

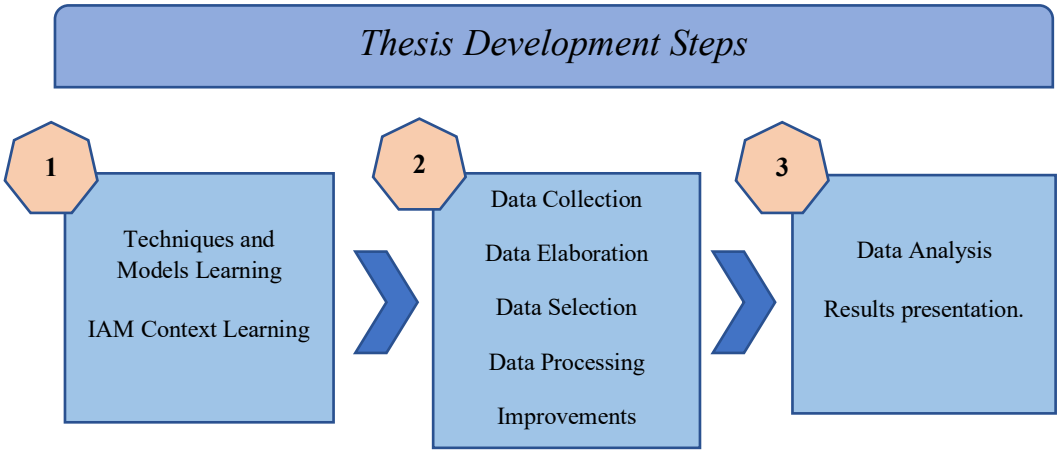
1.3 My role at the Observatory. Thesis Development.

It was at the end of September 2019 that I started to collaborate with the IAM observatory of Turin Polytechnic. At first, all tasks were related to learning how the observatory works and the different techniques and getting familiarized with the diverse methodologies that are used for both collecting and processing data (Algorithms, Models, Indicators, Matrices, etc.); for which I have been forced to train my Microsoft Office skills as well.

After having learned how to deal with this data management I was able to identify the needed data for the different analysis and to apply the theoretical approaches the observatory is used to work with.

Thesis Development

The development of this research-thesis has been identified to be divided in three main steps as shown in the following picture.



Step 1

The first month of the thesis development has been dedicated to the first step, regarding the primary[2] learning about the techniques and methodologies applied in the observatory regular workplace and also getting familiarized with the market context in which these techniques would be afterwards applied.

Step 2

The second step, recognized as an application step of the thesis, has been in part the longest and arduous one.

Before initiating with this application step, it was needed to plan and define which kind of analysis it will be intended to do.

As it has been previously introduced, the first activity of this step was concerned to receiving the information provided by the Distributors, this information is generally received in CSV format or similar. Once this data has arrived needs to be validated and is properly classified (data aggregation/elaboration process) through diverse algorithms according to what it will be afterwards needed.

The basic aim of this data aggregation is to have the accurate information at least regarding: How much is sold, what is sold (analysing by each single product code), Which brands are sold and at What price is being sold.

[2] It has been referred as primary for the only reason that the "learning activity", to the full extent of its meaning, has been in fact developed through all the thesis development steps.

All this information is being continuously managed through a data-base management system called Microsoft SQL server.

It is important to highlight that this step has not been only related to the data treatment, but during this period an improvement of the already existing algorithms and model has also been done; in order to improve/ease future data management.

Step 3

Thanks to what it has been done in the first and second steps, we can affirm that the third step access was unlocked and consequently enabled to carry out. Here is where the tools and knowledges incorporated in the first phase and the qualified data obtained in the second one are integrated in order to carry out the desired analysis and final results.

It is important to highlight that the meaning of the arrows between each step is to show the correlation of one activity to the other, and therefore the impossibility of overlapping tasks.

2. Theoretical framework

In order to be able to understand the methodology applied in the analysis section, carried out in chapter 3, and the theoretical background of the conclusions derived from it, the present chapter has been developed.
The overall analysis carried out through this thesis can be considered to be divided in two main parts, the revenues variances analysis (with both classic and new model approaches), and consequently a presentation of the so called “Competitive Positioning” analysis from two different points of view is going to be developed.

It is important to highlight that the methodological tools, that will be explained as follows and will be applied all along this paper work have been developed based on the techniques and tools the IAM Observatory of Politecnico di Torino is used to work with, which are explained in the referenced paper. (Guelfi & Saluto, Turnover Variances Analysis. Managerial Analysis with new and disused products, 2019)

2.1 Revenues Variances Analysis.

As we might know, Value Creation is the basic aim any business entity tries to achieve.

And in particular, business revenue is an essential economic parameter which influence the profitability of a business. Revenue, together with revenue growth are for sure indicators to be considered for understanding the economic value variance of a certain business. Due to the aforementioned importance of the revenue behaviour and its relevance from a managerial point of view, is that it has been chosen to study its variance. (Guelfi & Saluto, Turnover Variances Analysis-Determinants for a Managerial and Competitive Analysis, 2019)

Considering the initial point of the thesis analysis, which is related to the revenues' variances, there are three methodological sections that will be carried out.
The first part will be connected to the choices and the essential data selection to develop the analysis of revenues variances. The second part will analyse the revenues variances using the classic model. The last part will analyse revenues variances using the new model.

The analysis of variances is a control tool, which is essential for managerial levels to become aware of changes in the organization. Taking into account this analysis, it avoids the risk of taking blind decisions due to the lack of information.
If we consider a certain parameter to take under analysis, through the analysis of variances, it is expected to identify and assess the contribution of each single determinant of it. In particular, it is a learning organization and decision-making tool in that it allows management, having identified the positive or negative impact of each determinant, to have a proper use of resources with respect to the strategic objective of creating economic value for the shareholder in the short and medium term. In this direction, the analysis of variances is fundamental in the control of the margin and of business costs in almost all cases in which it is essential to understand the causes of change in performance compared to the past and the planned objective.

The following thesis aims to analyse revenues variances in the event that, in the time frame subject to observation (2016-2019), in addition to the products sold continuously (which we will be referring as Ongoing Products), we are going to consider also the introduction of new products and the disposal of old products, what

means the products that are sold in the current period but were not sold in the previous one and the products which are no longer sold in the current one but were not sold in the previous one, respectively.

In particular, the information content of the classical model of analysis of revenues variances is going to be compared to a new model that, in contrast, distinguishes volumes of the three types of products, ongoing (continuative), new and disused (discontinued).

This new approach, is considered to be, for the aim of this thesis analysis more significant and accurate both in identifying the contribution of the various determinants to the change in revenues, most realistic and precise results, and for their possible managerial uses, for example in terms of competitive positioning of the company.

2.2 Essential data to carry out the analysis of revenues variance

The starting point of the variances analysis is to choose the result configuration, it means the variable we are going to consider as the aim of study of this research.

This thesis, as it has already been mentioned, focuses on the first essential magnitude for the company and for the related creation of economic value: the revenues.

The following step is related to identifying which are the determinants that contribute to generate the revenues. In this particular study case, and for the classic model approach, there will be four determinants that are going to be considered:

1. Volumes sold (V);
2. Mix of products sold (M);
3. Bonuses recognized to customers in relation to the revenues achieved (B);
4. Selling prices recognized by the customers (P).

Considering a particular product under analysis, “Volumes sold” makes reference to the quantity (how many units) of that product that has been sold. Instead, “Mix of products sold”, which can also be found in this thesis to be mentioned as “product mix” refers to which is the share of each type of unit (recognized by its particular product code) considering the total of products sold.

Recognizing these determinants as the ones to take into account for the revenues' variance analysis is an essential step but not the last. In fact, it is also important to consider how these determinants are going to be ordered. This order is to be settled according to the most significant managerial sequence, the so-called the right (taking into account the information purpose) sequence. Under these considerations, the identified right sequence is the following:

1. Volumes actually sold;
2. Mix of the aforementioned volumes actually sold;
3. Bonuses actually granted to customers on current volumes and mixes sold;
4. Prices of the current volumes, mix and bonuses.

Keys to reading

- The numerical analysis of variances will be made for the most significative products sold in the automotive IAM. Criterion of selection is explained in the following chapter;
- Under the consideration that for the aforementioned analysis, the information that is to be analysed corresponds to two consecutive time periods, the current results are written in **bold** and the past ones in normal font;
- Arabic numerals, 1,2,3,4, indicate for the numerical example the different products;
- The letters V, B, P and M indicate respectively sold volumes, bonus percentage, unit price of the product and mix percentage of each product;
- The methodological path, the development of the formulas and the numerical exemplification will be carried out analytically only for generic products with the aim of illustrating the analysis development. Instead, for the application to the real context (IAM Italia), due to the size of the data being managed, just the results are going to be shown.
- In order to avoid confusions, it is important to clarify that from here on, the word "Product Category" will be referred to the general products categories as for example Car Brake Pads, Car Batteries, and so on. While instead, "product" will be used for the specific product codes, the example in this case could be a code associated to the product “Car Battery 45 AH”.

This explanation and the following figure have been particularly carried out for the only aim of a better interpretation of the paper work for the reader.

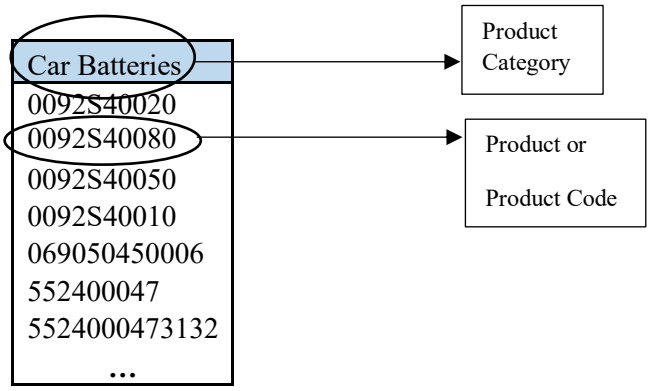


Figure 4 - Keys to Reading. Differentiating Product from Product Category.

2.3 Revenues Variances Analysis, using the Classic Model.

The main goal of this model is to both, see which is to reach the result of the main variable (Revenues) variance but also see how much each single determinant has contributed to the revenues change.

As it has been mentioned before, revenues are affected by a set of several determinants and it is important for management to know exactly each specific impact of these single determinants on the revenues change, meaning which are the sources that are affecting the overall result, and to what extent.

In particular, it is possible to carry out as many variances analysis as the identified revenues determinants. Consequently, considering the four revenues determinants that have been taken into account in the classic model (volumes, product mix, bonuses and prices) four revenues variances analysis can be carried out.

$$1\,Product\ Revenues\ Variance\ = f\ (\triangle Volumes\ sold, \triangle Product\ mix, \triangle Bonus, \triangle\ Price)$$

Therefore:

$$1\,PRV = f\ (1PVV, 1PMV, 1PBV, 1PPV)$$

Where:

1PVV: Volume Variance referring to product 1.

1PMV: Mix Variance referring to product 1.

1PBV: Bonus Variance referring to product 1.

1PPV: Price Variance referring to product 1.

1. The volumes variance measures the impact of their change on revenues, maintaining product mix, bonuses and prices of the previous period;

2. The mix variance measures, as concerns the volumes actually sold, the impact of its change maintaining bonuses and prices of the previous period: it is not only important how much it is sold but what it is sold;

3. The bonuses variance measures, based on the volumes and the product mix of the current period, the impact of their change on revenues maintaining the prices of the previous period;

4. The prices variance measures, with volumes, product mix and bonuses of the actual period, the impact of their change on revenues.

In operational terms and with reference to the 1 Product of a specific product category belonging to a specific market:

a. 1 Current Revenues is equal to the multiplication of the four product determinants, concerning the current period: volumes (**V**), 1 mix (**M1**), 1 price (**P1**) and 1 percentage bonus (**B1**);

b. 1 Past Revenues is equal to the multiplication of the same four determinants in the past: volumes (V), 1 mix (M1), 1 price (P1) and 1 percentage bonus (B1);

c. to obtain the 1 Product Revenues Variance 1PRV it's sufficient to properly calculate the above current and past values of the determinants. The variances analysis that is going to be carried out in this thesis it will be focused on the "shifting" model. The variance analysis could have been also carried out by the "difference" model; the results reached of course are the same. An example of the application of the difference model can be found in the following reference. (Guelfi & Saluto, Turnover Variances Analysis and Company Competitive Mapping, 2019)

Subsequently, regarding the methodology of the "shifting" model it works as follows. It begins by taking the past revenues, and then this value is modified by replacing a determinant at a time, always according to the right sequence. After every "variable shifting", the difference between the adjusted current revenues and the previous one needs to be calculated. For example, the 1 product volume variance is equal to the difference between the "1 adjusted current volumes revenues", because actual product volumes replace past product volumes, and the "past revenues".

In order to have a better understanding of what has been previously presented, a numerical example will be expressed. The following *"Table 1"* shows specific values for the different Revenues determinants: Volumes, mix percentage, Bonus percentage and Unit Price; as concerns the previous period, PP, and the current one, CP.
In particular, for the specific goal of the analysis, three different kind of products have been chosen, regarding the following specifications: Product 1 has been sold in both periods, the past and the current one; Product 2 has been sold just in the current period; Product 3 has been sold just in the first period.

	Revenues Determinants	Product 1		Product 2		Product 3		Total	
		PP	**CP**	PP	**CP**	PP	**CP**	PP	**CP**
A	Volumes (V)	100	150	0	20	50	0	150	170
B	Bonus Percentage (B)	3,50%	3,00%	0,00%	4,00%	2,50%	0,00%		
C	Unit Price (P)	9,65	10,67	0	7,68	6,825	0		
D	Mix (M)	66,67%	88,24%	0,00%	11,76%	33,33%	0,00%	100,00%	100,00%
E=A•C•(1-B)	Revenues (R)	931,23	1.552,49	0,00	147,46	332,72	0,00	1.263,94	1.699,94

Table 1 - Numerical example of classic model application. Revenues variances as a sum of the determinant's variances.

Now, departing from the information *"Table 1"* provides us, that we will consider as our input in our classic model analysis, we are able to make the following calculations, and finally arrive to the estimation[3] of the revenue's variance.

At follows, the Revenues Variances Analysis is going to be only developed analytically for the example of the generic Product 1.

According to the "shifting" model formula:

1 Product Revenues Variance PRV=1 ***Current Revenues****-1 Past Revenues=*

$$V^{4} \mathbf{\ x\ M1\ x\ P1}\ x\ (1 - \mathbf{B1}) - V\ x\ M1\ x\ P1\ x\ (1 - B1) =$$

[3] We are not considering results as exact values but estimations, since there are steps as filtering and rounding which may lead some lack of precision.
[4] As explained in "keys to reading", as there is no number in here, it means we are not considering the volume in reference to a specific product, but instead as the total.

***170** x **88,24%** x **10,67** x (1-**3,00%**) – 150 x 66,67% x 9,65 x (1-3,50%) =*

1.552,49 – 931,23 = 621,26

Now, following the "right sequence" which importance has already been mentioned, we are to proceed in the following way for calculating each determinants' variance:

1 Volumes Variance 1VV

Shift Vp with **Vp**:

1 Product Volume Variance PVV= 1 Adjusted Current Volumes Revenues - 1 Past Revenues=

***V** x M1 x P1 x (1 – B1) – V x M1 x P1 x (1 – B1) =*

***170** x 66,67% x 9,65 x (1-3,50%) – 150 x 66,67% x 9,65 x (1-3,50%) =*

1.055,39 – 931,23 = 124,16

1 Mix Variance 1MV

Shift Mc1 with **Mc1**:

1 Product Mix Variance PMV= 1 Adjusted Current Mix Revenues - 1 Adjusted Current Volumes Revenues=

***V** x **M1** x P1 x (1 – B1) – **V** x M1 x P1 x (1 – B1) =*

***170** x **88,24%** x 9,65 x (1-3,50%) – **170** x 66,67% x 9,65 x (1-3,50%) =*

1.396,84 - 1.055,39 = 341,45

1 Bonus Variance 1BV

Shift Bc1 with **Bc1**:

1 Product Bonus Variance PBV= 1 Adjusted Current Bonus Revenues - 1 Adjusted Current Mix Revenues=

***V** x **M1** x P1 x (1 – **B1**) – **V** x **M1** x P1 x (1 – B1) =*

***170** x **88,24%** x 9,65 x (1-**3,00%**) – **170** x **88,24%** x 9,65 x (1-3,50%) =*

1.404,08 - 1396,84= 7,24

1 Prices Variance 1PV

Shift Pc1 with **Pc1**:

1 Product Price Variance PPV= 1 Adjusted Current Price Revenues - 1 Adjusted Current Bonus Revenues=

***V** x **M1** x **P1** x (1 – **B1**) – **V** x **M1** x P1 x (1 – **B1**) =*

***170** x **88,24%** x **10,67** x (1-**3,00%**) – **170** x **88,24%** x 9,65 x (1-**3,00%**) =*

1.552,49 – 1.404,075= 148,41

Total:

1 Product Revenues Variance PTV= ∑ 4 single determinants=

$$PVV + PMV + PBV + PPV =$$
$$124{,}16 + 341{,}45 + 7{,}24 + 148{,}41 = 621{,}26$$

The bridge chart of the *"Figure 5"* graphically represents the transition from the 1 past revenues to the current one and the *"Table 2"* shows the results of the revenues variances analysis of all three products.

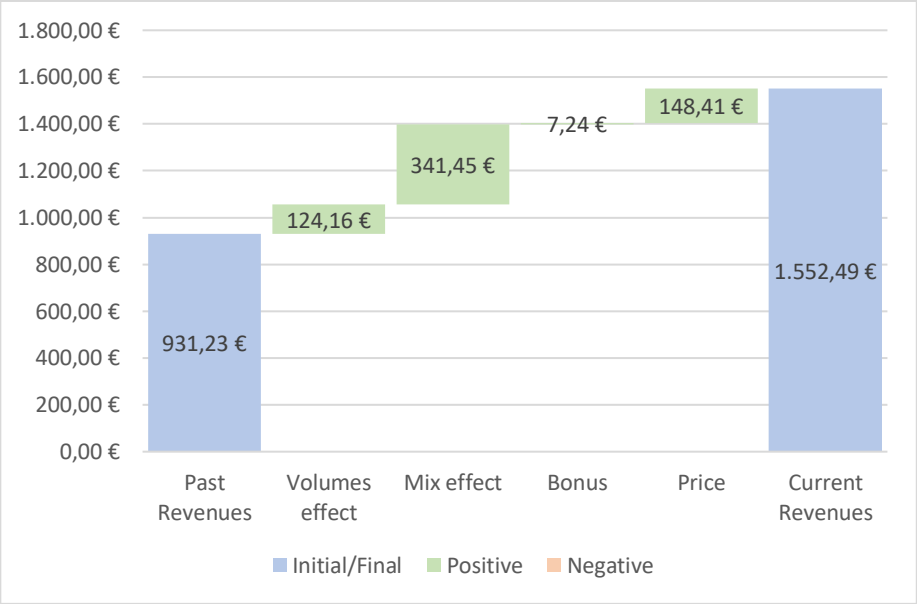


Figure 5 - Product 1 Revenues Variances. The Bridge Chart of the Determinants of the Classic Model.

Product	Volumes Variance VV	Mix Variance MV	Bonus Variance BV	Prices Variance PV	Revenues Variance TV
1	124,16	341,45	7,24	148,41	621,26
Δ%	*9,82%*	*27,01%*	*0,57%*	*11,74%*	*49,15%*
2	0	0	0	147,456	147,46
Δ%	*0,00%*	*0,00%*	*0,00%*	*11,67%*	*11,67%*
3	44,36	-377,081	0	0	-332,72
Δ%	*3,51%*	*-29,83%*	*0,00%*	*0,00%*	*-26,32%*
Total	168,53	-35,63	7,24	295,87	436,00
Δ%	*13,33%*	*-2,82%*	*0,57%*	*23,41%*	*34,49%*

Table 2 - Revenues Variances as sum of volumes, mix, bonuses and prices revenues variances (in italic the percentage change related to the past revenues of "1.263,94") for the Classic Model.

From a managerial point of view, the analysis of the revenue's variances (in this case connected to a specific product category[5]) draw special attention to the following business meanings:

- As concerns the total performance of the product category (composed of the 3 products analysed), the results of the variances analysis show an increase in revenues compared to the previous period of 34,49% (+436,00), where prices and volumes contributed respectively with an increase of +23,41% (+295,87) and +13,33% (+168,53), slightly amplified by the bonus effect by +0,57% (+7,24). On the other hand, the negative effect of the mix had an impact of -2,82% (-35,63);
- As regards the single product performance, the classic model shows no inconsistencies in relation to product 1, which not by coincidence turns out to be an ongoing product.
- The interpretation of the determinants results of the product 2 (New product) instead creates perplexities and in particular there are doubts concerning if it should be correct that all the change in revenues is attributable to the price effect. And if it was not like this, it is inevitable to think how would the values of the other determinants would be modified. The point is that the classical model of revenues variance analysis does not work in the case of new products not sold in the previous period. And it does not work for evaluating both new product performance and total product category performance, in this case of analysis.
- Regarding the product 3 (disused product) we can see that conversely the effects where all attributed to the volumes and the mix effect; in theory the model could work for this kind of product, but as the product it has not longer been sold the meaning of the numbers (results) are not correct.

In summary, the classical formula of the analysis of revenues variances does not work in the hypothesis of news products sold, it means products that appear in the current period but not in the previous one.

[5] Though this thesis has been focused on the analysis of the Product Categories, it is important to highlight that this one of the many analysis that could have been done according to the information and capabilities provided by the IAM observatory. Just to mention, others could have been related instead to the brands trend, the general market trend, confrontations between companies and market performance, and so many more economic/financial analysis. (Guelfi, IAM TREND ITALIA., 2015)

Another point is that, as there is no possibility of comparison when referring to a product that appear to be sold just in one period, the classical analysis of variances calculates the overall volume effect and the mix effect considering the variation in quantity and the variation in the type of products sold(mix of products) without distinguishing whether these products were sold in both periods of the analysis (ongoing products) or were sold in the past and not in the current period (disused products) or are sold in the current period but not in the past (new products).

On the whole, to fully recover the correct management meaning of the analysis of revenues variances it is necessary to introduce further determinants in the analysis, with the product discrimination that has been permanently mentioned above.
As follows, the new model is presented with the aim of addressing the issues the classic model turned out to show.

2.4 Revenues Variances Analysis using the New Model.

In contrast to the Classic Model, the New Model proposes to distinguish three different determinants of revenues variance by volume effect: the first one refers to volumes of new products (product codes which were not sold the previous year but are presented to be sold in the current one), the second refers to volumes of disused products, or also called discontinued products (product codes which were sold in the first period but no longer sold in the second one), and the third one refers to volumes connected to ongoing products (which refers to continuous products), it means the product codes which appeared to be sold both in the first and the second period under consideration.

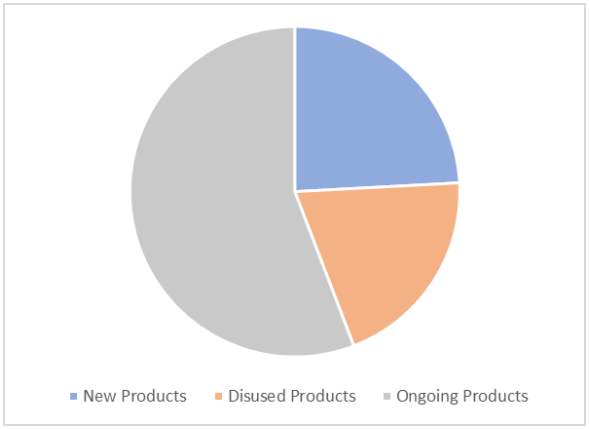


Figure 6 - Discrimination of the different volumes effect (New Model)

This distinction between the different volume effects has the great merit of clarifying the revenues performance attributable to the volumes and of supporting the management in correctly understanding how much revenues has been lost due to the volumes of products no longer sold (disused), because they are not competitive or because they went out of production, as well as how much revenues has been achieved thanks to the sales volumes of the new products, to the widening of the range or to merit of better commercial policies and ultimately to accurately measure, exclusively for ongoing products, the appropriate effects on prices and mix.

Therefore, this new model expects not only to show a more exhaustive description of the determinants regarding the volumes effect, but also avoids the misleading indications of the other determinants (bonus, price and mix effects) which should always be calculated respect to ongoing products.

As it has been previously explained for the Classic Model, there is a right sequence to follow according to the analysis we are aiming to do. Then, for the New Model, considering its six determinants (instead of the four of the classic model) the revenues variances will be calculated according to the following sequence:

1. New products volumes effect.
   In this case we make reference to how much revenues has been achieved due to the many units of new product that were sold in the new period (which were not sold in the first);

2. Disused products volumes effect.
   Here instead, it is going to be calculated basing on how much revenue has been lost due to the many units of product that were not sold anymore in the second period respect to the first one;

3. Ongoing products volumes effect.
   This volume variance effect is connected to the revenue's variances due to how many units of the ongoing products that have been sold in the two periods;

4. Ongoing mix effect of products sold.
   This effect is considered to be connected to the revenue's variances due to the changes associated to the share (%) of each unit of the ongoing products to the total of the ongoing products;

5. Ongoing products bonus effect.
   In this case, we will consider the revenues variances due to the bonus effect recognized to customers in relation to the revenues achieved by the ongoing products;

6. Ongoing products price effect.
   Lastly, this determinant refers to the revenue's variances caused by the selling prices effect recognized by the customers on the ongoing products.

In summary, the New Model tends to be more precise and preferred towards the Classic one, in order to attribute all the revenues achieved by the new products in the current period to the volume effect from new products while eliminating all the other effects. The revenues lost by discontinued products is associated with the disused products volumes effect and even in this case all the other effects are set to zero, while instead for the continuous products the formulas of the classic model are used. Therefore, the numbers obtained show more significant results.

Along these lines, an analytic example will be developed for the New Model, as it has been previously done for the Classic one.

Hence, the Revenues Variances Analysis is going to be illustrated now analytically through six determinants.

For a better interpretation and comparison of the models, the same products and respective determinants values are to be used in order to better interpret the differences contrasting both model's results. It is also recommended, for the better interpretation of the following formula to go back to the section "Keys to reading".

The "shifting" formula for the New Model applied to Product 1 (ongoing product), Product 2 (new product) and Product 3 (disused product):

n.Revenues Variance n.RV =
*if (**V** x **Mn**) > 0 and (V x Mn) = 0 then New Products Volumes Variance = n **Actual Revenues***
*otherwise if (**V** x **Mn**) = 0 and (V x Mn) > 0 then Disused Volumes Variance = - n Past Revenues*
*otherwise if (**V** x **Mn**) > 0 and (V x Mn) > 0 then Ongoing Volumes Variance=*
n Actual Revenues - n Past Revenues

for the product 1 we should apply the formulas of the classic model, then for products 2 and 3 it continuous as follow):

2 *Revenues Variance 2RV =*

*if (**V** x **M2**) > 0 and (V x M2) = 0 then New Products Volumes Variance **= 2 Current Revenues***

***V** x **M2** x **P2** x (1 – **B2**) - V x M2 x P2 x (1 – B2) =*

***170** x **11,76%** x **7,68** x (1 – **4,00%**) - 150 x 0,00% x 0,00 x (1 – 0,00%) = 147,46*

3 Revenues Variance 3RV =

*if (**V** x **M3**) = 0 and (V x M3) > 0 then Disused Volumes Variance = - 3 Past Revenues*

***V** x **M3** x **P3** x (1 – **B3**) - V x M3 x P3 x (1 – B3) =*

***170** x **0,00%** x **0,00** x (1 – **0,00%**) - 150 x 33,33% x 6,83 x (1 – 2,75%) = -332,72*

*As concerns products 2 and 3 each shift of V with **V**, M2 with **M2** and M3 with **M3,** B2 with **B2** and B3 with **B3,** P2 with **P2** and P3 with **P3**, generates a variance equal to zero.*

Total Variance:

*2 Revenues Variance 2RV= ∑ **4 single determinants**= 2VV + 2MV + 2BV + 2PV=*

147,46+ 0 + 0 +0= 147,46

*3 Revenues Variance 3RV= ∑ **4 single determinants**= 3VV + 3MV + 3BV + 3PV=*

-332,72+ 0 + 0 +0= -332,72

According to the *"Table 3"*, the results of the revenues variances analysis for the three products and the bridge chart of the *"Figure 7"* explain, using the histogram bars, the passage from the past revenues to the current revenues through the positive or negative contribution of the various revenues determinants.

Product	New Products Volumes Variance NVV	Disused Volumes Variance DVV	Ongoing Volumes Variance OVV	Ongoing Mix Variance OMV	Bonus Variance BV	Prices Variance PV	Revenues Variance RV
1	0	0	124,16	341,45	7,24	148,41	621,26
Δ%	*0,00%*	*0,00%*	*9,82%*	*27,01%*	*0,57%*	*11,74%*	*49,15%*
2	147,46	0	0	0	0	0	147,46
Δ%	*11,67%*	*0,00%*	*0,00%*	*0,00%*	*0,00%*	*0,00%*	*11,67%*
3	0	-332,72	0	0	0	0	-332,72
Δ%	*0,00%*	*-26,32%*	*0,00%*	*0,00%*	*0,00%*	*0,00%*	*-26,32%*
Total	147,46	-333,72	124,16	341,45	7,24	148,41	436,00
Δ%	*11,67%*	*-26,32%*	*9,82%*	*27,01%*	*0,57%*	*11,74%*	*34,49%*

Table 3 – Total Revenues Variances as sum of Volumes, Mix, Bonus and Prices Revenues Variances of the total performance of the three products (In Italics the percentage change related to the pas total revenues of 1.263,94) for the New Model.

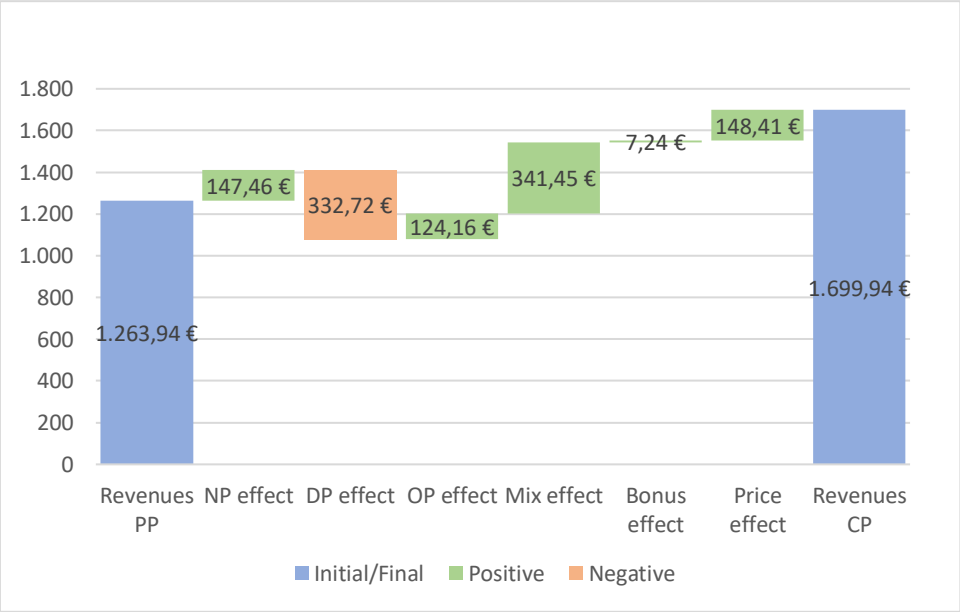


Figure 7 - Total Revenues Variances. The Bridge Chart of the Determinants of the New Model

Just for the better comparison of the results, the bridge chart of the Product Category (which includes all three products) by the Classic Model is included bellow.

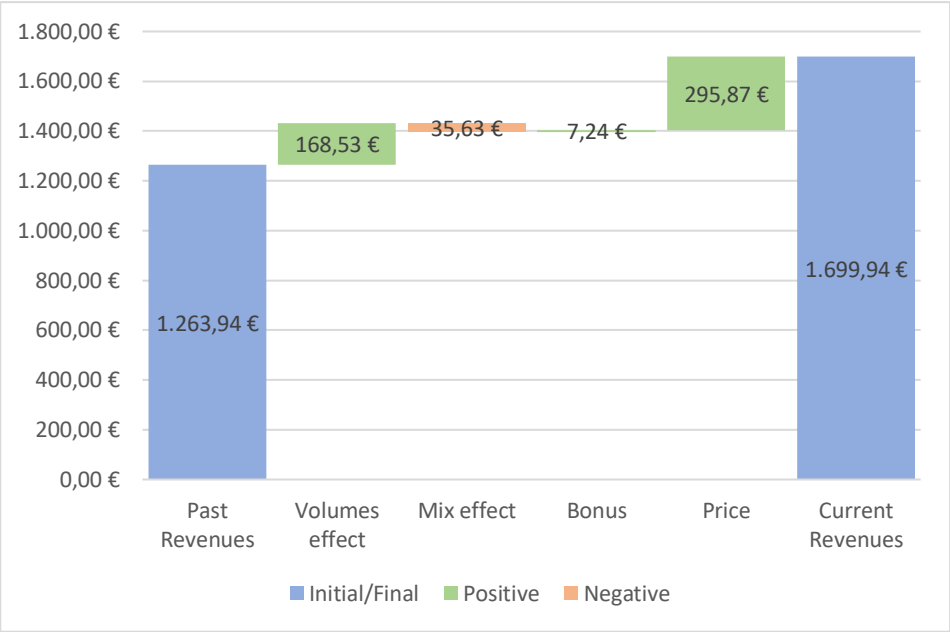


Figure 8 - Total Revenues Variances. The Bridge Chart of the Determinants of the Classic Model

The analysis of revenues variances carried out with the new model shows significantly different results for the company compared to the classic model and in particular the following business meanings can be highlighted.

- For the New Model, the increase in revenues (+436,00 +34,49%) in contrast to the previous period, is mainly due to the mix variance (+341,45 +27,01%) meanwhile the classic model instead has shown a negative impact of the mix effect to the revenues growth (-35,63 -2,82%), mainly affected by the consideration of the losses attributed to the disused products.

- In addition, the positive growth effect of prices on revenues it seems to be half as significant respect to what the Classic Model showed. While the CM was representing a price effect of (+295,87 +23,41%), the New Model represented a positive growth effect of (+148,41 +11,74%). It is logical to expect these differences considering the misleading effect of the Classic Model of associating all the new products effect to the prices effect. Instead, it is certainly clearer that the revenues variances of Product 3 need to be attributed to the New Products Volumes Variance;

- In relation to product 3, the classic model divides the revenues variance between the volumes effect and the mix effect: in managerial terms is not a useful operation since it alters the mix effect severely penalized by the product 3 and without the benefit of the introduction of the new product 2;

- The new model allows to determine and evaluate the difference between the revenues acquired with new products and that lost with disused products and to take the appropriate actions to confirm or change the commercial policy;

- Furthermore, it provides us more transparent results regarding the other three determinants (mix, bonus, price), by being calculating just considering ongoing products; which avoids the misleading effects new and old products could cause if being considered.

- The revenues variance analysis of product 1 results to be unchanged compared to the classic model, since the formulas and methodology applied for ongoing products are the same for both models.

2.5 Competitive Matrix and Value Creation

When analysing the market performance of certain products, as a management level is it important to know which is the evolution of their competitive positioning as well. By recognizing this, management by developing an overall analysis of a company performance (that would include each product category) is able to drop to conclusions about their competitive strategies are meeting their past objectives and also enables them to develop the most appropriate competitive strategy to create economic value.

It is important to highlight that the methodological tools, that will be explained as follows and will be applied all along this paper work have been based on the analysis techniques and tools the IAM Observatory of Politecnico di Torino is used to work with. (Guelfi & Saluto, Turnover Variances Analysis and Company Competitive Mapping, 2019)

The variance analysis which has been explained before is a technique which allows not only to recognize the different determinants affecting the revenues variances, but also allows us to map the competitive path of the different products being analysed.

Depending on the choice of the combination of the determinants of the revenue's variance analysis, there are different competitive positioning maps that can be developed. The competitive positioning maps can be made by selecting by graph two determinants and positioning them on a two-dimensional Cartesian system. Then, by the values of the selected two determinants obtained from the variance analysis model the intersection point is to be found, which will be useful for evaluating the competitive position of the product.

Having chosen this two-variables system, then the matrix will be divided into four regions/quadrants numbered according to the following figure.

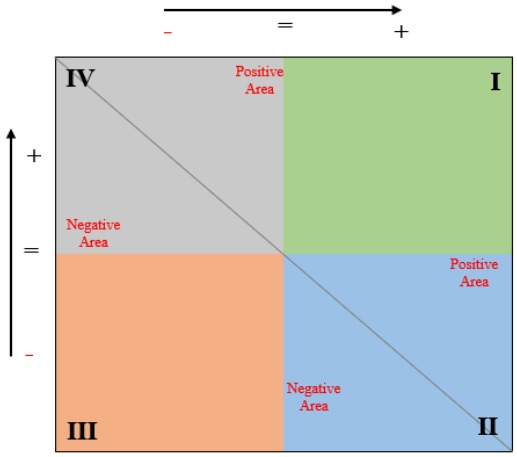


Figure 9 – Empty Matrix as a representation of the ones that are going to be used for the analysis

These quadrants, as shown in the figure above, are numbered from the 1st to the 4th and respectively named by Roman numerals: I, II, III, IV. At the same time, as we can appreciate in the figure, for each of the aforementioned quadrants their respective signs of the two coordinates are: I (+, +), II (-, +), III (-, -), IV (+, -). Of course, always considering the first notation for the abscise-axis and the second one for the coordinates-axis.

After having presented the format of the matrixes we are allowed to present the different three Competitive positioning Maps that can be made departing from the turnover variances' analysis.

1. The "Volumes/Net Prices Elasticity Map".

2. The “Volumes Quality Map”
3. The “Mix/Net Prices Map or Snake Map”.

Volumes/Net prices elasticity Map

The “Volumes/Net Prices Elasticity Map” focuses on comparing the two determinants: Volumes Variances and Net Prices variances. From now on, Net Prices will be referred to the prices effect discounted the bonus effect, so it is important to highlight that with this single variable we are actually considering the effect of two determinants.

The main goal with this map is to see how the product is performing in terms of competitive positioning, regarding its ability to reach a positive equilibrium between revenues Volumes variance and revenues Net prices variances.

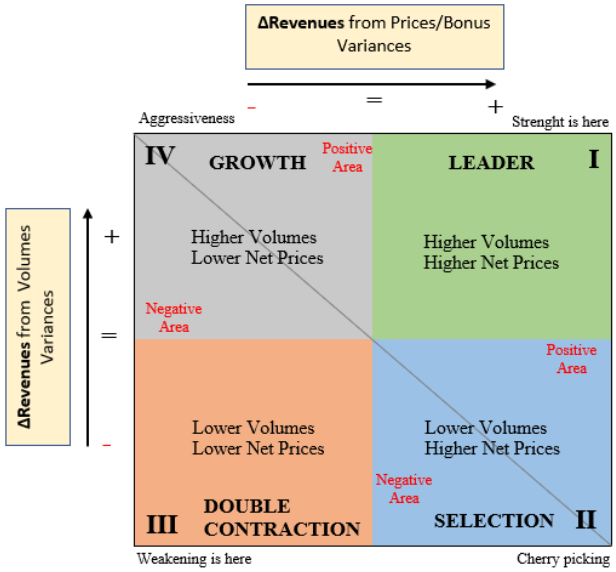


Figure 10 - Volumes/Net Prices Elasticity Map

As it can be appreciated in the above figure, the map shows four different quadrants. The first one it is called the “LEADER” position, which is actually the best one in which a product can be positioned. The products that have their respective determinants intersection in this quadrant means that have presented an increase in their revenues respect to the previous period caused by both a higher volume of products sold and at the same time higher net prices. Once a product has reached this positioning, the main challenge for it is to keep on staying there (to show continuity).

The second quadrant instead it is called “SELECTION”, and the main reason of the attribution of this name is to make reference to products that have presented strategy of selling less in terms of quantity (lower volumes) but at higher unit net prices, creating a kind of “niche”. As we can see in the map, in dark grey there is a bisector which divides the area of the map in positive/negative. Then, still analysing this particular quadrant we can realize that products which are positioned in the positive area are the ones which presented an increase in revenues variances caused by the fact that the increase of revenues due to the higher net prices has been greater that the reduction in revenues caused by the lower volumes sold. For products which are positioned in the negative area, it is vice-versa what explained before.

The third quadrant it is called “DOUBLE CONTRACTION”. Being here, we can say that it is the worst position a product can perform. In this particular map, this positioning represents that there has been a reduction on revenues connected both to a reduction of volumes sold and a reduction of net prices. The real risk that a product positioned here may suffer is the fact that, if it presents continuity on this quadrant, they will be sucked in a process of progressive exit from the competition and therefore of the market. “This is the worst competitive positioning and it shows a dangerous weakening of the value proposition because it is no longer enough to reduce prices to stop the decline of sold volumes.” (Guelfi & Saluto, Turnover Variances Analysis and Company Competitive Mapping, 2019)

Last but not least, we have the fourth quadrant which it is called “GROWTH”. On the contrary of the “SELECTION” strategy, products that are positioned on this quadrant are the ones who have been shown an growth on revenues by an increase of the quantity of products sold (higher volumes), but a decrease of net prices. What happens with the positive/negative area in this quadrant it should be understood the same way as what it happens in the second quadrant. “The growth policy is a way to conquer market share, but it needs a coherent cost structure and/or weak competitors unable to increase prices.” (Guelfi & Saluto, Turnover Variances Analysis and Company Competitive Mapping, 2019)

Volumes Quality Map

The Volumes Quality Map focuses instead on comparing the two determinants: Product Mix Variance vs. Volumes Variance. The main goal of this map is to analyse

both the quantity of the products being sold (volumes) but at the same time the quality of the mix.

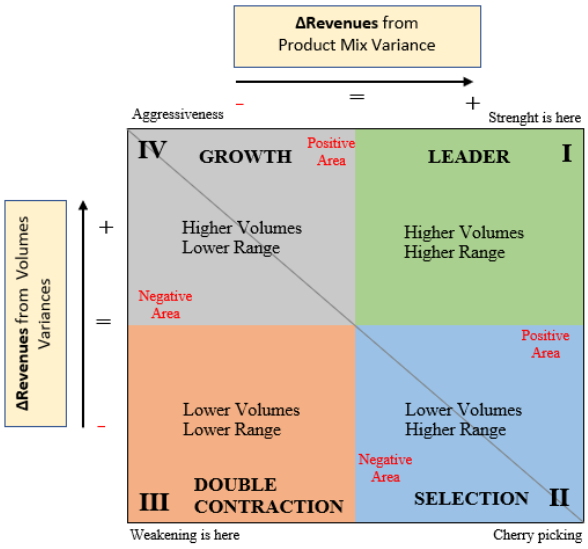


Figure 11 - Volumes Quality Map

As the above figure shows, we are able to identify in this map four quadrants, with the following interpretations.

On the first quadrant, we can see the "LEADER" position, in which products that are positioned in this area represent the case of those who have suffered an increase in revenues connected to both an increase of the overall quantity of products sold and to a better quality of the range of products sold. From here on, every time that "better quality" it is used it will be associated to a better mix combination in terms of higher product unit value, it has nothing to do with the actual quality of the products. As in the previous map, the challenge is always, once you have reached this position, to continually stay in there.

The second quadrant represent products which have been sold under a business strategy of "SELECTION". This position means that companies have realized revenues by reducing their quantity of volumes sold, but increasing the quality of what has been sold. The bisector map line divides the map in two areas. Products positioned in the positive part are the ones which have increased their revenues because the increase caused by the Mix Variance which was higher than the reduction caused by

the lowering of sold products. The vice-versa thing happens for products that are positioned in the negative area.

The third quadrant is where the "DOUBLE CONTRACTION" is shown. This means that a product positioned in here represents a revenue drop caused by both a lower quantity of products sold and a lower quality of the sold products.

The fourth quadrant represent a "GROWTH" status in the sense that products positioned here represent strategies of a market which is trying to "expand" their selling by compromising the quality mix (it means to lower it), and at the same time increasing the volumes sold.

Mix/Net Prices Map or Snake Map

The Mix/Net Prices Map focuses instead on comparing the two determinants: Mix Variance vs Net Prices Variance.

The main goal with this map is to see how the product is performing in terms of competitive positioning, regarding its coherence between the quality of the product mix (what is offering to sell) and the net prices of this range of products (how much it is asking for them).

"The net prices/mix exchange ratio is consistent if a higher (lower) price corresponds to a higher (lower) mix: in competitiveness terms the first relation, higher/higher, is positive while the second, lower/lower, is negative." (Guelfi & Saluto, Turnover Variances Analysis and Company Competitive Mapping, 2019)

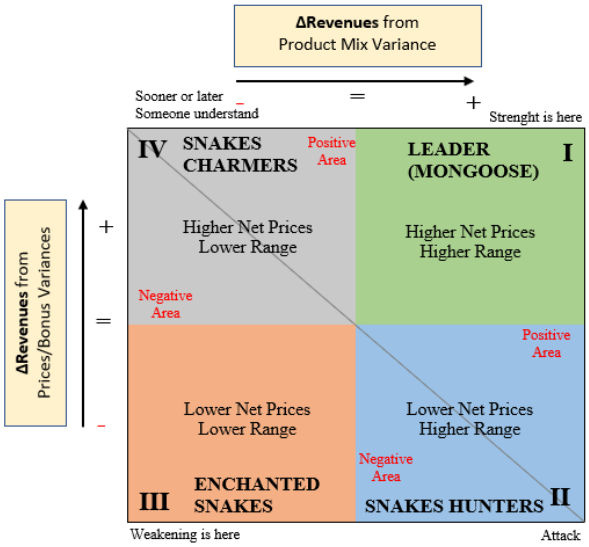


Figure 12 - Mix/Net Prices Map or Snake Map

As the above figure shows, we are able to identify in this map four quadrants, with the following interpretations.

In the first quadrant, the “LEADER” (or Mongoose) position, is the best competitive positioning a product can perform. In this case, it can be appreciated an overall revenue increase due to both an increase of the quality of the products sold and a parallel increase of the net prices.
The name “SNAKE HUNTERS” is given to the second quadrant in order to represent those products which are sold by “attacking and capturing” customers by an offer of a better-quality mix but at lower prices.

The third quadrant, which name is “ENCHANTED SNAKES” is dedicated to those products which have suffered a double revenue contraction. This is the worst positioning, since it represents a drop of the revenues caused by a double effect: negative mix variance and negative net price variance.

In the fourth quadrant we can find the products denominated in a status of “SNAKES CHARMERS”. This name is given in order to represent the products that “enchant” customers by selling lower products mix at higher net prices. The same rule of the bisector line plays a role in here, as explained in the previous maps.
This is considered to be a temporary competitive position, since products which are sold under this strategy of reducing the price/value relationship are in risk of losing clients, if continuing to perform in this way. This may happen because clients are no longer able to pay the increase in prices so they change supplier, or they just noticed this price/value drop and change supplier as well. Is important to highlight the negative effect this might have, since as we know from a “marketing” and “business strategy” point of view it is more difficult and costly to attract and gain more clients than to keep/maintain the current ones.

3. Revenues Variances Analysis applied to the most relevant Italian automotive IAM products.

In the following chapter, the Classic and New models for estimating revenues variances will be applied to a particular market sector and in respect of that sector to specific product categories.

The case study chosen for the application of the revenues variances analysis, as mentioned in the beginning of this thesis is related to the Italian Automotive Independent After Market (IAM) and all the data used it has been collected and provided along with the IAM Observatory of the Polytechnic University of Turin. In particular, the analysis is going to be focused on the most relevant products sold by the Distributors in the timeframe 2016-2019. Then, four years of data has been properly collected, processed and managed for doing the following analysis.

Even though the theoretical framework has been developed with numerical values, for confidentiality reasons the following results will be shown as percentage values.

The Product Categories that have been chosen for the further analysis have been the following:

- Car Brake Pads of the total sample (7.796 different codes of many brands were identified in the period under analysis).

Figure 13 - Car Brake Pads image. (Kapoor, 2018)

- Car Batteries of the total sample (4.817 different codes of many brands were identified in the period under analysis).

Figure 14 - Car Batteries image. (Clarios, 2020)

- Car Clutch Kits of the total sample (6.596 different codes of many brands were identified in the period under analysis).

Figure 15 - Car Clutch Kit image. (ZF Friedrichshafen AG, 2020)

The application of the aforementioned analysis models to a concrete real market sector aims to highlight the different results that both models throw respect to the revenues variance analysis; and will allow us to figure out the competitive positioning the products presented during such time period. These results are related to the analysis of the selection of products sold by the sample of IAM distributors in the timeframe 2016-2019, of the classic model with four determinants and the new model with six determinants and, therefore, the incomplete and misleading management information related to the classic model.

In conclusion, the following chapter aims to analyse the revenues variances of specific product categories but at the same time, the secondary objective is to compare the results derived from both models and therefore try to reach to a logical and realistic interpretations of the given results.

A table has been developed to group the results that have been carried out through the following chapters. As it might be useful to turn back and referencing to while reading any particular section, it has been added as the Annex 1, which can be seen at the end of the thesis.

3.1 Data collection and selection to carry out the analysis of revenues variances.

As explained in the introductory chapter, the Automotive Independent After-Market is a huge market, therefore is logical to expect that many data analysis can be developed in connection to it. As in every analysis concerning huge data management, a selection of the data considered for the particular analysis developed in this thesis, has been done. This selection, as well, has to be made in order to be relevant to the results we are going to take conclusions from. It means, there should be an accurate criterion of selection for the desired results we would like to obtain.

Therefore, for analysing the product categories behaviour of the products sold by the Italian IAM Distributors, the choices of the products to be analysed has been reduced to the main, or also called most relevant products; in terms of the share they have of the total market revenues.

So, the data selection has been made regarding the products which represent the highest revenues in the market, regarding the most recent original data provided by the IAM Observatory of the Polytechnic University of Turin (2019).

After the proper data collection, it is not a minor detail to mention that a data cleaning has been performed as well. This activity is exclusively referred to the second step of the thesis development. For each product category, it has been worked in the same way. After data has been collected, and before being analysed there have been some steps regarding the cleaning of this data aiming to manage more accurate information. Due to some inconsistencies the data coming from the Distributors and its

subsequently management may entail, methodologies and techniques concerning calculating the media, variance and standard deviation have been taken into account in order to be sure of analysing data which fitted in between significant parameters.

The following "Table 4" shows some of the product categories distinguished, indicating as well their specific share of revenues[6].
At the same time, the products shown in this table do not represent the total of the products sold in the Italian IAM (which by the case sum up to more than "220" different product categories). For a better understanding of the reader, the Table has been reduced by ignoring the less representative items.

Product Category	Revenues share (%)
Brake Pads	7,3%[7]
Car Batteries	6,2%
Clutch Kit	5,9%
Steering	3,7%
Lubrificants	3,5%
Buffers	3,4%
Brake Discs	3,1%
Flywheels	2,8%
Ignition filter	2,7%
Air filter	2,6%
Motors and alternators	2,5%
Oil filter	2,4%
Headlamps and rear lamps	2,1%
Windscreen wipers and windscreen blades	2,0%
Spark plug	1,9%
Turbines and Intercoolers	1,8%
Water pumps	1,6%
Cabin filters	1,5%
Engine gasket	1,3%

Table 4 - Product Category Revenues Share expressed in percentages, considering the total quantity of product categories the IAM Observatory works with.

[6] Considering as the Total, the total revenues of the whole market being studied (all product categories).
[7] Percentages shown for each Product category are calculated respect to the total revenues (obtained by all the products categories available.)

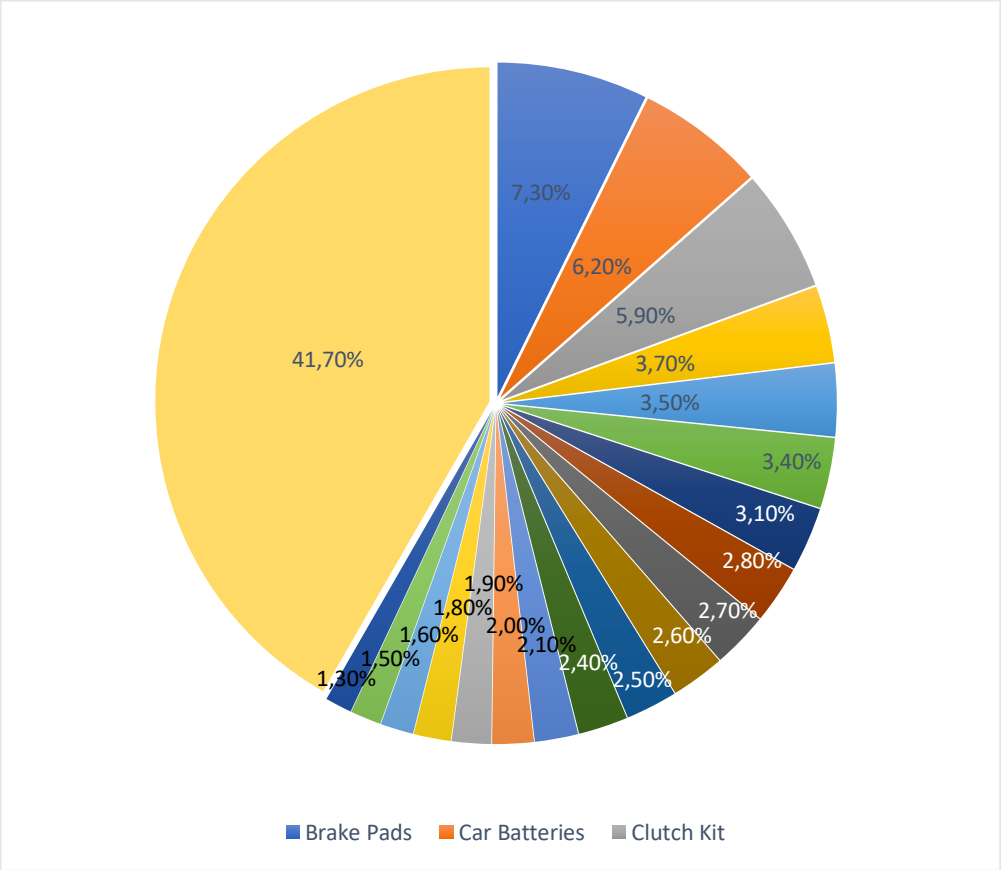


Figure 16 - Pie Chart showing the Italian IAM revenues share of each product category.

Therefore, according to the selection criterion aforementioned, the product categories chosen for the following revenues analysis are the mentioned below.

- Brake Pads (representing a 7,30% of the revenues of the market).
- Car Batteries (representing a 6,20% of the revenues of the market).
- Clutch Kit (representing a 5,90% of the revenues of the market).

It is not a minor thing to highlight that just these three (3) products which have been chosen for the further analysis represent nearly 20% of the overall market revenues. To add, it is important to highlight also that for the specific product "Car Batteries" the data we will be analysing comes from the Aftermarket distributors which sell also battery cars, but it is essential to take into account that this is just a branch of the "Car Batteries" global market. Therefore, we have to take into account that for the particular results of this product category we will be omitting the market share corresponding to

the specific battery industry and the one corresponding to large commercial chains that also sell car batteries.

Once the products subjected to this analysis have been chosen, it is important to highlight that the main data collected for the analysis has been mainly based on the following parameters:

- Revenues achieved, by each product category in each year being analysed (data from many brands selling these products).
- Volumes Sold, in connection to each product category in each year being analysed (data from many brands selling these products).

Then, departing from this official data, it was possible to determine the prices. Regarding the information related to the bonus, these values have been estimated according to results obtained by specific surveys which have been done to a representative percentage of distributors.

3.2 Brake Pads Revenues Variances

The following data analysis concerns the general product category “Car Brake Pads”.

Regarding the input data that has been considered for applying the following models, there has been carried out a prior criteria of data discrimination or also called data selection.
In order to reduce the data sample for a better quality of the data management, the input has been focused on the main brands of brake pads distributed in the market, which company names are reserved for confidentiality reasons. Even though, it is important to consider that this focus has been made just for better management of the data through our methodological methods, but it does not affect in any sense the possibility of associating these results with the total market trend, because the main goal of this data selection was to make the data processing more efficiently but still representative, in other words to not lose the meaningfulness of the results. Therefore, it is important to highlight that these 5 leader brands represent the 80% of the market (always making reference to the revenues share).

For the development of the variance’s analysis, the time frame 2016-2019 has been divided in three periods to be considered as follows:

- Period 1: 2016-2017
- Period 2: 2017-2018
- Period 3: 2018-2019

The significance of each period divisions is actually the confronting of the results of the latter year to those of the previous one, in each of the three single cases. Then, all results will be normalized and expressed as a percentage change respect to the previous year status which will be settled, in each single case, as the 100%.
In order avoid misunderstandings it is important to highlight, that even though the study has been divided in three periods (three different comparisons) the analysis considers data collection of the complete 4 years.

According to the methods analytically explained in chapter 2, the following numerical application will be carried out for this specific product of the Italian Independent After Market.
Both models' results have been calculated in order to show the differences between each other and the relevance of differentiating the volumes in order to avoid misinterpretations of the results.

3.2.1 Period 2016-2017

For the aforementioned time period, the overall revenues variance has been equal to +2,08%.

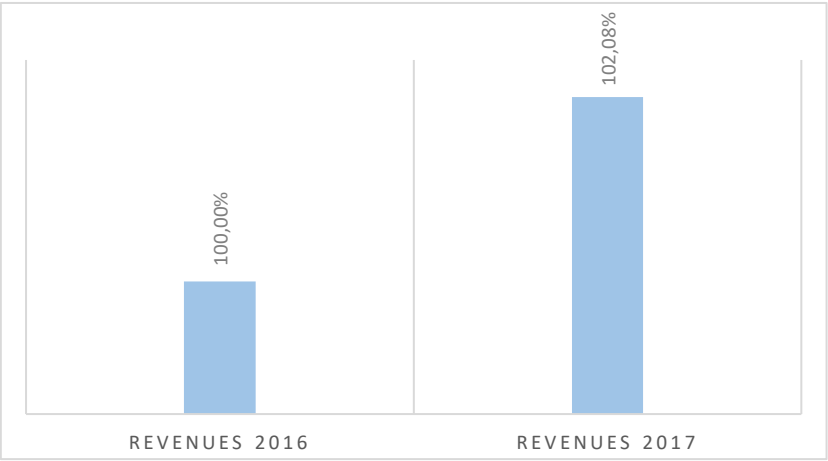


Figure 17 - Brake Pads Revenues Variance 2017 vs 2016.

Results for Car Brake Pads thrown by the Classic Model.

As concerns the global market of the "Car Brake Pads" it is interesting to show the following results.

Car Brake Pads (2016-2017)	Volume Variance VV	Mix Variance MV	Bonus Variance BV	Prices Variance PV	Revenues Variance RV
Δ%	*2,14%*	*1,78%*	*-0,99%*	*-0,85%*	*2,08%*

Table 5 - Car Brake Pads Revenues Variances as a sum of the determinant's variances. Classic model. Period 2016-2017.

The bridge chart of the figure *"Figure 18"* represents graphically the transition from the Car Brake Pads past revenues to the current one for the period frame 2016-2017.

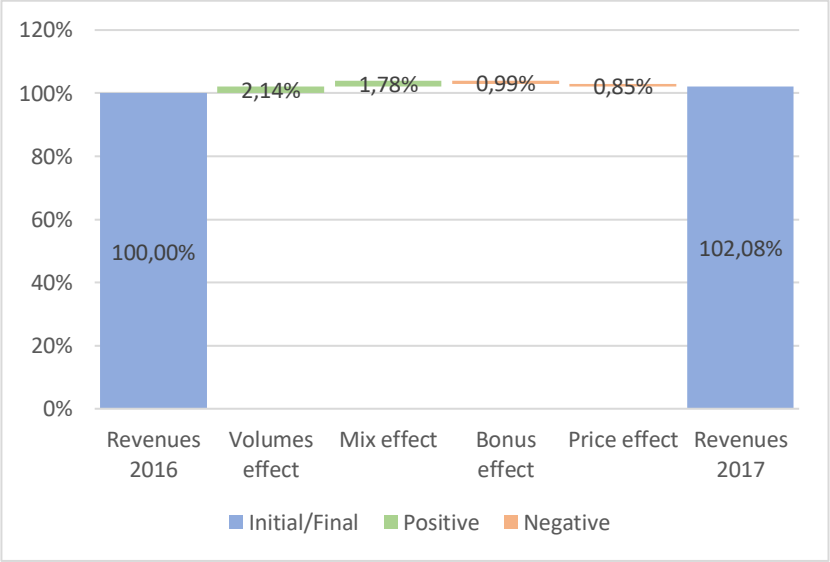


Figure 18 – Brake Pads Revenues Variances. Bridge Chart of the determinants. Classic Model. Period 2016-2017.

As we can see both in the table and graph, it has been noticed a slightly positive growth on revenues by a (2,08%), which is mainly affected by the positive influence of the volumes effect (2,14%) and the mix variance (1,78%). On the other hand, the bonus effect has had a negative impact over the current revenues and contributed decreasing it by the negative percentage of (-0,99%). At the same time, the price effect has participated eroding the revenues increases by a negative impact of (-0,85%).

Results for Car Brake Pads thrown by the New Model.

Then, according to the considerations explained in chapter 2 regarding the development of the New Model, the following data has been revealed for the product category "Car Brake Pads":

Regarding this specific period, it is important to mention that for the presented results there have been identified and analysed 7.283 different single products, which means "product codes". These products, at the same time, were recognized to be classified according to the following description:

Car Brake Pads (2016-2017)	
Disused Products	1.804
New Products	980
Ongoing Products	4.499

Table 6 - Car Brake Pads Volume classification. Period 2016-2017.

"Figure 19" gives us a graphical representation of the aforementioned volumes classification:

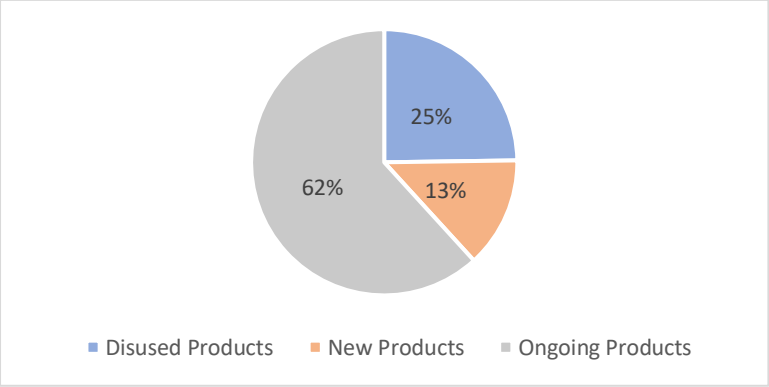


Figure 19 - Car Brake Pads Volume classification (in %). Period 2016-2017.

Now, according to this differentiation, it has been possible to calculate the values of the six (6) determinants of the revenues variance, which results are expressed in the following table and bridge chart, respectively.

Car Brake Pads (2016-2017)	New Products Volumes Variance NVV	Disused Volumes Variance DVV	Ongoing Volumes Variance OVV	Ongoing Mix Variance OMV	Bonus Variance OBV	Prices Variance OPV	Revenues Variance RV
Δ%	*2,97%*	*-1,93%*	*2,10%*	*3,76%*	*-0,99%*	*-3,82%*	*2,08%*

Table 7 - Car Brake Pads Revenues Variances as a sum of the determinant's variances.
New model. Period 2016-2017.

The bridge chart of the figure "Figure 20" helps us to graphically understand the transition from the Car Brake Pads past revenues to the current one for the period frame 2016-2017.

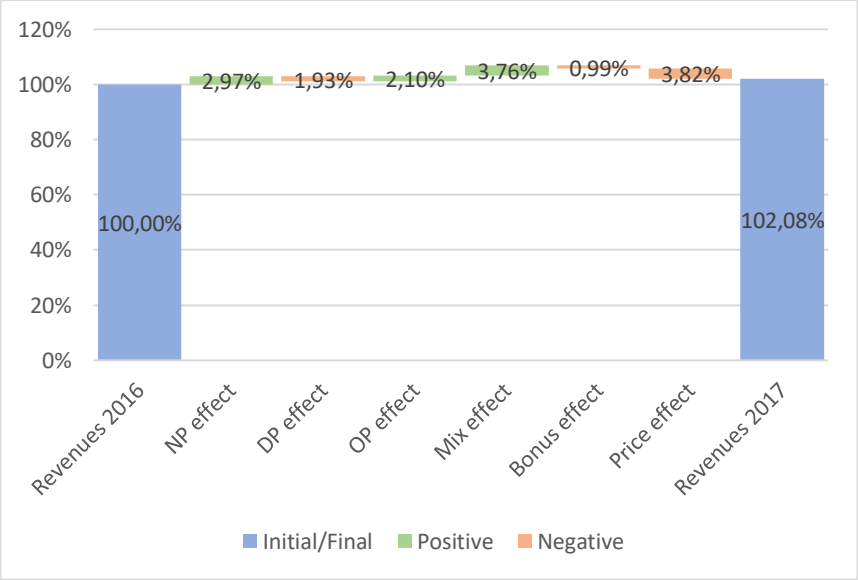


Figure 20 - Brake Pads Revenues Variances. Bridge Chart of the determinants.
New Model. Period 2016-2017.

As we can see both in the table and graph, here we can notice of course the same final result which is a revenues growth of (+2,08). In this case, this increase can be noticed to be mainly connected to the positive mix effect variance (+3,76%), the insertion of new products has contributed by a (+2,97%) and the positive ongoing products variance by a (+2,10%).

On the other hand, we can notice that the disused products effect was not as big to erode the positive effect of new products (-1,93% vs +2,97%). Nonetheless, the main negative contribution in this period has been due to the price variance effect of the ongoing products (-3,82%).

3.2.2 Period 2017-2018

For the aforementioned time period, the overall revenues variance has been equal to +7,44%

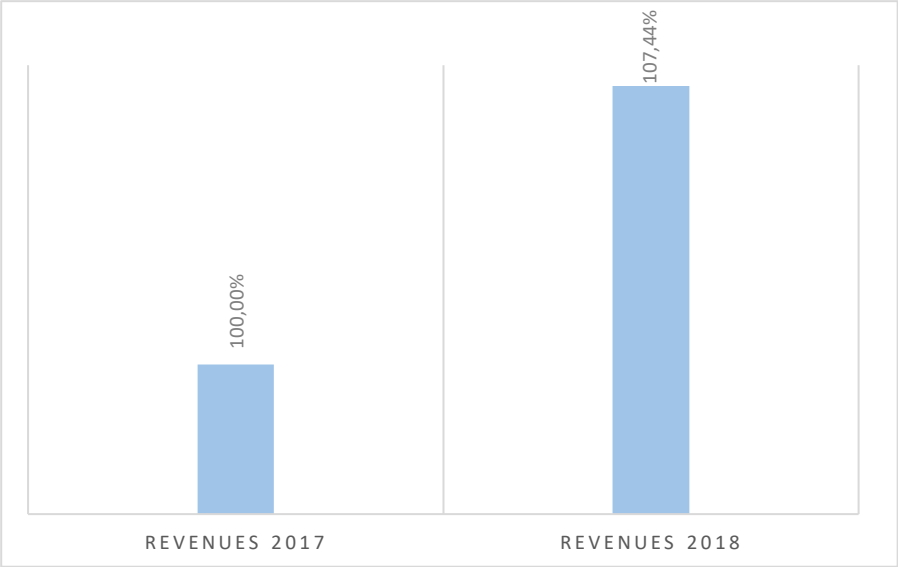


Figure 21 – Brake Pads Revenues Variance 2018 vs 2017.

Results for Car Brake Pads thrown by the Classic Model.

As concerns the global market of the Car Brake Pads it's interesting to show the following results.

Car Brake Pads (2017-2018)	Volume Variance VV	Mix Variance MV	Bonus Variance BV	Prices Variance PV	Revenues Variance RV
Δ%	*9,91%*	*-1,96%*	*-0,65%*	*0,14%*	*7,44%*

Table 8 – Car Brake Pads Revenues Variances as a sum of the determinant's variances. Classic model. Period 2017-2018.

The bridge chart of the figure "Figure 22" represents graphically the transition from the Car Brake Pads past revenues to the current one for the period frame 2017-2018.

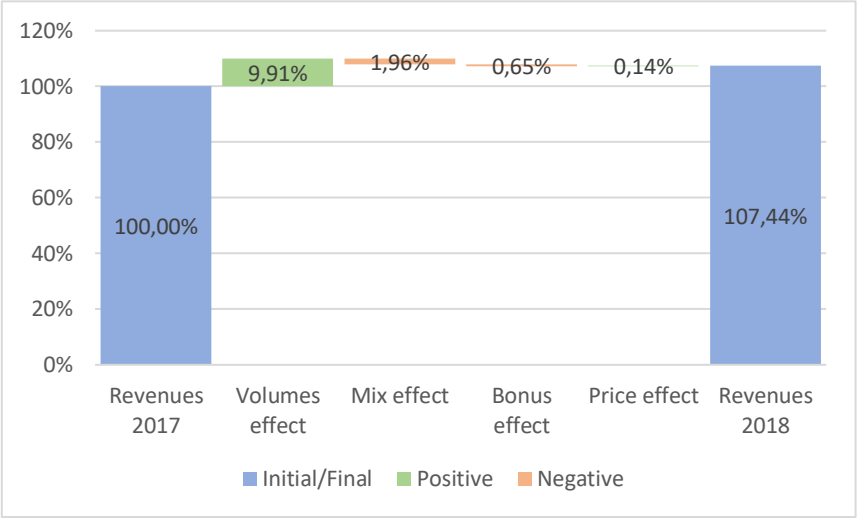


Figure 22 - Brake Pads Revenues Variances. Bridge Chart of the determinants. Classic Model. Period 2017-2018.

As we can see both in the table and graph, we can appreciate a better performance of the product in terms of revenues realized. The registered growth has been of (+7,44%) undoubtedly caused by the volume's variance (+9,91%), which positive effect has been eroded by the negative effect of the mix variance (-1,96%) and the bonus variance (-0,65%). The price variance has had a barely noticeable positive effect of (+0,14%) which seems not that relevant to the overall increase.

Results for Car Brake Pads thrown by the New Model.

Then, according to the considerations explained in chapter 2 regarding the development of the New Model, the following data has been revealed for the product category "Car Brake Pads":

Regarding this specific period, it is important to mention that for the presented results there have been identified and analysed 7.404 different single products, which means "product codes". These products, at the same time, were recognized to be classified according to the following description:

Car Brake Pads (2017-2018)	
Disused Products	860
New Products	1.923
Ongoing Products	4621

Table 9 - Car Brake Pads Volume classification. Period 2017-2018.

"Figure 23" gives us a graphical representation of the aforementioned volumes classification:

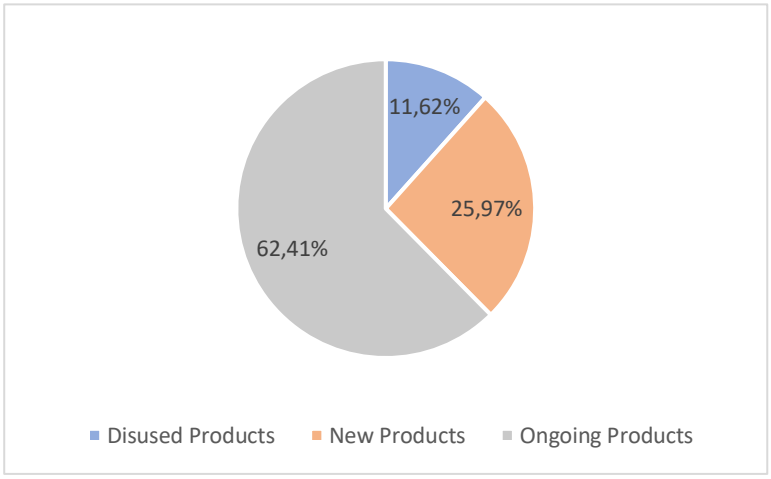


Figure 23 - Car Brake Pads Volume classification (in %). Period 2017-2018.

Now, according to this differentiation, it has been possible to calculate the values of the six (6) determinants of the revenues variance, which results are expressed in the following table and bridge chart, respectively.

Car Brake Pads	New Products Volumes Variance NVV	Disused Volumes Variance DVV	Ongoing Volumes Variance OVV	Ongoing Mix Variance OMV	Bonus Variance BV	Prices Variance PV	Revenues Variance RV
Δ%	*3,81%*	*-0,51%*	*9,86%*	*-1,40%*	*-0,65%*	*-3,68%*	*7,44%*

Table 10 - Car Brake Pads Revenues Variances as a sum of the determinant's variances. New Model. Period 2017-2018.

The bridge chart of the figure "Figure 24" helps us to graphically understand the transition from the Car Brake Pads past revenues to the current one for the period frame 2017-2018.

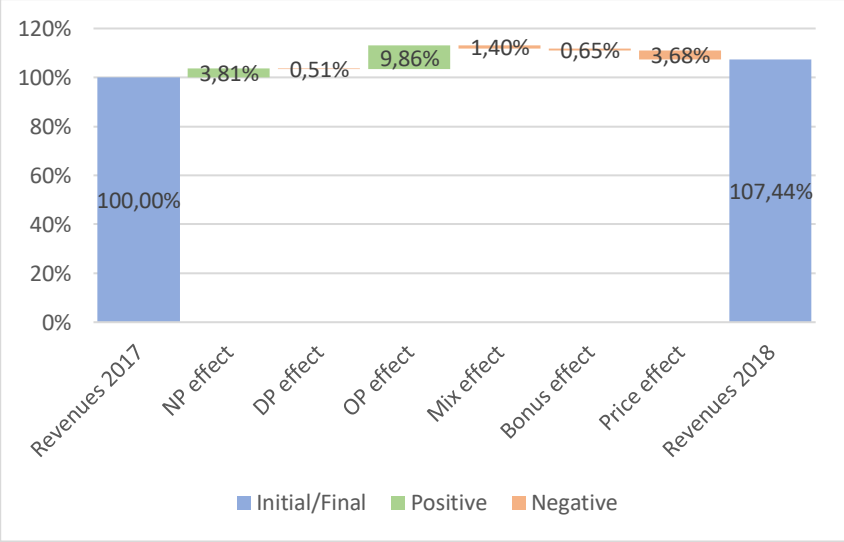


Figure 24 - Brake Pads Revenues Variances. Bridge Chart of the determinants. New model. Period 2017-2018.

According to the results thrown by the new model instead, we can see that in contrast to the old model, in this case the price variance has had a significant participation in the erosion of the revenues increase by a (-3,68%). Meanwhile, the volumes effect continues to be the main contributor to the revenues change, but thanks to the New Model we can notice that the actual growth is more connected to the volumes increase of the ongoing products (+9,86%) than to the insertion of new products (+3,81%). In this particular period and for this particular product, there has been a barely noticeable reduction of revenues due to the disused products (-0,51%). With a less impact, but still a negative one, the mix variance (-1,40%) and the bonus variance (-0,65%) have helped in negatively impacting the revenues growth.

3.2.3 Period 2018-2019

For the aforementioned time period, the overall revenues variance has been equal to +0,99%.

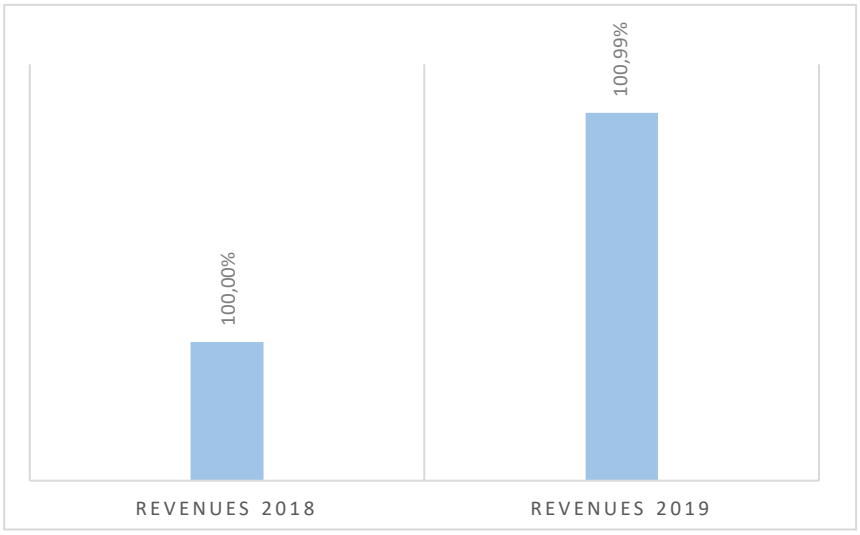


Figure 25 - Brake Pads Revenues Variance 2019 vs 2018.

Results for Car Brake Pads thrown by the Classic Model.

As concerns the global market of the Car Brake Pads it's interesting to show the following results.

Car Brake Pads (2018-2019)	Volume Variance VV	Mix Variance MV	Bonus Variance BV	Prices Variance PV	Revenues Variance RV
Δ%	*4,43%*	*1,62%*	*-0,62%*	*-4,44%*	*0,99%*

Table 11 - Car Brake Pads Revenues Variances as a sum of the determinant's variances. Classic Model. Period 2018-2019

The bridge chart of the figure "Figure 26" graphically represents the transition from the Car Brake Pads past revenues to the current one for the period frame 2018-2019.

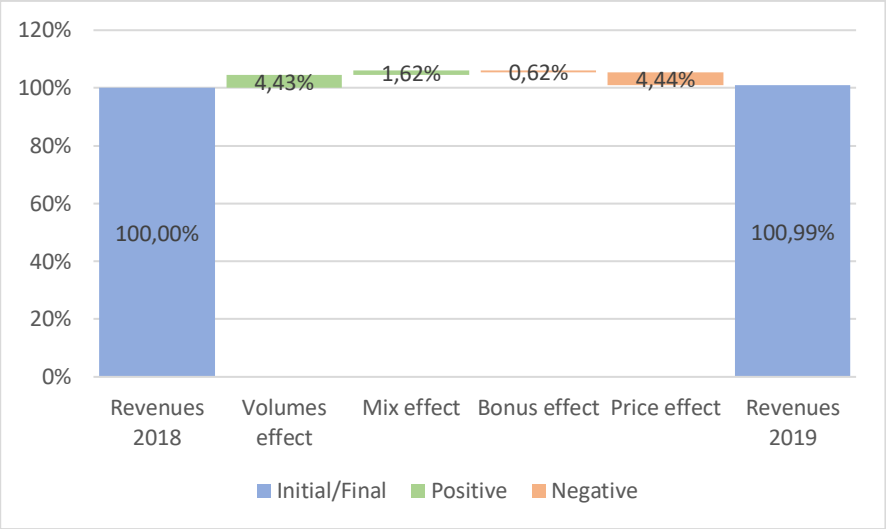


Figure 26 - Brake Pads Revenues Variances. Bridge Chart of the determinants.
Classic model. Period 2018-2019.

This time period, in contrast to the others has presented a small, hardly noticeable change in terms of revenues variances. Nevertheless, this overall result does not mean that there have been not significative variances in the single determinants. This particular case, in fact is a clear example of the importance of considering the single determinants variances to have a real image of how a product is performing in the market. By the variances analysis we can identify, by the results the classic model offers, a positive volumes variance (+4,43%) which was completely eroded by the price variance (-4,44%). Then, it can be appreciated a positive effect of the Mix variance (+1,62%) which has been partially eroded by the bonus variance (-0,62%). And after all these single up-downs we can see the final positive revenues variance of (+0,99%).

Results for Car Brake Pads thrown by the New Model.

Then, according to the considerations explained in chapter 2 regarding the development of the new model, the following data has been revealed for the product category "Car Brake Pads":

Regarding this specific period, it is important to mention that for the presented results there have been identified and analysed 7.667 different single products, which means "product codes". These products, at the same time, were recognized to be classified according to the following description:

Car Brake Pads (2018-2019)	
Disused Products	578
New Products	1.124
Ongoing Products	5.965

Table 12 - Car Brake Pads Volume classification. Period 2018-2019.

"Figure 27" gives us a graphical representation of the aforementioned volumes classification:

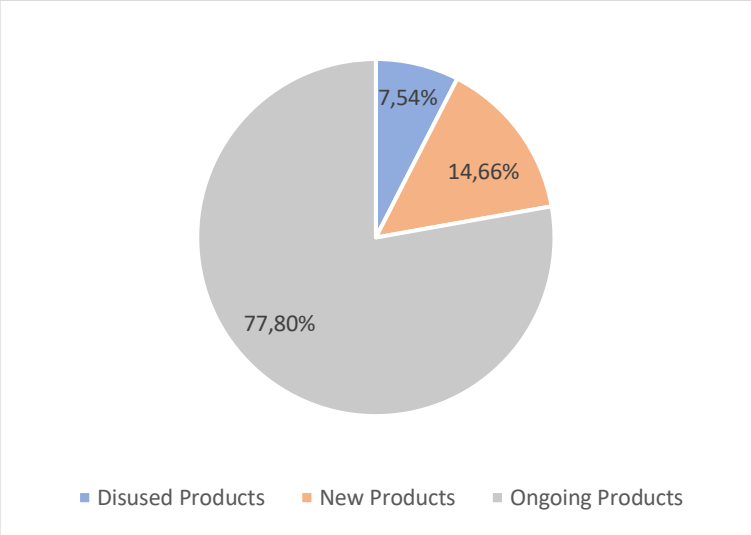


Figure 27 - Car Brake Pads Volume classification (in %). Period 2018-2019.

Now, according to this differentiation, we have been able to calculate the values of the six (6) determinants of the revenues variance, which results are expressed in the following table and bridge chart, respectively.

Car Brake Pads (2018-2019)	New Products Volumes Variance NVV	Disused Volumes Variance DVV	Ongoing Volumes Variance OVV	Ongoing Mix Variance OMV	Bonus Variance BV	Prices Variance PV	Revenues Variance RV
Δ%	*0,83%*	*-0,23%*	*4,42%*	*1,87%*	*-0,62%*	*-5,27%*	*0,99%*

Table 13 - Car Brake Pads Revenues Variances as a sum of the determinant's variances. New model. Period 2018-2019.

The bridge chart of the figure "Figure 28" helps us to graphically understand the transition from the Car Brake Pads past revenues to the current one for the period frame 2018-2019

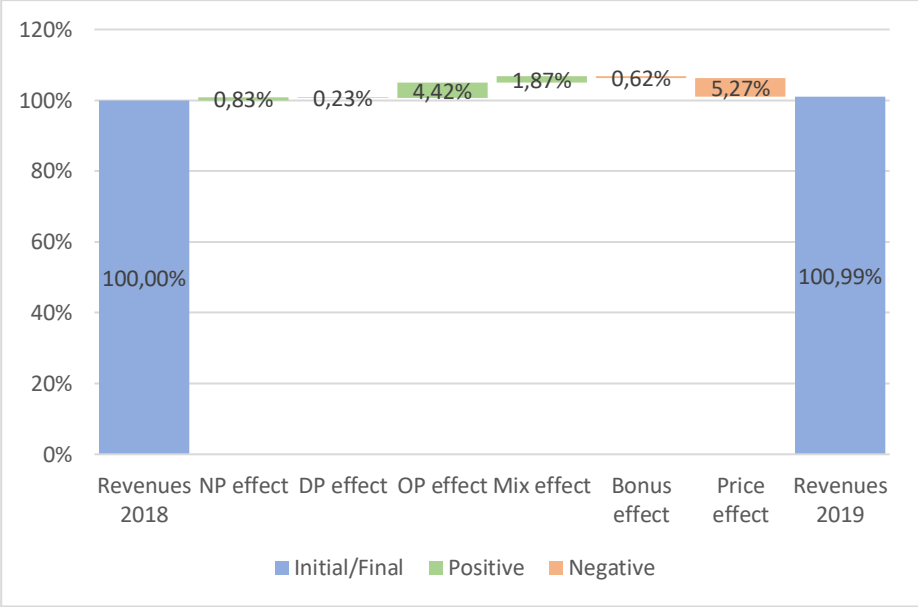


Figure 28 - Brake Pads Revenues Variances. Bridge Chart of the determinants. New model. Period 2018-2019.

According to the results shown by the old model, we can more clearly see that the positive volumes effect was attributed to the volumes variance of the ongoing products (+4,42%). There has been a little positive variance due to the new products that appeared to be sold on the current period which has been partially eroded by the effect of the disused products. The mix variance in this case contributed by a (+1,87%) to the overall revenues increase. Meanwhile, the main erosion of the revenues increase has been caused by the price variance, which means that even though the market presented a higher quantity of the ongoing products sold, they have been sold at lower prices which compromised the overall revenues realized. The bonus variance in this case it has been negative as well (-0,62%).

3.2.4 Overall results for the total period 2016-2019: Classic Model vs. New Model

So far, we have had the chance of analysing the results by simply comparing two time periods data and analysing the variances this comparison evinced.

The objective of this section is to show, by a single graph (all-in-one) all the information that has been previously presented. Which means which was the revenues variance for each year in respect to the previous one, and how strong has been the incidence of each determinant effect to the overall revenues variance result.

Once again, as the analysis has been so far done for both models, the presentation of the overall results will be done as well for both the classic and the new model. This may also help to see, in a quick look, how the results may differ from one approach to the other.

As it follows, the aforementioned graphs for the "Car Brake Pads" product category will be presented.

Classic Model

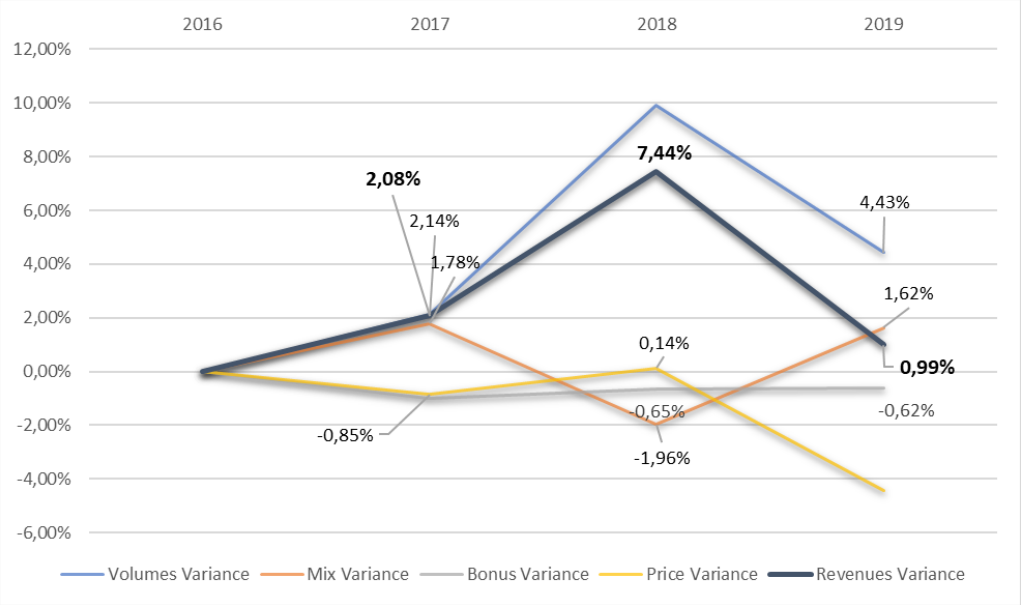


Figure 29 - Graph of the progressive revenues' variances and the respective determinants contribution for the overall timeframe (2016-2019) for Car Brake Pads. Classic model.

According to *"Figure 29"* it is possible now to see, in the same graph, the single determinants variance and the overall revenue's variance, represented with the thicker line. As we have chosen the New Model as the most accurate one for the analysis, further comments will be done regarding results shown by it.

New Model

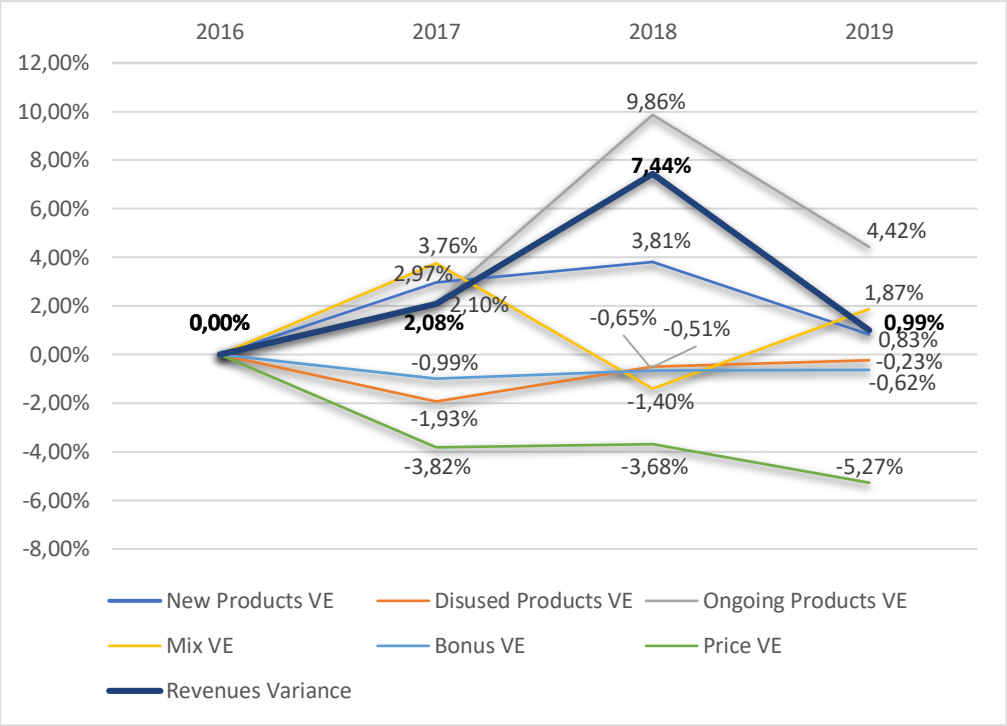


Figure 30 - Graph of the progressive revenues' variances and the respective determinants contribution for the overall time frame (2016-2019) for Car Brake Pads. New model

According to *"Figure 30"* we can appreciate a more descriptive representation of the revenue's variance, thanks to the accuracy of the New Model approach. We can notice, that the year 2018 has presented the widest range of values. This graphic representation is useful to stand in a specific year and see how different were the single determinants variance to the revenue's variance. As for the year 2018 we can see that the volumes effect was greater than the overall variance effect, but it was eroded by the other determinants.

3.3 Car Batteries Revenues Variances

The following data analysis concerns the general product category "Car Batteries". Regarding the input data that has been considered for applying the following models, there has been carried out a prior criteria of data discrimination or also called data selection.

In order to reduce the data sample for a better quality of the data management, the input has been focused on the main brands of car batteries distributed in the market, which company names are reserved for confidentiality reasons. Even though, it is important to consider that this focus has been made just for better management of the data through our methodological methods, but it does not affect in any sense the possibility of associating these results with the total market trend, because the main goal of this data selection was to make the data processing more efficiently but still representative, in other words to not lose the meaningfulness of the results. Therefore, it is important to highlight that these 5 leader brands represent the 81,63% of the market.

For the development of the variance's analysis, the time frame 2016-2019 has been divided in three periods to be considered as follows:

- Period 1: 2016-2017
- Period 2: 2017-2018
- Period 3: 2018-2019

The significance of each period divisions is actually the confronting of the results of the latter year to those of the previous one, in each of the three single cases. Then, all results will be normalized and expressed as a percentage change respect to the previous year status which will be settled, in each single case, as the 100%.

In order to avoid misunderstandings, it is important to highlight, that even though the study has been divided in three periods (three different comparisons) the analysis considers data collection of complete 4 years.
According to the methods analytically explained in chapter 2, the following numerical application will be carried out for this specific product of the Italian Independent After Market.

Both models' results have been calculated in order to show the differences between each other and the relevance of differentiating the volumes, in order to avoid misinterpretations of the results.

3.3.1 Period 2016-2017

For the aforementioned time period, the overall revenues variance has been equal to 12,23%

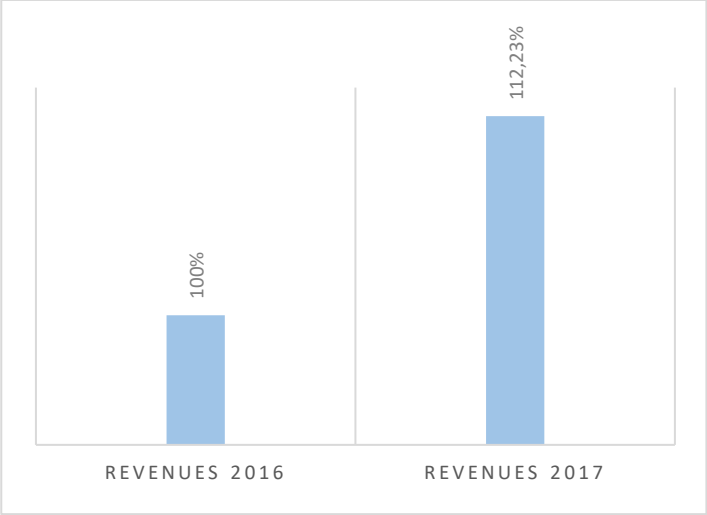


Figure 31 - Car Batteries Revenues Variance 2017 vs 2016.

Results for Car Batteries thrown by the Classic Model.

As concerns the global market of the Car Batteries it's interesting to show the following results.

Car Batteries (2016-2017)	Volume Variance VV	Mix Variance MV	Bonus Variance BV	Prices Variance PV	Revenues Variance RV
Δ%	*8,27%*	*-7,66%*	*-1,03%*	*12,66%*	*12,23%*

Table 14 - Car Batteries Revenues Variances as a sum of the determinant's variances.

The bridge chart of the figure *"Figure 32"* represents graphically the transition from the Car Batteries past revenues to the current one for the period frame 2016-2017.

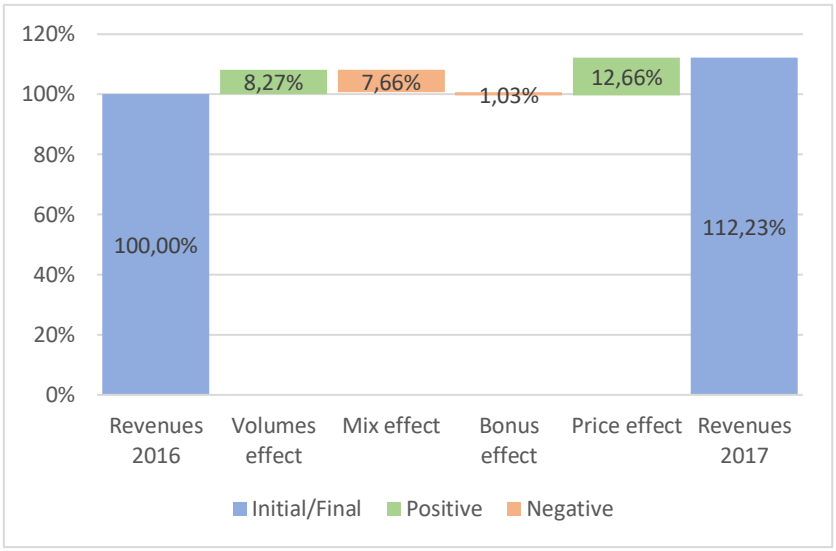


Figure 32 - Car Batteries Revenues Variances. Bridge Chart of the determinants. Classic Model. Period 2016-2017.

As we can see both in the table and graph, it has been a positive growth in revenues by a (12,23%), which is mainly affected by the positive influence of the volumes effect (8,27%) and the price variance (12,66%). On the other hand, the mix variance has had a negative impact over the current revenues and contributed decreasing it by the negative percentage of (-7,66%). Regarding the changes from one year to another of the bonus percentage, this did not represent a major determinant regarding the contribution to the revenue's variance, presenting a slightly negative effect of (-1,03%).

Results for Car Batteries thrown by the New Model.

Then, according to the considerations explained in chapter 2 regarding the development of the New Model, the following data has been revealed for the product category "Car Batteries".

Regarding this specific period, it is important to mention that for the presented results there have been identified and analysed 3.309 different single products, which means "product codes". These products, at the same time, were recognized to be classified according to the following description:

Car Batteries Volume (2016-2017)	
Disused Products	663
New Products	799
Ongoing Products	1.874

Table 15 - Car Batteries Volume classification. Period 2016-2017.

"Figure 33" gives us a graphical representation of the aforementioned volumes classification:

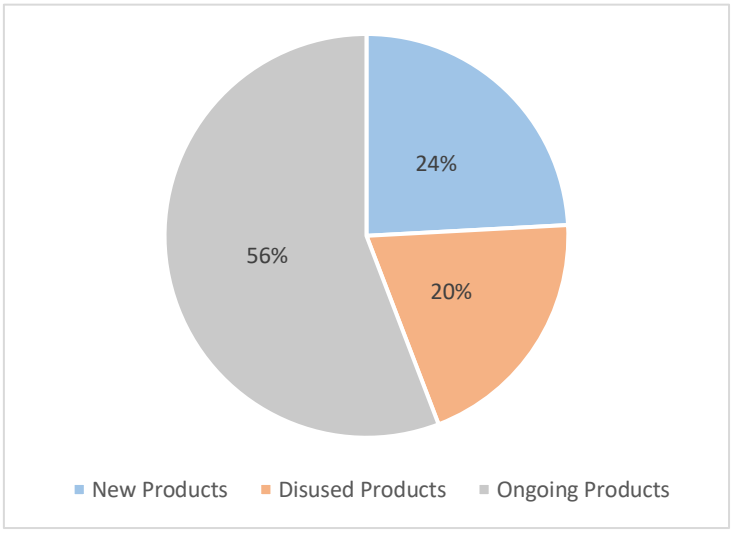


Figure 33 - Car Batteries Volume classification (in %). Period 2016-2017.

Now, according to this differentiation, we have been able to calculate the values of the six (6) determinants of the revenues variance, which results are expressed in the following table and bridge chart, respectively.

Car Batteries (2016-2017)	New Products Volumes Variance NVV	Disused Volumes Variance DVV	Ongoing Volumes Variance OVV	Ongoing Mix Variance OMV	Bonus Variance BV	Prices Variance PV	Revenues Variance RV
Δ%	*8,92%*	*-3,54%*	*7,98%*	*-3,82%*	*-1,03 %*	*3,73%*	*12,23%*

Table 16 - Car Batteries Revenues Variances as a sum of the determinant's variances. New model. Period 2016-2017.

The bridge chart of the figure *"Figure 34"* helps us to graphically understand the transition from the Car Batteries past revenues to the current one for the period frame 2016-2017.

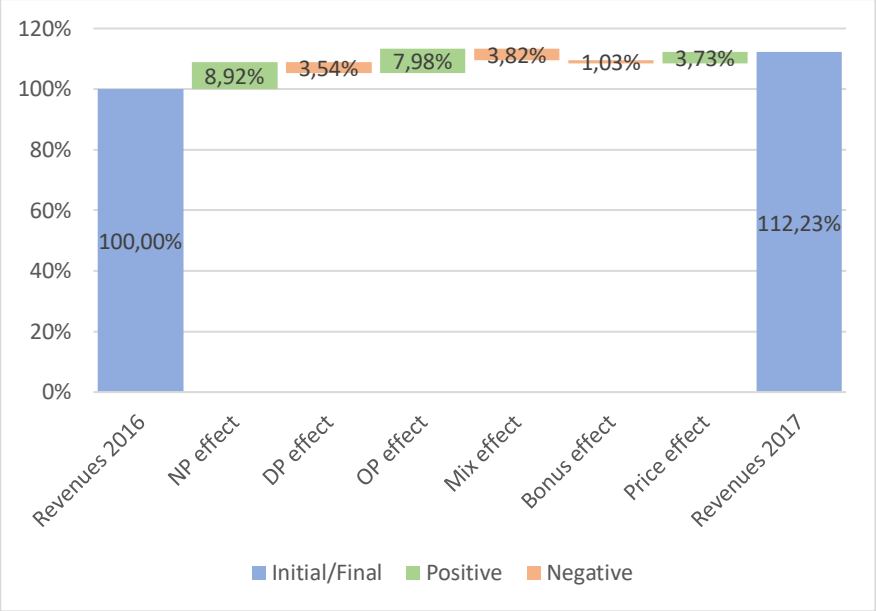


Figure 34 - Batteries Revenues Variances. Bridge Chart of the determinants. New model. Period 2016-2017

As we can see both in the table and graph, it has been a positive overall increase of the revenues due to the volumes effect by a (13,36%). But at the same time, we can now identify that even though the volumes effect has been positive, the negative effect caused by the disused Products has been equal to (-3,54%) but the overall result was positive because of the main contribution the new products (+8,92) had and the volumes increase of the ongoing ones (+7,98).

Both the mix and the bonus effect have had a negative impact towards the overall revenues by (-3,82%) and (-1,03%), respectively. Regarding the price effect, we can appreciate a positive contribution due to a higher average price of the product sold in 2017, respect to 2016.

3.3.2 Period 2017-2018

For the aforementioned time period, the overall revenues variance has been equal to 3,18%.

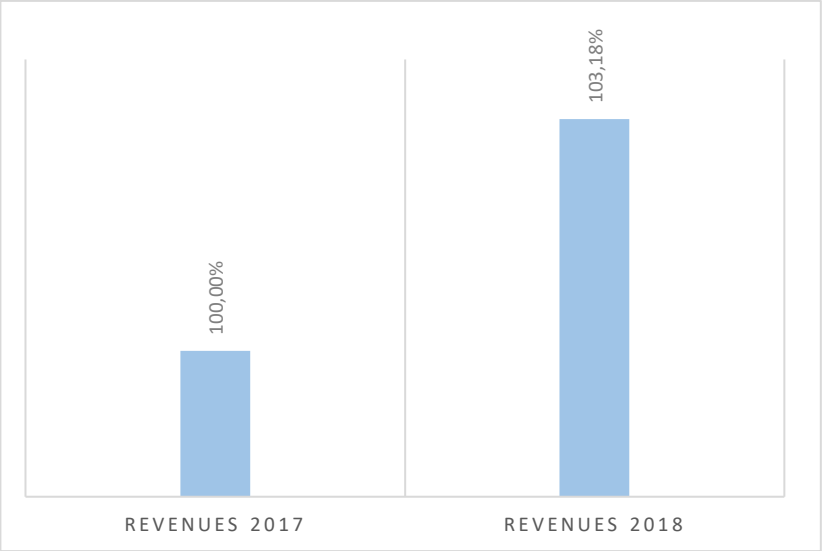


Figure 35 - Car Batteries Revenues Variance 2018 vs 2017.

The single contribution of each of the determinants involved in this increase of the revenues, will be shown as follows:

Results for Car Batteries thrown by the Classic Model

As concerns the global market of the Car Batteries it has been considered interesting to show the following results.

Car Batteries (2016-2017)	Volume Variance VV	Mix Variance MV	Bonus Variance BV	Prices Variance PV	Revenues Variance RV
Δ%	*-0,25%*	-3,52%	0,50%	*6,45%*	*3,18%*

Table 17 - Car Batteries Revenues Variances as a sum of the determinant's variances. Classic model. Period 2017-2018.

The following bridge shown in the "Figure 36" graphically represents the transition from the Car Batteries past revenues to the current one for the time period under analysis.

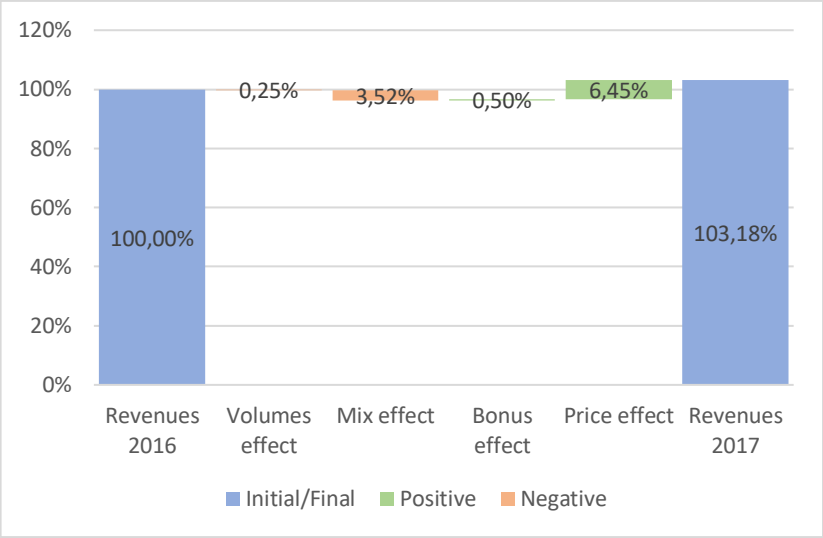


Figure 36 - Car Batteries Revenues Variances. Bridge Chart of the determinants. Classic model. Period 2017-2018.

As we can see both in the table and graph, it has been a little positive increase of the revenues by a (+3,18%), which is mainly caused by the positive influence of the price effect (+6,45%) and it was slightly amplified by the bonus effect (+0,50%). On the other hand, there has been a negative impact towards the actual revenues caused by the mix effect, which reduced the revenues by a (-3,52%), that effect has been slightly amplified by the volumes effect (-0,25%).

Results for Car Batteries thrown by the New Model.

According to the considerations explained in chapter 2 regarding the development of the new model, the following data has been revealed for the product category "Car Batteries".

Regarding this specific period, it is important to mention that for the presented results there have been identified and analysed 3.492 different single products, which means "product codes". These products, at the same time, were recognized to be classified according to the following description:

Car Batteries Volume (2017-2018)	
Disused Products	741
New Products	846
Ongoing Products	1.905

Table 18 - Car Batteries Volume classification. Period 2017-2018

"Figure 37" gives us a graphical representation of the aforementioned volumes classification:

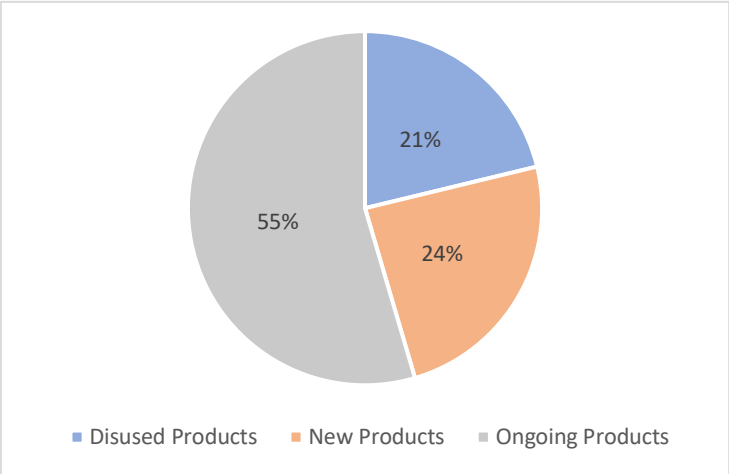


Figure 37 - Car Batteries Volume classification (in %). Period 2017-2018

Now, according to this differentiation, we have been able to calculate the values of the six (6) determinants of the revenues variance, which results are expressed in the following table and bridge chart, respectively.

Car Batteries (2017-2018)	New Products Volumes Variance NVV	Disused Volumes Variance DVV	Ongoing Volumes Variance OVV	Ongoing Mix Variance OMV	Bonus Variance BV	Prices Variance PV	Revenues Variance RV
Δ%	*6,99%*	*-4,76%*	*-0,23%*	*1,23%*	*0,50%*	*-0,55%*	*3,18%*

Table 19 - Car Batteries Revenues Variances as a sum of the determinant's variances. Classic Model. Period 2017-2018.

The bridge chart of the figure "Figure 38" helps us to graphically understand the transition from the Car Batteries past revenues to the current one for the period frame 2017-2018.

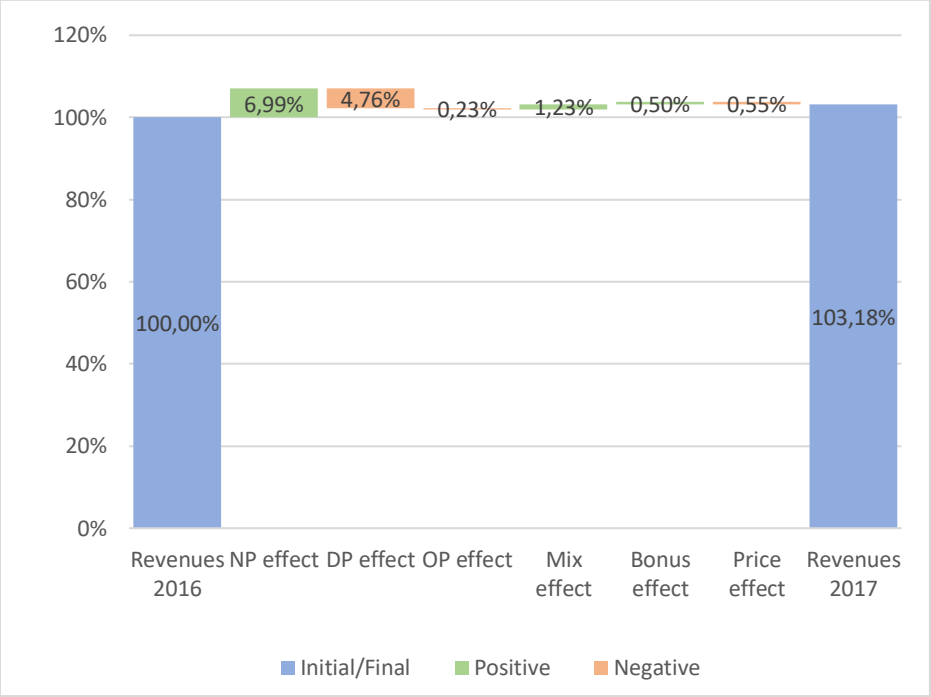


Figure 38 - Batteries Revenues Variances. Bridge Chart of the determinants. New model. Period 2017-2018.

As we can see both in the table and graph, there was a little increase in the overall revenues, mainly caused by the volumes effect of the new products sold in the new period (6,99%). On the other hand, there has been a decrease of the revenues by a percentage (-4.76%) due to disused products effects. Regarding the Mix effect of the ongoing products, of course, it has been noticed a positive contribution of (1,23%) which was slightly amplified by the bonus effect (+0,50%). The ongoing volumes effect, in this year presented a negative effect of (-0,23%) which was at the same time amplified by the negative effect of the ongoing prices by (-0,55%).

3.3.3 Period 2018-2019

For the aforementioned time period, the overall revenues variance has been equal to 0,09%.

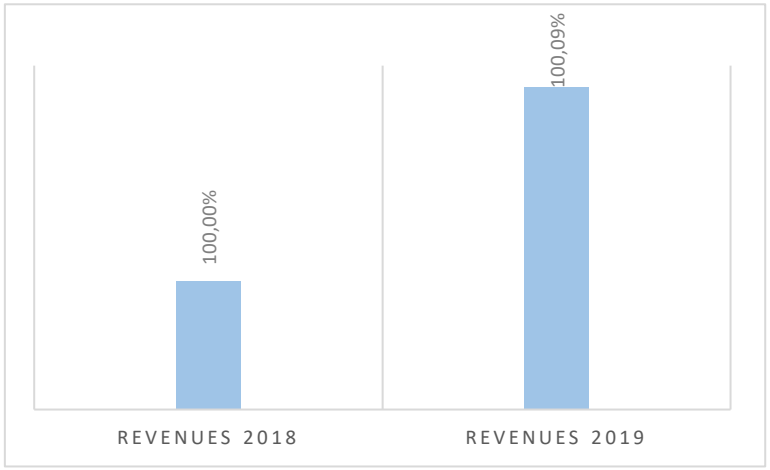


Figure 39 - Car Batteries Revenues Variance 2019 vs 2018.

Results for Car Batteries thrown by the Classic Model.

As concerns the global market of the Car Batteries it's interesting to show the following results.

Car Batteries (2018-2019)	Volume Variance VV	Mix Variance MV	Bonus Variance BV	Prices Variance PV	Revenue Variance RV
Δ%	*-1,04%*	-2,80%	*-0,60%*	*4,52%*	*0,09%*

Table 20 - Car Batteries Revenues Variances as a sum of the determinant's variances. Classic model. Period 2018-2019.

The bridge chart of the figure "Figure 40" represents graphically the transition from the Car Batteries past revenues to the current one for the period frame under analysis.

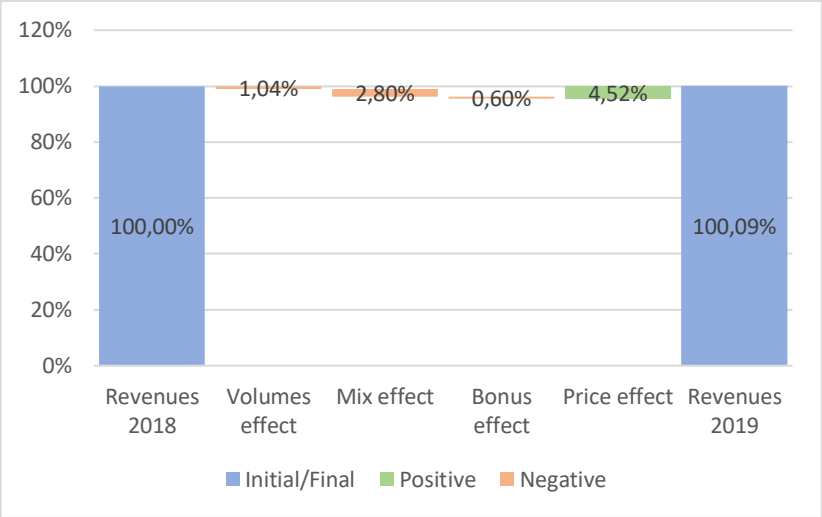


Figure 40 - Car Batteries Revenues Variances. Bridge Chart of the determinants. Classic model. Period 2018-2019.

As we can see both in the table and graph, there has been practically no change in the overall revenues from one year (2018) to the other (2019). If we pay attention to the single determinants the classic model considers, we can see a negative impact on the revenue's variance produced by the volumes effect, the mix effect and the bonus effect by a (-1,04%), (-2,8%) and (-0,6%), respectively. On the contrary, we can see a positive contribution to the variance caused by the price effect by a (+4,52%).

Results for Car Batteries thrown by the New Model.

Then, according to the considerations explained in chapter 2 regarding the development of the new model, the following data has been revealed for the product category "Car Batteries":

Regarding this specific period, it is important to mention that for the presented results there have been identified and analysed 3.655 different single products, which means "product codes". These products, at the same time, were recognized to be classified according to the following description:

Car Batteries Volume (2018-2019)	
Disused Products	705
New Products	903
Ongoing Products	2.047

Table 21 - Car Batteries Volume classification. Period 2018-2019

"Figure 41" gives us a graphical representation of the aforementioned volumes classification:

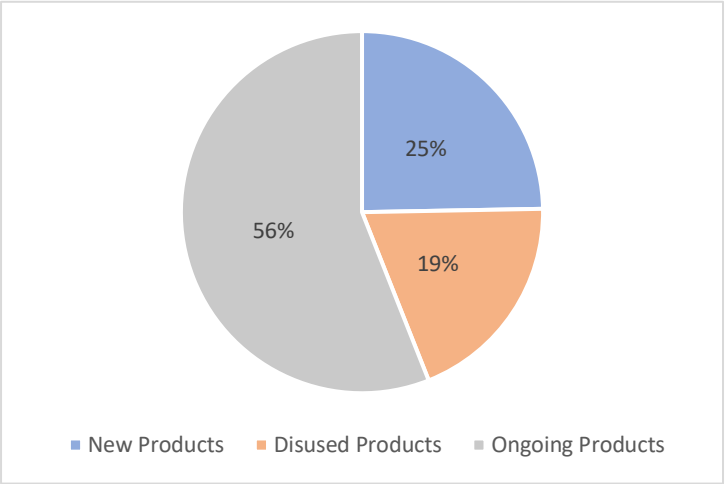


Figure 41 - Car Batteries Volume classification (in %). Period 2018-2019

Now, according to this differentiation, we have been able to calculate the values of the six (6) determinants of the revenues variance, which results are expressed in the following table and bridge chart, respectively.

Car Batteries (2018-2019)	New Products Volumes Variance NVV	Disused Volumes Variance DVV	Ongoing Volumes Variance OVV	Ongoing Mix Variance OMV	Bonus Variance BV	Prices Variance PV	Revenues Variance RV
Δ%	*6,08%*	*-2,66%*	*-1,01%*	*-0,16%*	*-0,60%*	*-1,56%*	*0,09%*

Table 22 - Car Batteries Revenues Variances as a sum of the determinant's variances. New model. Period 2018-2019.

The bridge chart of the figure "Figure 42" helps us to graphically understand the transition from the Car Batteries past revenues to the current one for the period frame 2018-2019.

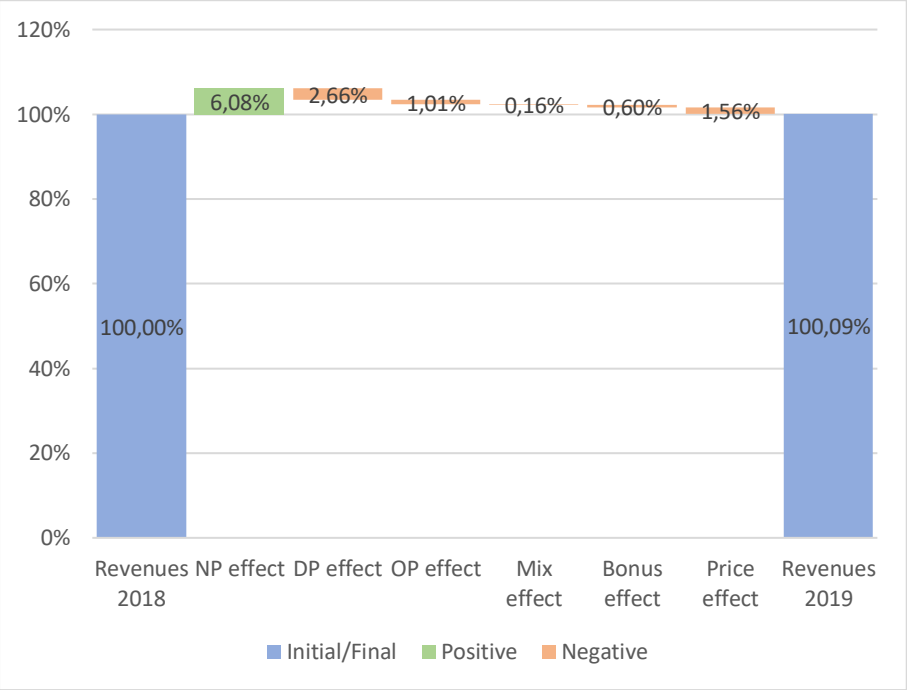


Figure 42 - Batteries Revenues Variances. Bridge Chart of the determinants. New model. Period 2018-2019.

As we can see both in the table and graph, there was a little increase in the overall revenues. But, in contrast to the results shown by the classic model, here we can appreciate that there was a positive contribution to the revenues variance of the 6,08% caused particularly by the new products effect. On the other hand, all the other determinants (disused products, ongoing products, mix, bonus, and price) presented a negative effect, of (-2,66%), (-1,01%), (-0,16%), (-0,60%) and (-1,56%), respectively. It is interesting to highlight that the by results shown by the classic model, the main component increasing the revenues was the price effect. In contrast, considering the division of the volumes we can appreciate that the main component increasing the revenues is instead the new products effects.

3.3.4 Overall results for the total period 2016-2019: Classic Model vs. New Model

So far, we have had the chance of analysing the results by simply comparing two time periods data and analysing the variances this comparison evinced.

The objective of this section is to show, by a single graph (all-in-one) all the information that has been previously presented. Which means which was the revenues variance for each year in respect to the previous one, and how strong has been the incidence of each determinant effect to the overall revenues variance result.

Once again, as the analysis has been so far done for both models, the presentation of the overall results will be done as well for both the classic and the new model. This may also help to see, in a quick look, how the results may differ from one approach to the other.

As it follows, the aforementioned graphs for the "Car Batteries" product category will be presented.

Classic Model

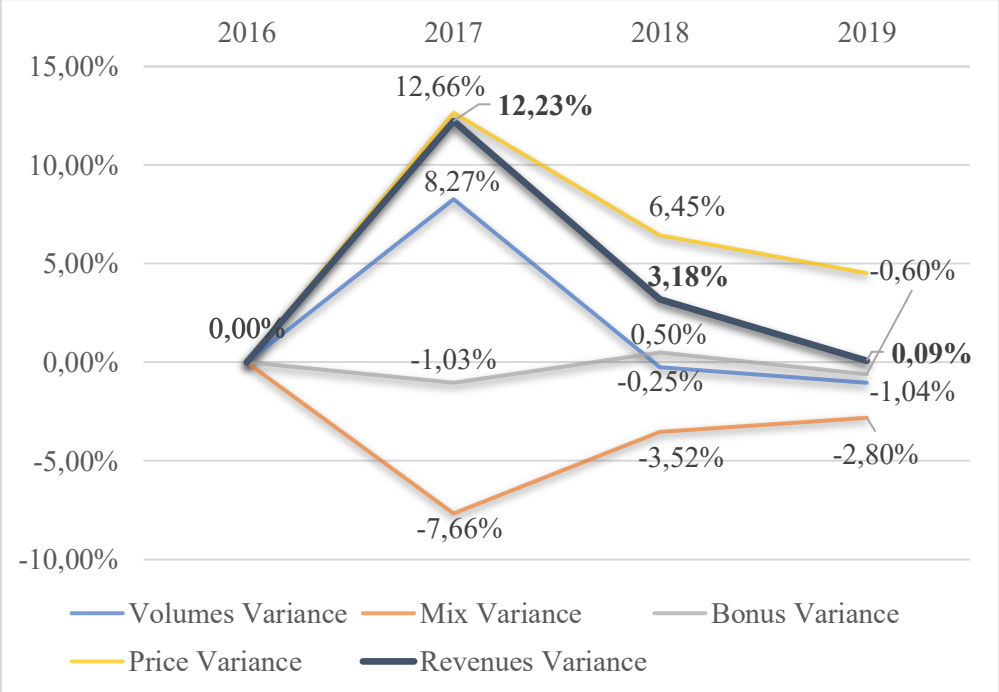


Figure 43 - Graph of the progressive revenues' variances and the respective determinants contribution for the overall time frame (2016-2019) for Car Batteries. Classic model.

According to the Figure "43" it is possible now to see, in the same graph, the single determinants variance and the overall revenue's variance, represented with the thicker line. As we have chosen the New Model as the most accurate one for the analysis, further comments will be done regarding results shown by it.

New Model

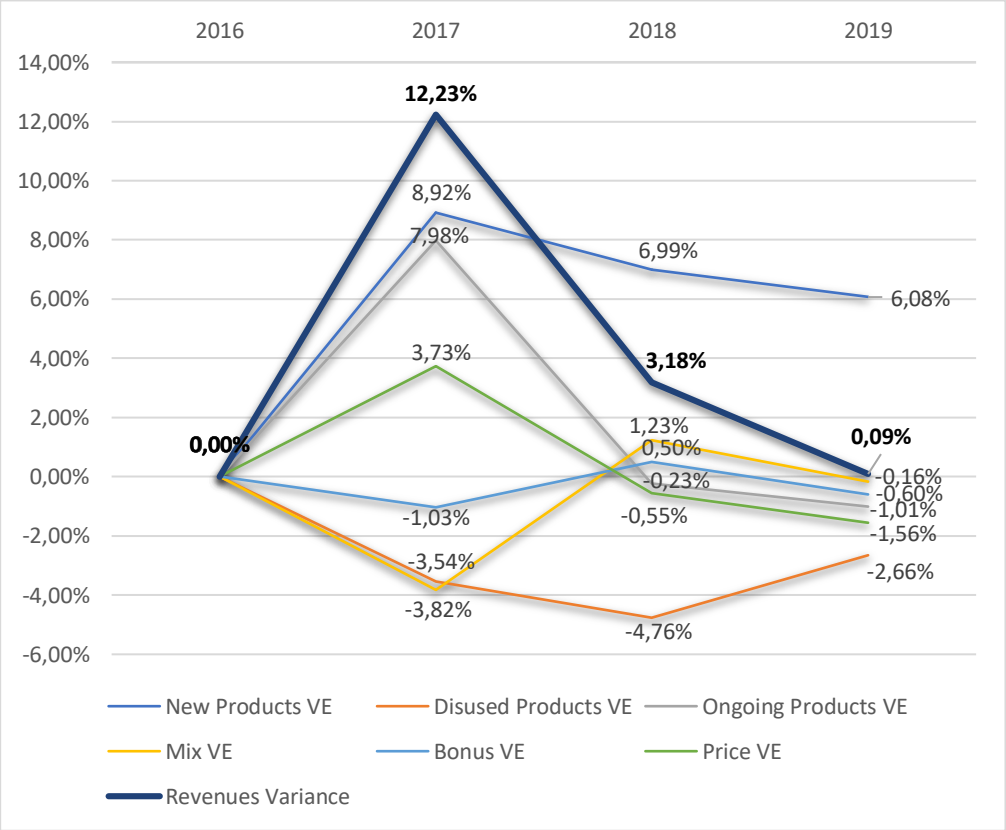


Figure 44 - Graph of the progressive revenues' variances and the respective determinants contribution for the overall time frame (2016-2019) for Car Batteries. New model.

According to the *"Figure 44"* we can appreciate a more descriptive representation of the revenue's variance, thanks to the accuracy of the New Model approach. We can notice, that in this case the year 2017 has presented the widest range of values. This graphic representation is useful to stand in a specific year and see how different were the single determinants variance to the revenue's variance. As for the year 2017 we can see that the volumes effect of the new products plus the ongoing ones and the price effect were eroded by the other determinants, and therefore the revenues variance achieved was the one shown in the Figure.

In this particular case, we can notice the difference between the results thrown by each model. While the classic model has shown a permanent noticeable increase year by year of the prices effect contribution to the revenues variance, the new model has been showing more conservative results regarding this effect.

In the particular case of the Car Batteries product category we can definitely associate the changes in prices to the changes in the market prices of the lead material, the main component of car batteries.

After researching which was the price trend of the lead component, we can confirm that the new model results are more accurate, under the certain hypothesis that the price performance of the car batteries are connected to the lead prices tend.

As follows, the graph shown in the *"Figure 45"* will show the historical prices of the lead material.

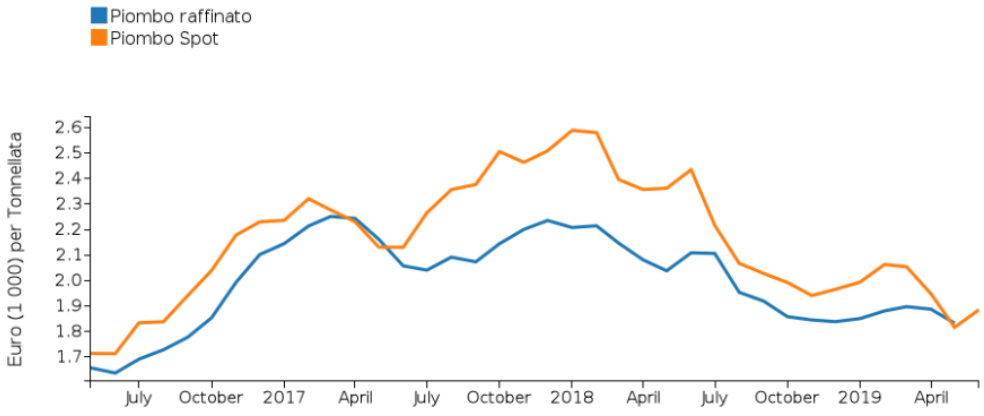


Figure 45 - Graph showing the Lead price trend for the last years. (Ranocchia, 2019)

This graph clearly shows an increasing trend in the prices from 2016 to 2017, which was mainly caused by a reduction in the supply of lead due to the closure of a smelter in Australia. This led to an increase in lead prices on the London Metal Exchange (LME). That should be connected partly with the increases in Car Batteries prices as well. Even though, after this peak reached in 2017, we are allowed to state that the price of lead has been in a negative trend for more than a year. In the summer of 2018,

the moment of the beginning of the trade war between the United States and China, the price of lead has fallen by -15%, continuing this downward trend to reach $ 1.820 per ton in May 2019. (Ranocchia, 2019)

All above is not only to try to explain the coherence of the prices effect but even to show, once again, the accurateness of the application of the new model in contrast to the classic one.

3.4 Car Clutch Kit Revenues Variances

The following data analysis concerns the general product category “Car Clutch Kit”.

Regarding the input data that has been considered for applying the following models, there has been carried out a prior criteria of data discrimination or also called data selection.
In order to reduce the data sample for a better quality of the data management, the input has been focused on the main brands of brake pads distributed in the market, which company names are reserved for confidentiality reasons. Even though, it is important to consider that this focus has been made just for better management of the data through our methodological methods, but it does not affect in any sense the possibility of associating these results with the total market trend, because the main goal of this data selection was to make the data processing more efficiently but still representative, in other words to not lose the meaningfulness of the results. Therefore, it is important to highlight that these leader brands represent the 88% of the market.
For the development of the variance’s analysis, the time frame 2016-2019 has been divided in three periods to be considered as follows:

- Period 1: 2016-2017
- Period 2: 2017-2018
- Period 3: 2018-2019

The significance of each period divisions is actually the confronting of the results of the latter year to those of the previous one, in each of the three single cases. Then, all results will be normalized and expressed as a percentage change respect to the previous year status which will be settled, in each single case, as the 100%.

In order to avoid misunderstandings, it is important to highlight, that even though the study has been divided in three periods (three different comparisons) the analysis considers data collection of complete 4 years.
According to the methods analytically explained in chapter 2, the following numerical application will be carried out for this specific product of the Italian Independent After Market.

Both models' results have been calculated in order to show the differences between each other and the relevance of differentiating the volumes, in order to avoid misinterpretations of the results.

3.4.1 Period 2016-2017

For the aforementioned time period, the overall revenues variance has been equal to 4,49%.

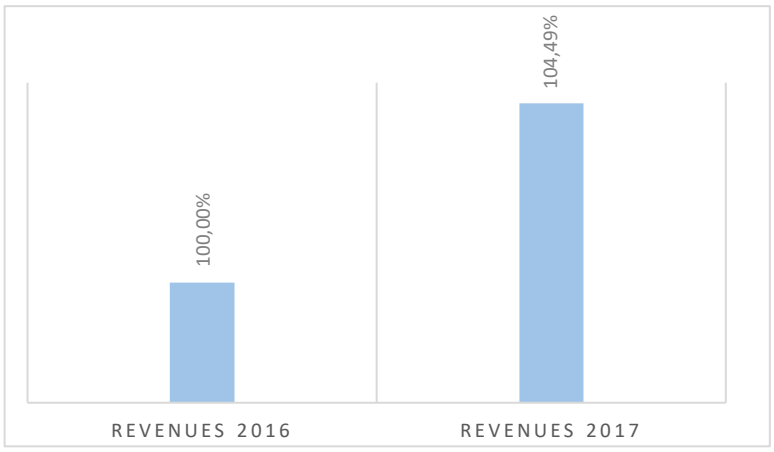


Figure 46 - Car Clutch Kit Revenues Variance 2017 vs 2016.

Results for Car Clutch Kits thrown by the Classic Model.

As concerns the global market of the Car Clutch Kits it's interesting to show the following results.

Car Clutch Kit (2016-2017)	Volume Variance VV	Mix Variance MV	Bonus Variance BV	Prices Variance PV	Revenues Variance RV
Δ%	*4,10%*	*1,44%*	*-0,30%*	*-0,75%*	*4,49%*

Table 23 - Car Clutch Kit Revenues Variances as a sum of the determinant's variances.

The bridge chart represented in "Figure 47" graphically shows the transition from the Car Clutch Kit past revenues to the current one for the period frame 2016-2017.

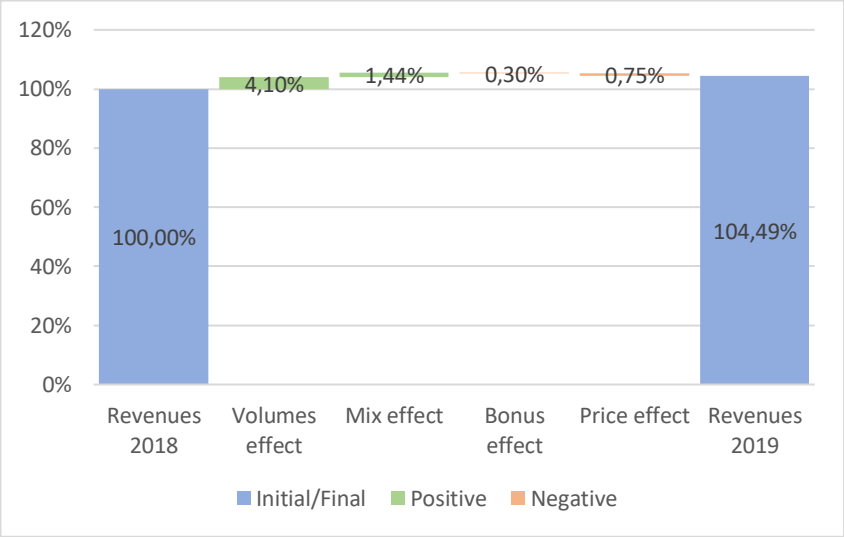


Figure 47 - Car Clutch Kit Revenues Variances. Bridge Chart of the determinants. Classic Model. Period 2016-2017.

As we can appreciate both in the table and graph, it has been a slightly increase in revenues (+4,49%, vs the previous period), where the volumes effect and the mix effect had a positive contribution by (+4,10%) and (+1,44%), respectively. On the other hand, this increase has been a slightly noticeable eroded by the bonus and the price effect.

Results for Car Clutch Kit thrown by the New Model.

Then, according to the considerations explained in chapter 2 regarding the development of the new model, the following data has been revealed for the product category "Car Clutch Kit":

Regarding this specific period, it is important to mention that for the presented results there have been identified and analysed 4.773 different single products, which means "product codes". These products, at the same time, were recognized to be classified according to the following description:

Car Clutch Kit (2016-2017)	
Disused Products	748
New Products	752
Ongoing Products	3.273

Table 24 - Car Clutch Kit Volume classification. Period 2016-2017

"Figure 48" gives us a graphical representation of the aforementioned volumes classification:

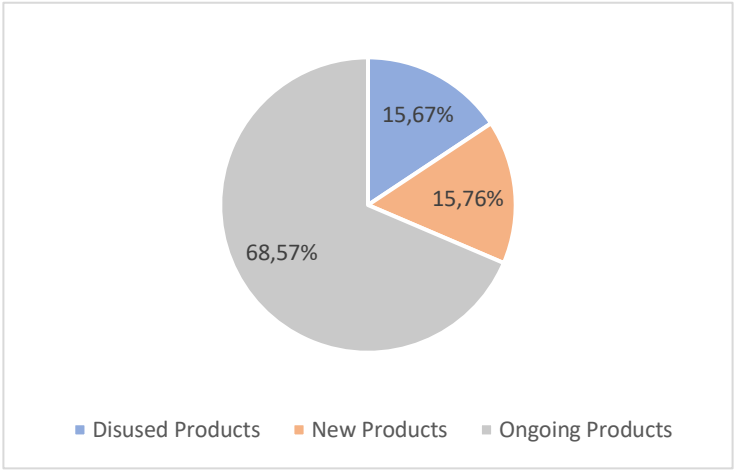


Figure 48 - Car Clutch Kit Volume classification (in %). Period 2016-2017.

Now, according to this differentiation, we have been able to calculate the values of the six (6) determinants of the revenues variance, which results are expressed in the following table and bridge chart, respectively.

Car Clutch Kit (2016-2017)	New Products Volumes Variance NVV	Disused Volumes Variance DVV	Ongoing Volumes Variance OVV	Ongoing Mix Variance OMV	Bonus Variance BV	Prices Variance PV	Revenues Variance RV
Δ%	*3,70%*	*-0,98%*	*4,06%*	*2,46%*	*-0,30%*	*-4,45%*	*4,49%*

Table 25 - Car Batteries Revenues Variances as a sum of the determinants variances.

The bridge chart of the figure *"Figure 49"* helps us to graphically understand the transition from the Car Clutch Kit past revenues to the current one for the period frame 2016-2017.

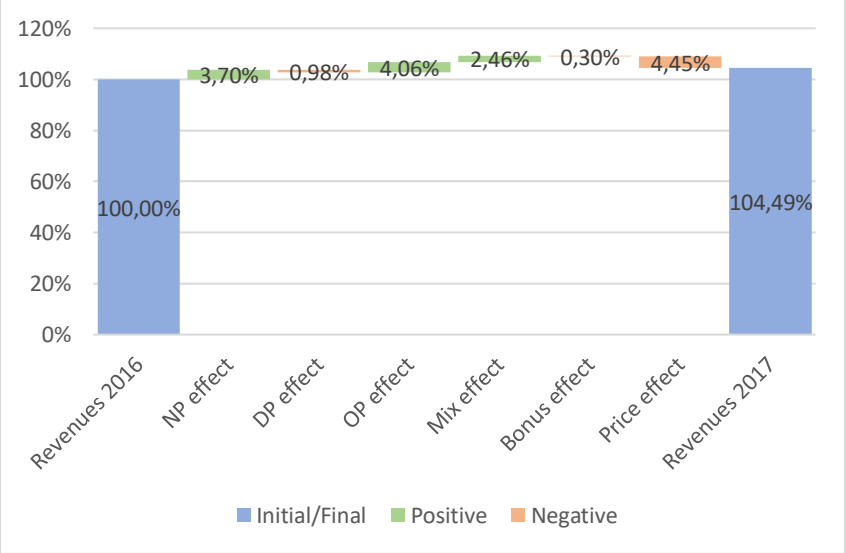


Figure 49 – Car Clutch Kit Revenues Variances. Bridge Chart of the determinants. New model. Period 2016-2017.

As we can see both in the table and graph, as we should expect the overall result of the revenues variances coincides with the classic model.

In this particular case we can notice a positive contribution of the volumes effect respect to the new products by (+3,70) and by the ongoing products (+4,06%). There was a slightly noticeable decrease of the revenues caused by the disused products (-0,98) and by the bonus effect of the ongoing products (0,30%). Then the main negative impact was caused by the price effect (-4,45%).

3.4.2 Period 2017-2018

For the aforementioned time period, the overall revenues variance has been equal to 7,61%.

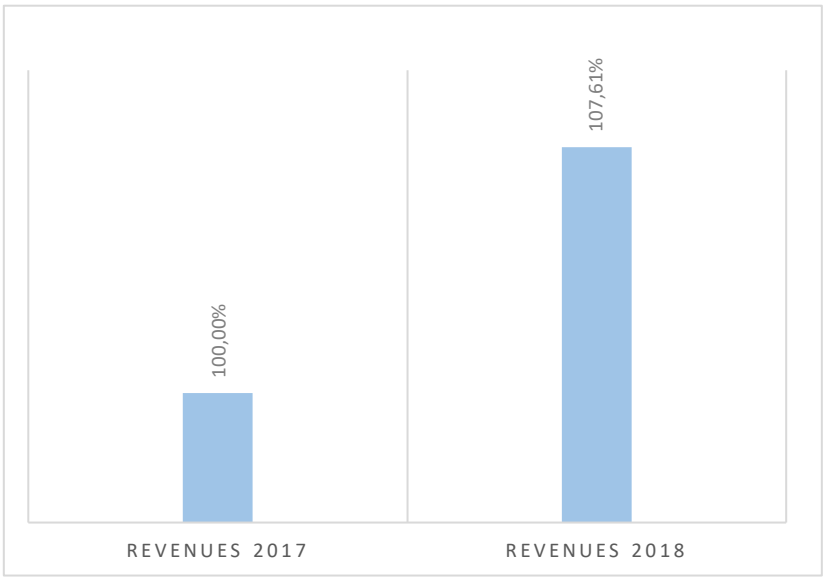


Figure 50 - Car Batteries Revenues Variance 2018 vs 2017.

The single contribution of each of the determinants involved in this increase of the revenues, will be shown as follows:

Results for Car Clutch Kit thrown by the Classic Model.

As concerns the global market of the Car Clutch Kit it has been considered interesting to show the following results.

Car Clutch Kit (2017-2018)	Volume Variance VV	Mix Variance MV	Bonus Variance BV	Prices Variance PV	Revenues Variance RV
Δ%	*12,68%*	*-5,01%*	*-0,52%*	*0,46%*	*7,61%*

Table 26 - Car Clutch Kit Revenues Variances as a sum of the determinants variances.

The following bridge chart shown in the "Figure 51" graphically represents the transition from the Car Clutch Kit past revenues to the current one for the time period under analysis.

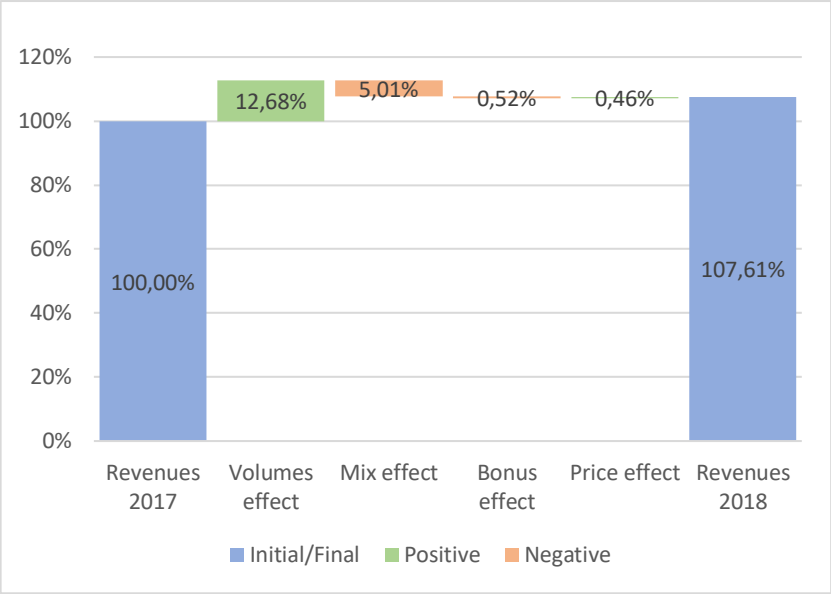


Figure 51 - Car Clutch Kit Revenues Variances. Bridge Chart of the determinants. Classic model. Period 2017-2018.

As we can see both in the table and the graph, as concerns the total performance of the product category under consideration, the classic model results show an increase in revenues compared to the previous period of (7,61%); mainly caused by the volumes effect (12,68%). While it can be noticed the negative effect of the mix (5,01%) which has been a little amplified by the bonus and the mix effect by (0,52%) and (0,46%), respectively.

Results for Car Clutch Kit thrown by the New Model.

According to the considerations explained in chapter 2 regarding the development of the new model, the following data has been revealed for the product category "Car Clutch Kit".

Regarding this specific period, it is important to mention that for the presented results there have been identified and analysed 4.472 different single products, which means "product codes". These products, at the same time, were recognized to be classified according to the following description:

Car Clutch Kit (2017-2018)	
Disused Products	919
New Products	748
Ongoing Products	3.105

Table 27 - Car Clutch Kit Volume classification. Period 2017-2018

"Figure 52" gives us a graphical representation of the aforementioned volumes classification:

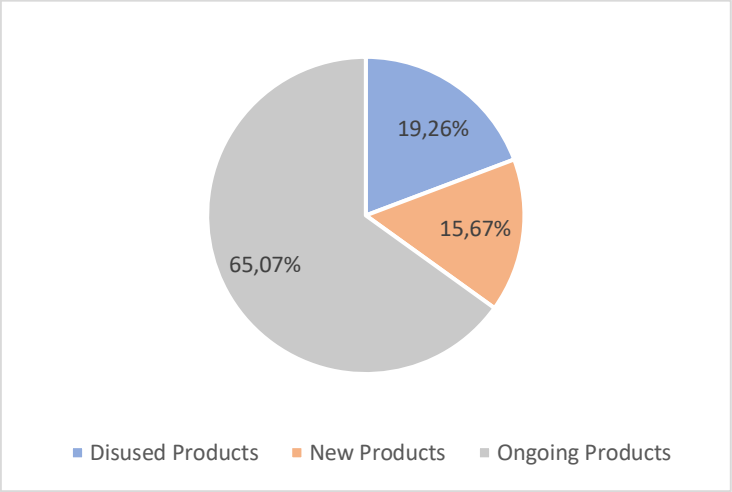


Figure 52 - Car Clutch Kit Volume classification (in %). Period 2017-2018

Now, according to this differentiation, we have been able to calculate the values of the six (6) determinants of the revenues variance, which results are expressed in the following table and bridge chart, respectively.

Car Clutch Kit (2017-2018)	New Products Volumes Variance NVV	Disused Volumes Variance DVV	Ongoing Volumes Variance OVV	Ongoing Mix Variance OMV	Bonus Variance BV	Prices Variance PV	Revenues Variance RV
Δ%	*5,44%*	*-1,50%*	*12,49%*	*-3,31%*	*-0,52%*	*-4,99%*	*7,61%*

Table 28 - Car Batteries Revenues Variances as a sum of the determinants variances.

The bridge chart of the figure "Figure 53" helps us to graphically understand the transition from the Car Clutch Kit past revenues to the current one for the period frame 2017-2018.

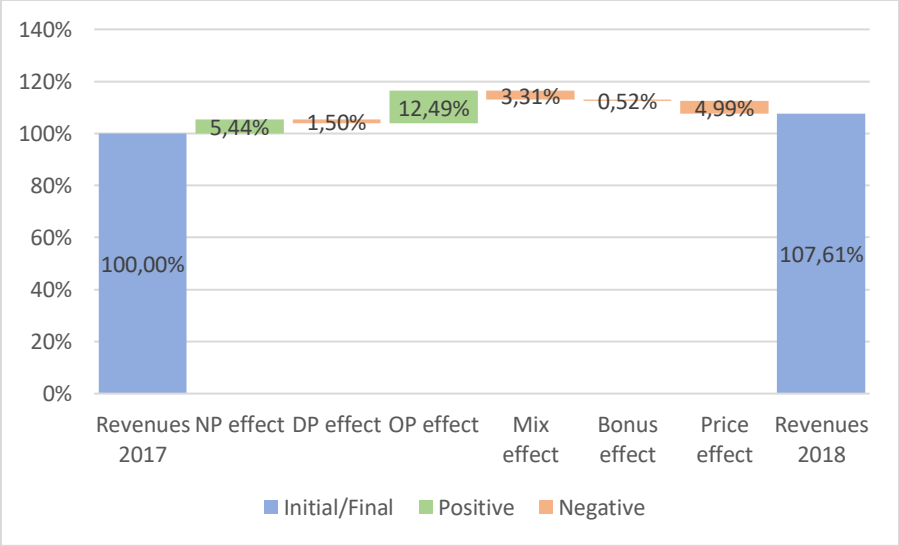


Figure 53 – Car Clutch Kit Revenues Variances. Bridge Chart of the determinants. New Model. Period 2017-2018

As we can appreciate both in the table and the graph, there has been, as concerns the total performance of the company an overall increase of +7,61%; mainly caused by the volumes effect of the ongoing products (+12,49%) and the new products (+5,44%). On the other this increase has been eroded by the price effect (-4,99), the mix effect (3,31%) and a little by the bonus effect (-0,52), all of them respect to ongoing products of course. There can be also highlighted a little decrease of the revenues caused by the disused products.

If we compare the overall determinants contributions, we can notice that while the old model was giving a slightly decrease in revenues due to the price effect (-0,46%), the new model shows a greater negative contribution to the revenues by (-4,99%). This difference might be associated by the number of new products introduced (+748).

3.4.3 Period 2018-2019

For the aforementioned time period, the overall revenues variance has been equal to (-3,36%).

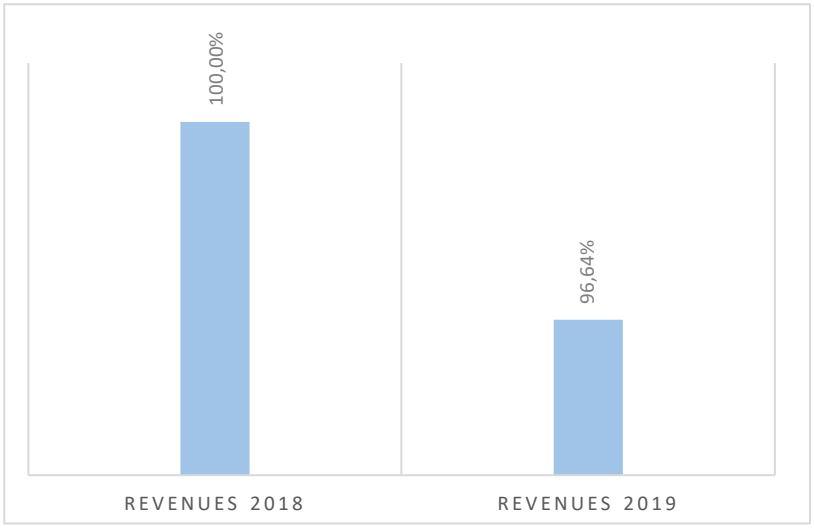


Figure 54 - Car Clutch Kit Revenues Variance 2019 vs 2018.

Results for Car Clutch Kit thrown by the Classic Model.

As concerns the global market of the Car Clutch Kit it is interesting to show the following results.

Car Clutch Kit (2018-2019)	Volume Variance VV	Mix Variance MV	Bonus Variance BV	Prices Variance PV	Revenues Variance RV
Δ%	*1,77%*	*-9,87%*	*-0,25%*	*4,99%*	*-3,36%*

Table 29 - Car Clutch Kit Revenues Variances as a sum of the determinant's variances.

The bridge chart of the figure "Figure 55" represents graphically the transition from the Car Clutch Kit past revenues to the current one for the period frame under analysis.

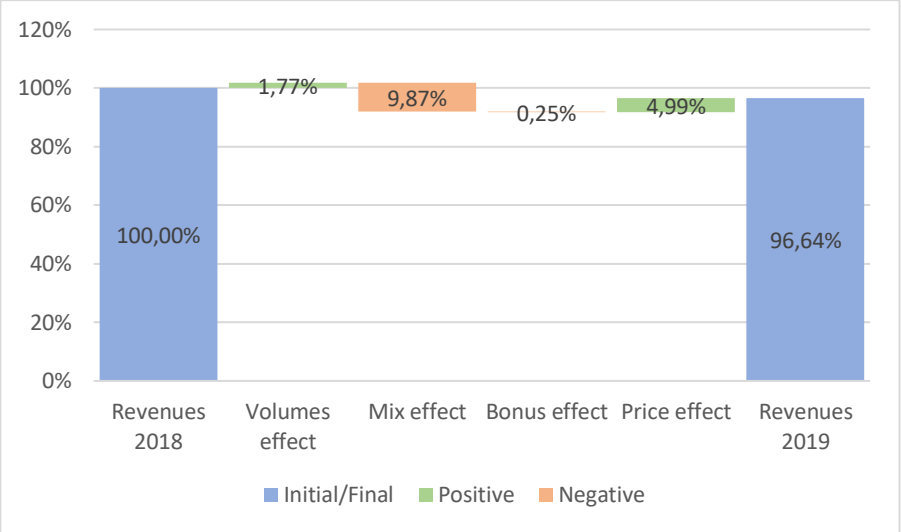


Figure 55 - Car Clutch Kit Revenues Variances. Bridge Chart of the determinants. Classic model. Period 2018-2019.

As we can notice both in the table and graph, it can be identified a revenues' decrease of a (-3,36%, vs the previous period). This negative effect was mainly caused by the mix effect (-9,87%) and a little by the bonus effect (-0,25%). On the contrary, this negative overall impact has been partially eroded by the single positive contributions of the volumes effect (+1,77%) and the price effect (+4,99%).

Results for Car Clutch Kit thrown by the New Model.

Then, according to the considerations explained in chapter 2 regarding the development of the new model, the following data has been revealed for the product category "Car Clutch Kit":

Regarding this specific period, it is important to mention that for the presented results there have been identified and analysed 5.370 different single products, which means "product codes". These products, at the same time, were recognized to be classified according to the following description:

Car Clutch Kit (2018-2019)	
Disused Products	858
New Products	1.517
Ongoing Products	2.995

Table 30 - Car Batteries Volume classification. Period 2018-2019

"Figure 56" gives us a graphical representation of the aforementioned volumes classification:

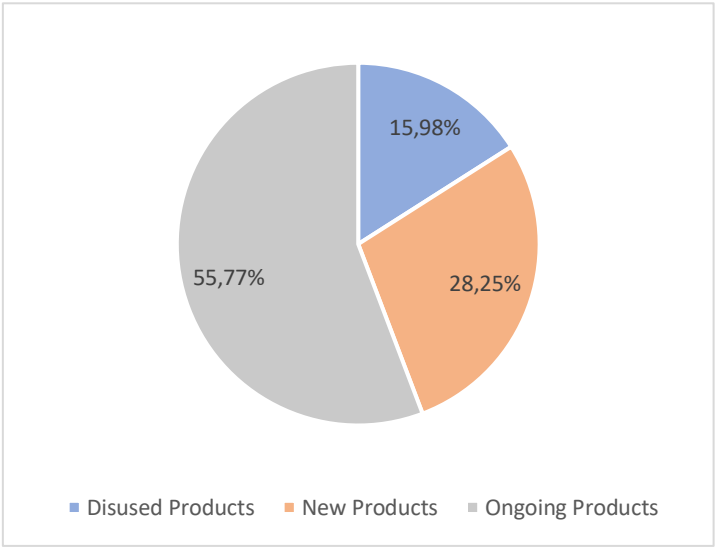


Figure 56 - Car Batteries Volume classification (in %). Period 2018-2019

Now, according to this differentiation, we have been able to calculate the values of the six (6) determinants of the revenues variance, which results are expressed in the following table and bridge chart, respectively.

Car Clutch Kit (2018-2019)	New Products Volumes Variance NVV	Disused Volumes Variance DVV	Ongoing Volumes Variance OVV	Ongoing / Mix Variance OMV	Bonus Variance BV	Prices Variance PV	Revenues Variance RV
Δ%	*7,21%*	*-2,40%*	*1,73%*	*-7,43%*	*-0,25%*	*-2,22%*	*-3,36%*

Table 31 - Car Clutch Kit Revenues Variances as a sum of the determinants variances.

The bridge chart of the figure "Figure 57" helps us to graphically understand the transition from the Car Clutch Kit past revenues to the current one for the period frame 2018-2019.

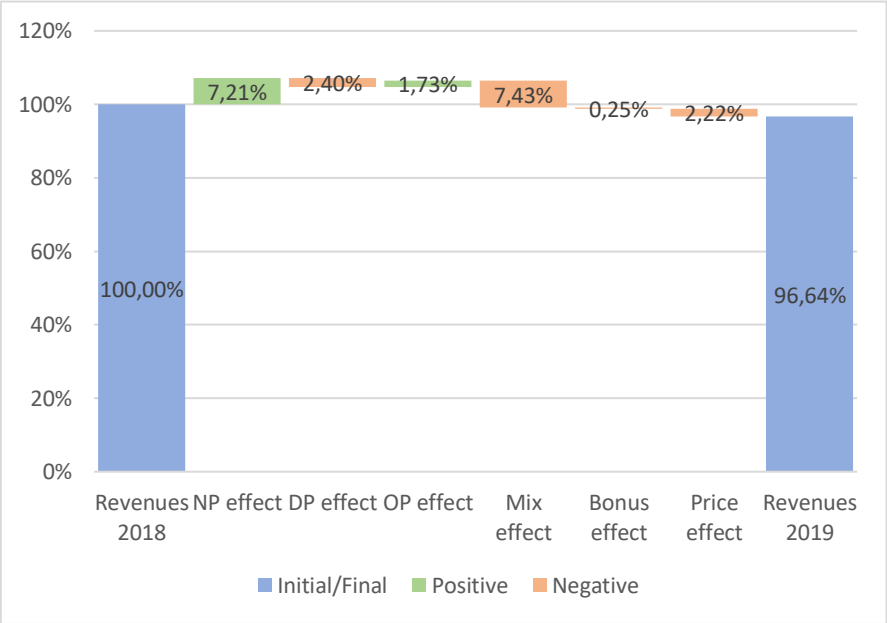


Figure 57 - Car Clutch Kit Revenues Variances. Bridge Chart of the determinants.

As we can appreciate both in the table and graph, as concerns the total performance of the product category under analysis there has been a revenues' decrease of (-3,36%). Even though the new products effect has had a big contribution to the revenue's variances (7,21%), this was not enough to overcome the negative mix variance (7,43%). The volumes variance of the ongoing products has been, even though in a lower percentage, positive as well (1,73%), while the bonus and the price variance has been negative (-0,25%) and (-2,22%), respectively. The disused variance has shown a participation of the (-2,40%) in this case.

3.4.4 Overall results for the total period 2016-2019: Classic Model vs. New Model

So far, we have had the chance of analysing the results by simply comparing two time periods data and analysing the variances this comparison evinced.

The objective of this section is to show, by a single graph (all-in-one) all the information that has been previously presented. Which means which was the revenues

variance for each year in respect to the previous one, and how strong has been the incidence of each determinant effect to the overall revenues variance result.

Once again, as the analysis has been so far done for both models, the presentation of the overall results will be done as well for both the classic and the new model. This may also help to see, in a quick look, how the results may differ from one approach to the other.

As it follows, the aforementioned graphs for the "Car Clutch Kit" product category will be presented.

Classic Model

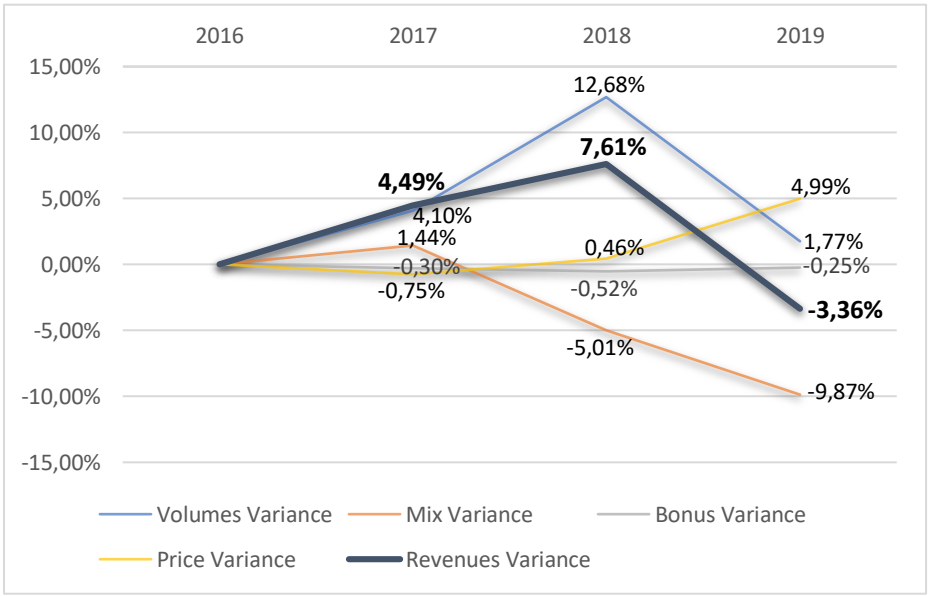


Figure 58 - Graph of the progressive revenues' variances and the respective determinants contribution for the overall time frame (2016-2019) for Car Batteries. Classic model.

According to the Figure "58" it is possible now to see, in the same graph, the single determinants variance and the overall revenue's variance, represented with the thicker line. As we have chosen the New Model as the most accurate one for the analysis, further comments will be done regarding results shown by it.

New Model

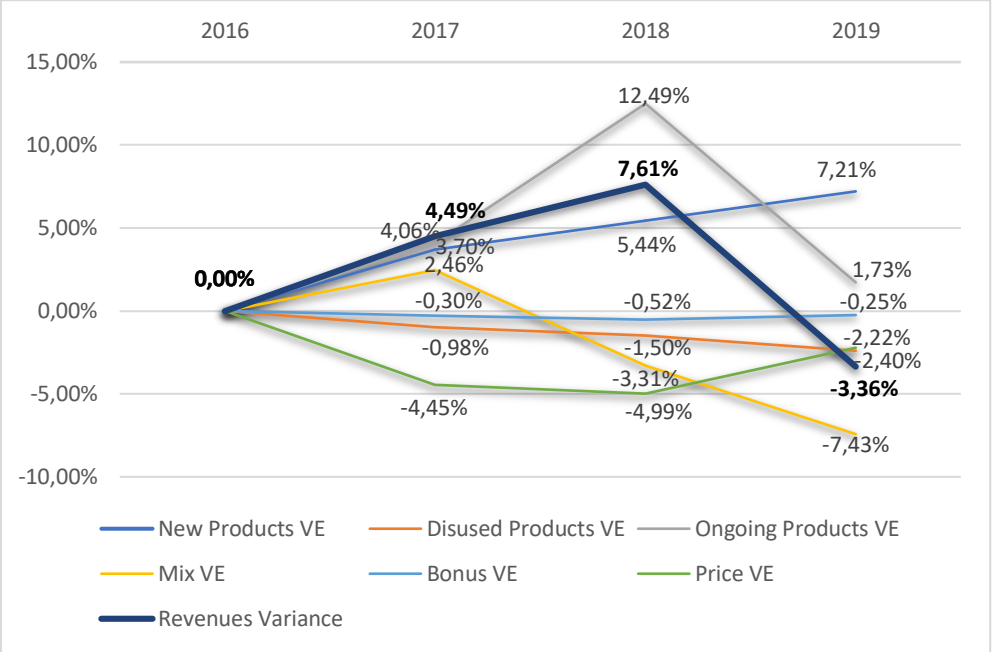


Figure 59 - Graph of the progressive revenues' variances and the respective determinants contribution for the overall time frame (2016-2019) for Car Batteries. New model.

According to the Figure "59" we can appreciate a more descriptive representation of the revenue's variance, thanks to the accuracy of the New Model approach. We can notice, that in this case the year 2018 has presented the widest range of values. This graphic representation is useful to stand in a specific year and see how different were the single determinants variance to the revenue's variance. As for the year 2018, we can see that the volumes effect of the ongoing products was actually higher than the overall revenues variances but it was partially eroded by the other determinants.

4. Market Competitive Positioning by product category

In this section, thanks to the results provided by the variance analysis, we are allowed to achieve a further objective of great managerial utility related to the competitive positioning of the different product categories respect to the different time periods that have been taken into account (covering the total timeframe period 2016-2019).

As the ones presented in the theoretical framework, at follows there are three (3) Competitive Positioning Maps[8] that are going to be developed for each Product Category. For a better-quality value of the information of the Map, it has been chosen to show the results in this way so that in each map we will be able to appreciate the changes of the Competitive Position the product has suffered from one year to another.

- The Volumes/Net Prices Elasticity Map;
- The Volumes Quality Map;
- The Mix/Net Prices Map

For a better understanding of the aforementioned graphs, the periods will be represented in the graph with the latter year of the period. (i.e. the year 2017 shown in a graph will represent the values concerning the changes during the time period 2016-2017).
In all the maps, as it has been done during the variance analysis, the determinants variances are expressed as a percentage of the previous period revenue.

In addition, for a better understanding of the graph, and a better visual quality of the results the scale that has been used for the axes has been +/- 10%. It might be some exceptional value over the maximum it has been chosen, in that particular case it will be exceptionally situated out of the limits of the graph.

4.1 Car Brake Pads Competitive Positioning

In this section, three competitive maps will be developed in order to better appreciate the competitive performance of the product respect to the different determinants that have influenced this positioning.

Volumes/Net Prices Elasticity Map

The following map intends to show if the product was able to reach, for every time period, an equilibrium between net prices variances and volumes variance.

[8] It is essential to understand that for obtaining significant results, the information used has been based on the New Model results, and consequently considering the determinant's variances connected to Ongoing Products.

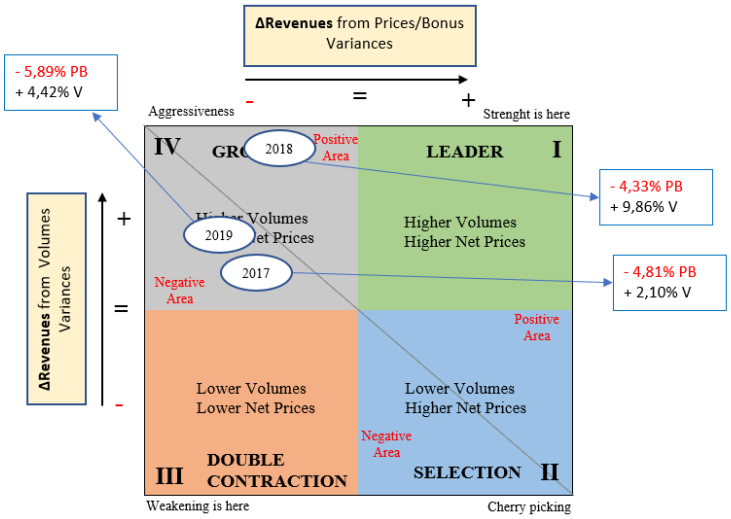


Figure 60 – Volumes-Net Prices Elasticity Map for Car Brake Pads.

In the case of the "Car Brake Pads" we can notice a continuative performance on the GROWTH quadrant, which means that for all the three periods the net price variance has been negative while the volumes variance has been positive. Anyway, it is important to highlight that just for the time period 2017-2018 the product was able to completely overcome the negative effect of the net prices' variance by the noticeable positive volumes' variance. In this case, the positioning of the product shows to be in the positive area of the GROWTH quadrant. Instead, for the other time periods under analysis we can notice that the volumes variance was not enough to overcome the negative effect of the Net Prices variances, and therefore they remain to be positioned in the negative area of the quadrant.

To be clear, during these time frames the product was able to increase the volumes (quantity sold) but with an average general price reduction, which compromised the positioning of the product and for two of the three periods caused an overall negative growth effect on revenues.

Volumes Quality Map

The following map compares the Mix variances and the price/bonus variance, in this particular case applied to the "Car Brake Pads".

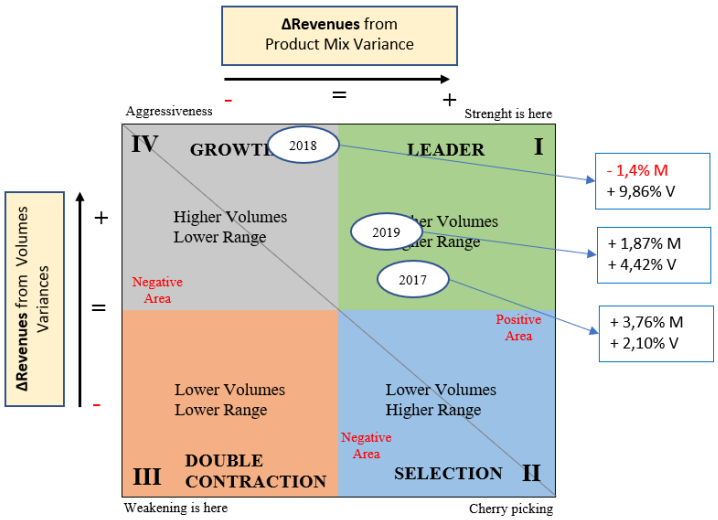


Figure 61 – Quality-Volumes Map for Car Brake Pads

By having a look on this map, we can see that the product, in all three periods showed a general good performance. In the first period (2016-2017) for example it shows a double positive revenues variance, in the sense that the product has increase its revenues by both increasing the volumes sold and also improving its quality mix. For the most recent period, 2018-2019, the situation presented the same characteristics, the only difference in here is that the contribution was greater by the mix than by the volumes, while in for the first period it was the other way around. Anyway, what is important is that the two determinants variances are positive and therefore the product ends up to be positioned in the best competitive positioning.

Considering the middle period (2017-2018) we can notice a temporary move to the GROWTH quadrant, by the reduction of the mix quality during this time frame. Anyway, the overall result is positive because the increase in the volumes variance in this period was big enough to overcome this negativity and to position the product in the positive area, far from the bisector division.

So, as a complete conclusion the product has presented a successfully positioning in this case.

Snake Map

The following map compares the Mix variances and the price/bonus variance, in this particular case applied to the “Car Brake Pads”.

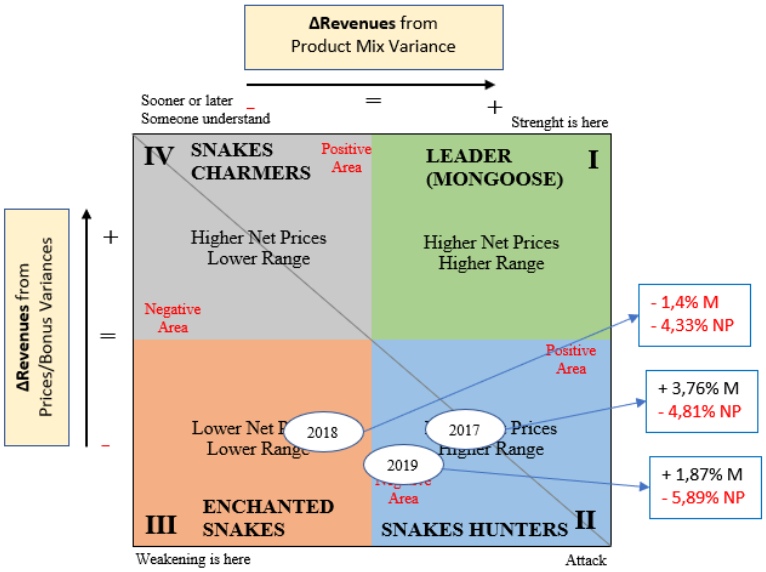


Figure 62 - Snake Map for Car Brake Pads

Last but not least, we have the snake map for the "Car Brake Pads". In all three periods we can notice that there has been a noticeable negative Net Prices variance, which prevented the product to achieve the best competitive positioning. Even though the mix variance has been positive for the time periods (2016-2017) and (2018-2019), in none of the cases this positivity was enough to overcome the negative variance of the net prices. The result of this effect is the positioning on the negative area of the second quadrant. For the time period 2017-2018 the situation has been even worst, in the sense that the mix variance has been negative as well, so the product position ends to be the worst one due to this double contraction (price reduction and lower mix quality).

Car Brake Pads Competitive Positioning Sequence

After having analysed the product performance respect to each matrix analysis, a general table can be made grouping the sequence of the positioning the product has presented along the different periods.

	Competitive Positioning Sequencing		
Product Category	**2016-2017**	**2017-2018**	**2018-2019**
Car Brake Pads			
Volumes/Net Prices Map	GROWTH	GROWTH	GROWTH
Volumes Quality Map	LEADER	LEADER	GROWTH
Snake Map	SNAKES HUNTERS	ENCHANTED SNAKES	SNAKES HUNTERS

Table 32 - Competitive Positioning sequencing for Car Brake Pads respect to the three Maps analysed.

By having a look on this table, we can notice that the product has presented a stable positioning connected to the price elasticity map. It is important anyway to highlight that was just for the year 2018 that the product was situated in the positive side of the map, which means the right side of the bisector. That's the misleading information this table has, and this is why it is important to analyse things in a whole, with all available resources.

We can say then, that the product "Brake Pads" has presented a development tendency of growth, connected to the permanent increase of the volumes sold. It seems a little bit contradictory to think that there is a greater consumption of this type of spare parts when actually the specific brake market tendency is to develop more sophisticated mechanisms which actually reduce the brake pads wear. Even though, the real facts show that at least in Italy as it has been previously mentioned, the circulating fleet of cars is increasing and the average age of the circulating fleet it is increasing as well. And within the limits of considering this product category, we can see that the last-mentioned product competitive advantages are overcoming the fact of the car technologies continuous improvement, which in this case would decrease the brake pads consumption. Consequently, the products currently show to present a continuous development in terms of volumes.
On the other hand, the price effect towards the revenues has shown a permanently degradation effect, and this might be related to the fact that, as the after-market continues to grow and new competitive brands are entering the market, the trend is to reduce prices in order to maintain competitiveness.
In the case of the Volumes/Quality it has shown a stable positioning until the year 2018 in which the product suffered a positioning change due to the degradation of the mix quality.

4.2 Car Batteries Competitive Positioning

In this section, three competitive maps will be developed in order to better appreciate the competitive performance of the product respect to the different determinants that have influenced this positioning.

Volumes/Net Prices Elasticity Map

The following map intends to show if the product was able to reach, for every time period, an equilibrium between net prices variances and volumes variance.

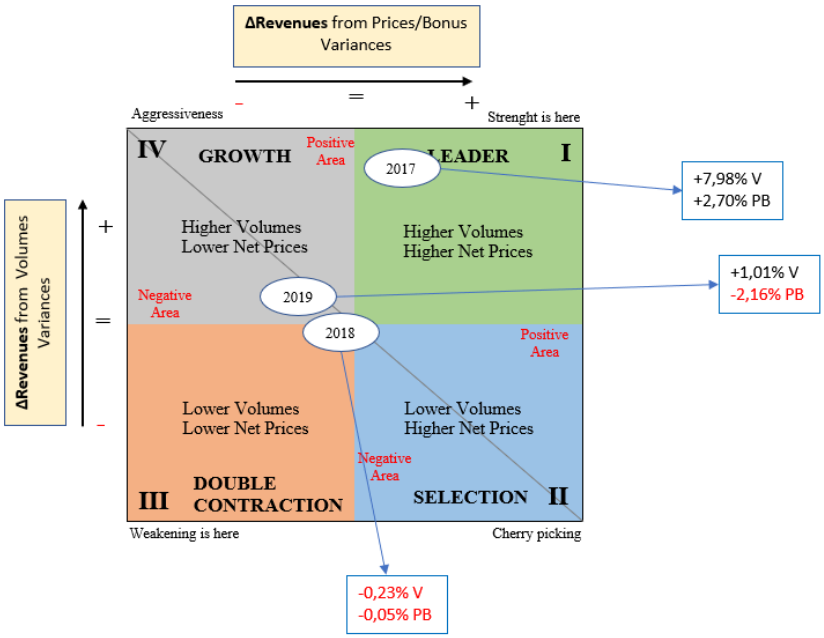


Figure 63 - Volumes-Net Prices Elasticity Map for Car Batteries.

In summary, the Product Category "Car Batteries" has presented an outstanding good performance in terms of Volumes/Net Prices elasticity for the time period 2016-2017. In contrast, we can observe that the in following periods its positioning declined to the negative area presenting both a negative Volumes variance and Price/Bonus variance contribution; reaching the "Double Contraction" state for the time period 2017-2018. For the next one, 2018-2019, the general position was not much better but the product was able to scale to the GROWTH quadrant because of the positive effect of ongoing volumes. Anyway, it is important to highlight that the Net Prices results continued to decrease and therefore the final positioning, as for the previous period 2017-2018, is still positioned in the negative area of the map.

Volumes Quality Map

The following map compares the Mix variances and the price/bonus variance, in this particular case applied to the "Car Batteries".

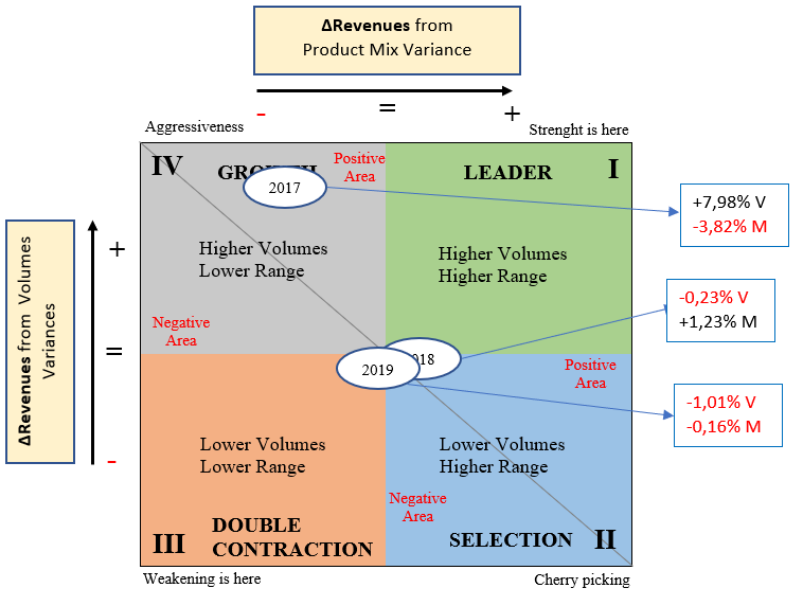


Figure 64 - Quality-Volumes Map for Car Batteries

As we can see, in accordance to the previous map, also in this case the time period 2016-2017 presents an outstanding position in comparison with the other time periods. We can notice a degradation of the performance period by period. In the first one, 2016-2017, we can see that the product it is situated in the GROWTH quadrant due to the great positive volumes' variance and the negative mix variance. In this case, as the volumes variance was comfortably able to overcome the negative mix variance, and then the product ends up to be positioned in the positive area. For the following period, 2017-2018 we can see that the overall situation was inverted, in the sense that the mix turned to be positive while the volumes variance decreased barely below zero. Even though the overall effect is positive, we can say that this advantageous position is hanging by a thread, due to its nearness to the bisector limit. And finally, for the time period 2018-2019 we can notice a double negative effect caused both by the degradation of the ongoing volumes and also the product mix.

Snake Map

The following map compares the Mix variances and the price/bonus variance, in this particular case applied to the "Car Batteries".

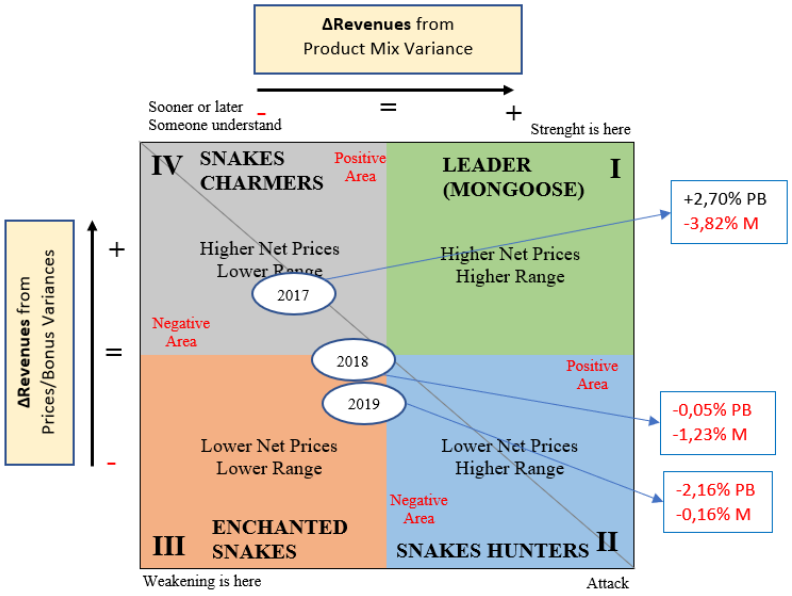


Figure 65 - Snake Map for Car Batteries.

In summary, in this case we can observe that in general the positioning is not that good. Even though the product shows to be really near to the bisector, in none of the time periods has shown a positioning in the positive area.

In the first one, 2016-2017 the increases in prices (net prices variances) have not been enough to overcome the losses due to the quality degradation of the product mix. In the following periods, the situation was worst; since the product shows a continuous degradation in terms of net prices effect and quality of the product mix.

Car Batteries Competitive Positioning Sequence

After having analysed the product performance respect to each matrix analysis, a general table can be created by grouping the sequence of the position the product has presented along the different periods.

Always, it is not only important to have a look of how the product has performed in a specific year but it is also interesting to analyse if the product has been able to maintain this positioning.

	Competitive Positioning Sequencing		
Product Category	**2016-2017**	**2017-2018**	**2018-2019**
Car Batteries			
Volumes/Net Prices Map	LEADER	DOUBLE CONTRACTION	GROWTH
Volumes Quality Map	GROWTH	SELECTION	DOUBLE CONTRACTION
Snake Map	SNAKES CHARMERS	ENCHANTED SNAKES	ENCHANTED SNAKES

Table 33 - Competitive Positioning sequencing for Car Batteries respect to the three Maps analysed.

Now, by having a look on the table, the first thing we can notice is how the situation has changed for this product from 2016-2017 to the following periods; if we analyse the overall positioning considering all maps.

Because of the striking outstanding results, the product has shown for the time period 2016-2017, it was necessary to study indeed this situation and find a possible explanation to this behaviour and moreover its consequently degradation.

As far as our technical knowledges might be concerned, it is at this point useful to remember how the weather conditions might affect the lifetime of this specific product. As we might know, extreme climate conditions tend to decrease the life product expectancy.

Therefore, a possible explanation of this situation can be related to the weather behaviour during the four last years that we have been permanently considering.

After inquiring on the weather historical data in Italy for the years 2016, 2017, 2018 and 2019, and for the particular purposes of this investigation this information was analysed and the following table was carried out, in order to show the most accurate results:

	2016	**2017**	**2018**	**2019**
T	16,38	16,22	16,66	16,44
TM	21,18	21,34	21,34	21,42
Tm	11,46	10,82	11,86	11,28

Table 34 - Average annual temperature in italy (°C). Based on website data. (Il Meteo, 2020)

As we can notice, the greater year range of temperature has been presented in the year 2017. As the historical data shows, the year 2017 has presented the lowest minimum average temperature, therefore under the consideration that winters have presented to be colder in this year compared to the other ones, we can directly connect this situation to the fact of a greater volume of batteries have being damaged in that year.

Another important fact to take into consideration is that the year 2017 has been not only colder in comparison to the other periods under analysis; but it has also reached the warmest temperatures in Italy for the last 200 years (Il Post, 2018).

Therefore, due to this particular situation is logical to assume a higher demand of car batteries in the year 2017. In the table then, it is logical that the product has overperformed in the year 2017 in comparison to the 2016. It is also logical that if there was a peak of demand in the 2017, to have a degradation in the positioning in 2018 if we are taking as a comparison base the year 2017.

4.3 Car Clutch Kit Competitive Positioning

In this section, three competitive maps will be developed in order to better appreciate the competitive performance of the product respect to the different determinants that have influenced this positioning.

Volumes/Net Prices Elasticity Map

The following map intends to show if the product was able to reach, for every time period, an equilibrium between net prices variances and volumes variance.

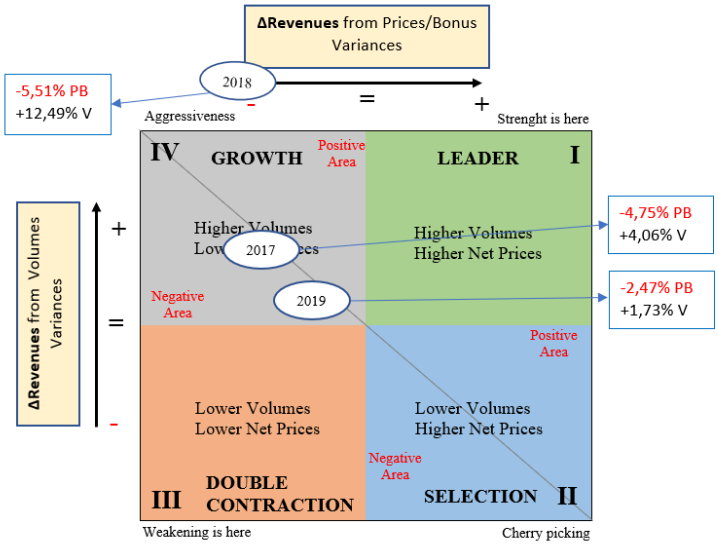


Figure 66 - Volumes-Net Prices Elasticity Map for Car Clutch Kit.

As it can be seen in this map, the product was able to show a permanence in the GROWTH quadrant. For the periods 2016-207 and 2018-2019 the negative effect of the Net Prices variance was greater than the positive effect of the volumes, then the product ended to be positioned on the negative side of the map. Instead, for the year 2017-2018 the product has presented a great positive change in terms of volumes variance (this surplus was more than enough to overcome the negative net price variance), which allowed the product to exceed the bisector line and place itself in the positive region of the GROWTH quadrant.

Volumes Quality Map

The following map compares the Mix variances and the price/bonus variance, in this particular case applied to the "Car Clutch Kit".

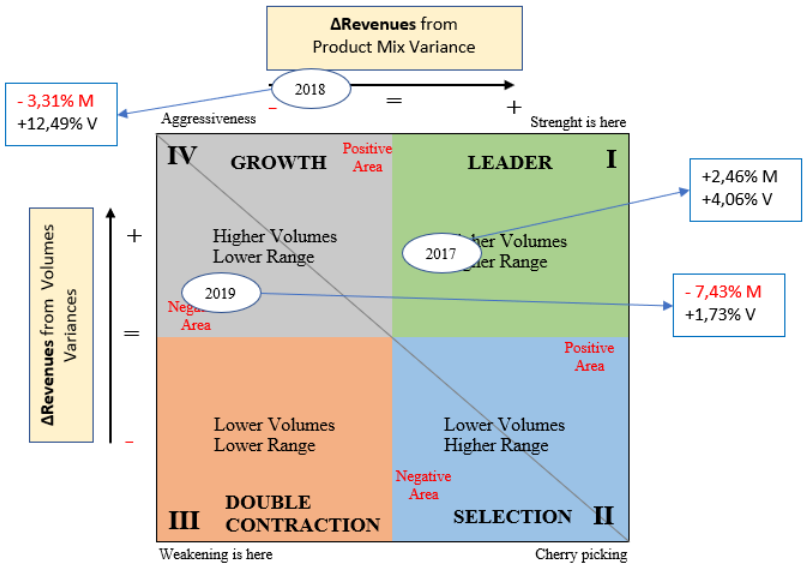


Figure 67 - Quality-Volumes Map for Car Clutch Kit.

In this case, we can also see a degradation in terms of the product positioning. The first period, 2016-2017, showed the best positioning a product can have, which is the increase in revenues connected to a double positive contribution od the variables taken into account. This means that not only there was an increase in the quantity of what it was sold but there was also an increase in terms of the quality, the range of products that have been sold. Instead, in the second period (2017-2018), even though it has been an even greater volumes variance compared to the previous period, the mix variance dropped to negative values. The overall effect considering these two variables, was anyway positive, positioning the product in the positive GROWTH area. At last, for

the time period 2018-2019 we can see that the mix variance dropped even more, and in this case the positive volumes variance was not enough to overcome this effect and therefore the product position declined to the negative area of the GROWTH quadrant.

Snake Map

The following map compares the Mix variances and the price/bonus variance, in this particular case applied to the "Car Clutch Kit".

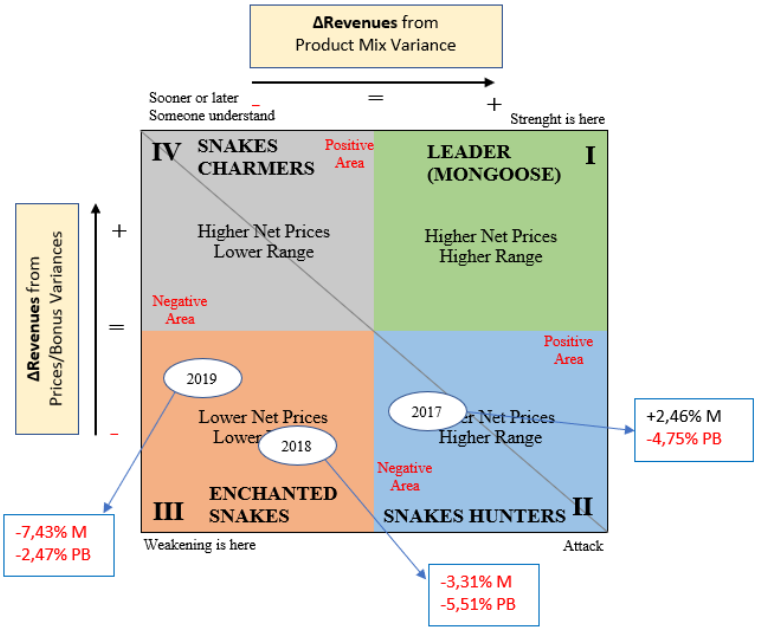


Figure 68 - Snake Map for Car Clutch Kit

For this specific product we can, by a simple look on the map, notice an unsuccessful performance. Not that bad, the product has started in the first period (2016-2017) positioned in the second quadrant. Though, in the negative area of it due to the negativity of the net prices variance which was in absolute terms higher than the positive mix variance, in that time frame. For the following time periods, the scenario it has been shown to be worst. Since in these periods there was not only the negative net prices variance, but instead these periods were characterized by a double contraction effect, which means that there has been a decrease in revenues caused by both a decrease in prices and a decrease in the quality of the range of products sold.

Car Brake Pads Competitive Positioning Sequence

After having analysed the product performance respect to each matrix analysis, a general table can be made grouping the sequence of the position the product has presented along the different periods.

	Competitive Positioning Sequencing		
Product Category	**2016-2017**	**2017-2018**	**2018-2019**
Car Clutch Kit			
Volumes/Net Prices Map	GROWTH	GROWTH	GROWTH
Volumes Quality Map	LEADER	GROWTH	GROWTH
Snake Map	SNAKES HUNTERS	ENCHANTED SNAKES	ENCHANTED SNAKES

Table 35 - Competitive Positioning sequencing for Car Clutch Kit respect to the three Maps analysed.

In the case of clutch kits, we can see that the performance has been similar to the one of the brake pads. In terms of elasticity it has not presented relevant changes, as we can see in the table it was able to maintain its positioning.

As regards the Volumes/Quality map we can see that in the first period the positioning was the best one but was degraded by the impoverishment of the mix quality for the following two years.

Once again, as explained for the car brake pads, the product positioning has been always positively influenced toward a better position by the positive volumes effect. And the background of this results is as explained before, the fact that the circulating fleet is increasing and aging at the same time.

On the other hand, the progressive negative contribution of the net prices effect towards to the revenues increase might be related to the fact that, as the after-market continues to grow and new competitive brands are entering the market, the trend is to reduce prices in order to maintain competitiveness. But as results can show, at least for the product under analysis the product is finding the way to overcome this net price negative effect with the positive influence of the positive volumes effect. In a simpler way, it seems that more products are being sold but at lower prices, but reaching an equilibrium between these two effects

5. Market Competitive Positioning by year.

The following section is going to be developed with the only aim of showing the results from a different point of view.

As it has been developed for the previous section, also in this one we will be taking the variance analysis output in order to analyse the product competitive positioning.
The aim of this section in contrast to the previous one is to show in the same visual image the positioning each product has presented for a specific time period.
Then, instead of creating the different maps for each product category, and analyse its progressive positioning, we are going now to stand in a particular period in time and from there we are going to analyse which was the situation for each single product.
It is important to highlight, that even though it is true that the information provided is actually the same, this chapter has been developed because it might be useful to have different points of view at the time of presenting the results.

In order to start the analysis, these subsections will be divided the same way it has been done for the revenue's variance analysis.

- Period 2016-2017
- Period 2017-2018
- Period 2018-2019

The same three (3) Competitive Positioning Maps that have been done in the previous section are going to be developed in this one, for each of the aforementioned time periods.

- The Volumes/Net Prices Elasticity Map;
- The Volumes Quality Map;
- The Mix/Net Prices Map

For each of the aforementioned graphs, in order to have a better understanding of it, the following abbreviations have been done:

- B: Representing the product category "Car Batteries".
- BP: Representing the product category "Car Brake Pads".
- CK: Representing the product category "Car Clutch Kit".

5.1 Product Categories Competitive Positioning (2016-2017)

In this section, three competitive maps will be developed in order to better appreciate the competitive performance the products have presented respect to the different determinants that have influenced this positioning.

Volumes/Net Prices Elasticity Map

The following map intends to show if the products were able to reach, in the time period under analysis, an equilibrium between net prices variances and volumes variance.

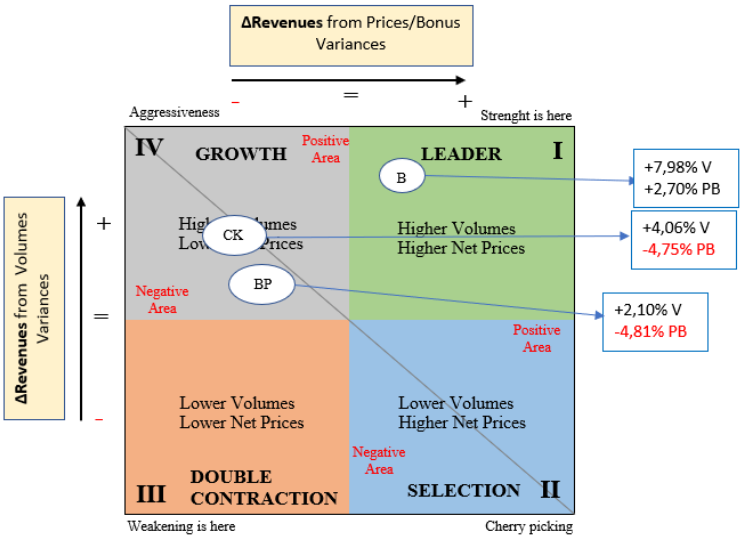


Figure 69 - Volumes-Net Prices Elasticity Map for Period 2016-2017 showing all (3) Product Categories Positioning.

According to what the Volumes-Net Prices Elasticity Map shows us, it is apparent that Batteries has overperformed comparing 2017 vs. 2016, situating in the best competitive positioning because of a double positive effect contribution. The reason of this overperformance has been analysed in deep in the section 4.2. In contrast, the Clutch Kit and the Brake Pads have presented a similar performance, both have presented positive volumes effects but at the end for neither of them was it enough to overcome the negative effects of the net prices.

Volumes Quality Map

The following map compares the Mix variances and the price/bonus variance, and the aim of comparing all the products might give us an image of how able each product was to find an equilibrium between the quantity sold and the quality of what it has been sold, for the time period under analysis.

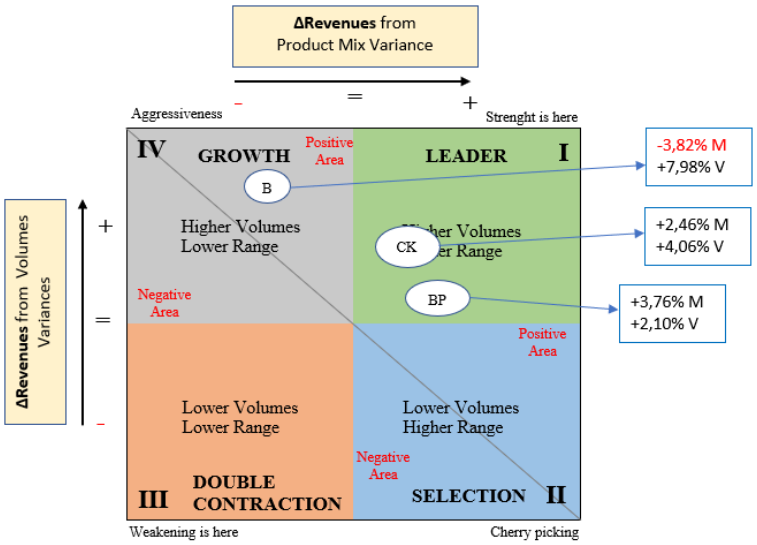


Figure 70 – Volumes-Quality Map for Period 2016-2017 showing all (3) Product Categories Positioning.

In this time frame under analysis we can see that the Clutch Kits and Brake Pads have presented a LEADER positioning, once again they show a similar behaviour which drove them to be situated in the same quadrant. On the other hand, batteries presented a GROWTH positioning achieved by the enormous positiveness of the ongoing volumes effect but eroded by the impoverishment of the mix quality.

Snake Map

The following map compares the Mix Variances and the Price/Bonus Variance. At follows, we can appreciate the competitive positioning (considering these two determinants) the product categories have presented for the time period under analysis. The principal aim of the following graph is to show how the different products were able to keep an equilibrium between the quality of the range of products being sold and the Net Prices, under the specific time period under analysis.

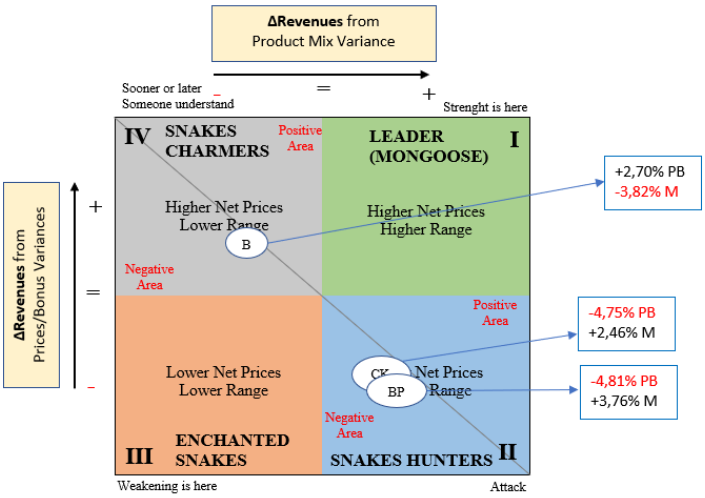


Figure 71 - Snakes Map for Period 2016-2017 showing all (3) Product Categories Positioning.

Last but not least, at a first sight we can notice once again the matching behaviour between the Clutch Kits and the Brake Pads, from a general point of view. Both product categories ended up being positioned in the SNAKES HUNTERS quadrant, which means they have shown an attacking performance by improving the quality mix and at the same time lowering the net prices, always considering the ongoing products of course. In the case of the batteries, they have presented a totally opposite positioned, situating itself in the SNAKES CHARMERS quadrant, which means that the product was able to increase the net prices but decreased the mix quality.

It is important though to highlight that all products have been situated in the negative area.

5.2 Product Categories Competitive Positioning (2017-2018)

In this section, three competitive maps will be developed in order to better appreciate the competitive performance the products have presented respect to the different determinants that have influenced this positioning.

Volumes/Net Prices Elasticity Map

The following map intends to show if the products were able to reach, in the time period under analysis, an equilibrium between net prices variances and volumes variance.

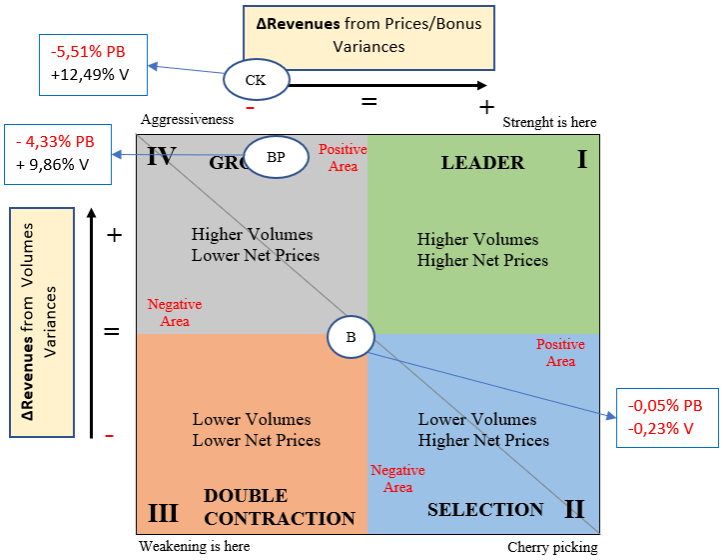


Figure 72 - Volumes-Net Prices Elasticity Map for Period 2017-2018 showing all (3) Product Categories Positioning.

Regarding the time period 2017-2018, we can see that the situation has completely changed respect to results showed by the previous period. Once again, the Clutch Kits and the Brake Pads ended positioned in the same quadrant, which is the GROWTH positioning, and both appeared to be on the right side of the bisector. Instead, the Batteries presented the worst positioning due to the double negative effect of the net prices and the ongoing volumes effect.

Volumes Quality Map

The following map compares the Mix variances and the price/bonus variance, and the aim of comparing all the products might give us an image of how able each product was to find an equilibrium between the quantity sold and the quality of what it has been sold, for the time period under analysis.

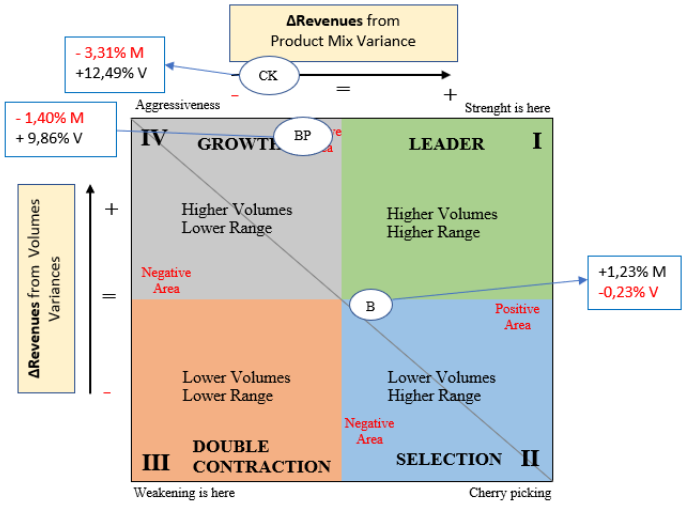


Figure 73 - Volumes-Quality Map for Period 2017-2018 showing all (3) Product Categories Positioning

Once again, we can confirm the similar behaviour of the Brake Pads and Clutch Kits, both situating theirselves in the GROWTH quadrant, positive area. The message behind this positioning is that the products, for this particular time period presented to be able to show positive revenues results by the effect of the volumes sold, and this has been in both cases enough to overcome the negative impact of mix quality reduction. The car Batteries showed and exactly opposite behaviour by improving the mix quality but endangering the volumes being sold, what it is know as a creation of a niche because a SELECTION of clients.

Snake Map

The following map compares the Mix Variances and the Price/Bonus Variance. At follows, we can appreciate the competitive positioning (considering these two determinants) the product categories have presented for the time period under analysis. The principal aim of the following graph is to show how the different products were able to keep an equilibrium between the quality of the range of products being sold and the Net Prices, under the specific time period under analysis.

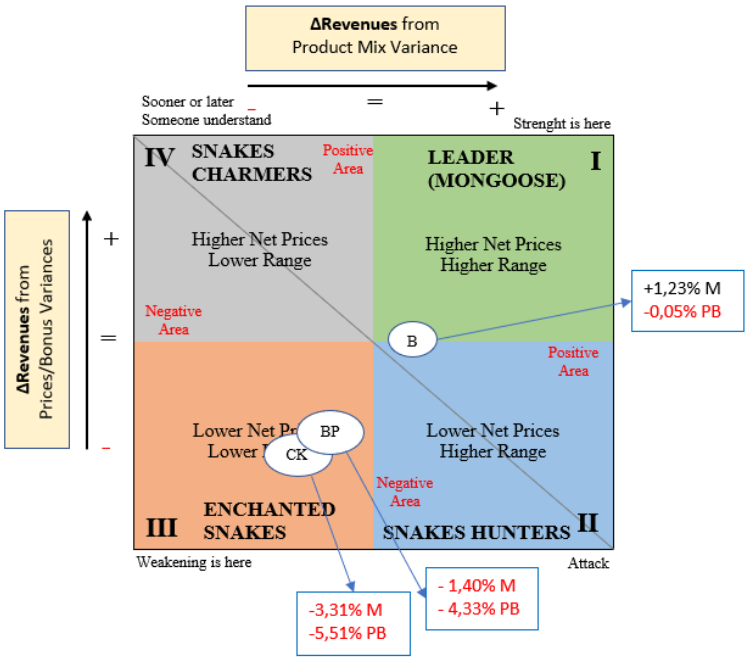


Figure 74 - Snakes Map for Period 2017-2018 showing all (3) Product Categories Positioning

It is not surprising anymore that Brake Pads and Clutch Kits appear to be situated in the same quadrant, one more time. In this case, anyway, the situation is not favourable since both ended up in the worst competitive positioning regarding the Snakes Map analysis. This means that both products have suffered, in this time period a revenue double contraction caused by both an impoverishment of the mix quality and a general net prices reduction; then they ended in what is called as the ENCHANTED SNAKES quadrant. The case of the Batteries presented to be, at least, better. The enrichment of the product mix has been, for this product, enough to overcome the slightly negative impact caused by the Net Prices effect; ending in the positive area of the map as a SNAKES HUNTERS product.

5.3 Product Categories Competitive Positioning (2018-2019)

In this section, three competitive maps will be developed in order to better appreciate the competitive performance the products have presented respect to the different determinants that have influenced this positioning.

Volumes/Net Prices Elasticity Map

The following map intends to show if the products were able to reach, in the time period under analysis, an equilibrium between net prices variances and volumes variance.

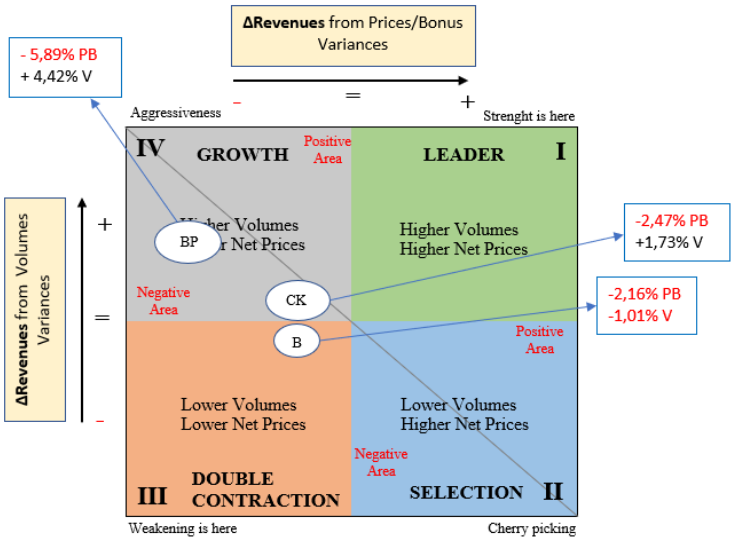


Figure 75 - Volumes-Net Prices Elasticity Map for Period 2018-2019 showing all (3) Product Categories Positioning.

According to what the Volumes-Net Prices Elasticity Map shows us, we can see in a quick look that the overall situation was not that good. Neither of the products was able to surpass the bisector line in order to situate themselves in the positive area.
Both Brake Paths and Clutch Kits managed to achieve the GROWTH quadrant. The Car Batteries instead presented a DOUBLE CONTRACTION due to the negative impact of both, the Net Prices and the Volumes sold.

Volumes Quality Map

The following map compares the Mix variances and the price/bonus variance, and the aim of comparing all the products might give us an image of how able each product was to find an equilibrium between the quantity sold and the quality of what it has been sold, for the time period under analysis.

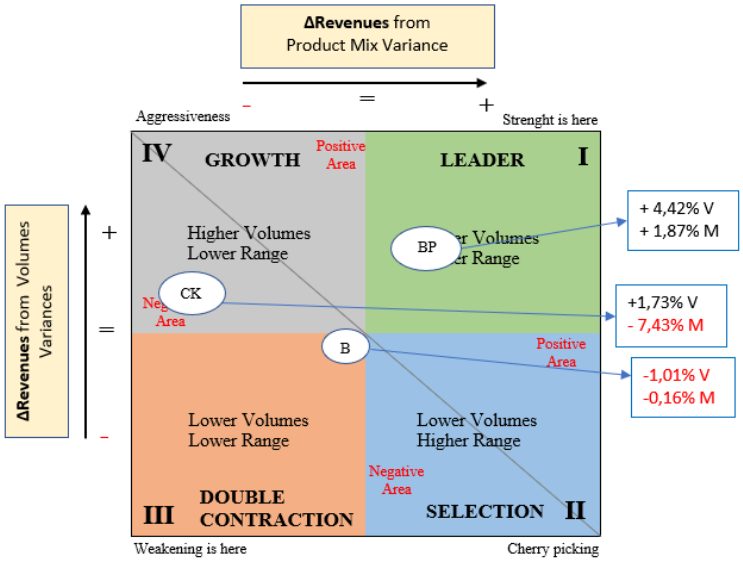


Figure 76 - Volumes-Quality Map for Period 2017-2018 showing all (3) Product Categories Positioning

Snake Map

The following map compares the Mix Variances and the Price/Bonus Variance. At follows, we can appreciate the competitive positioning (considering these two determinants) the product categories have presented for the time period under analysis. The principal aim of the following graph is to show how the different products were able to keep an equilibrium between the quality of the range of products being sold and the Net Prices, under the specific time period under analysis.

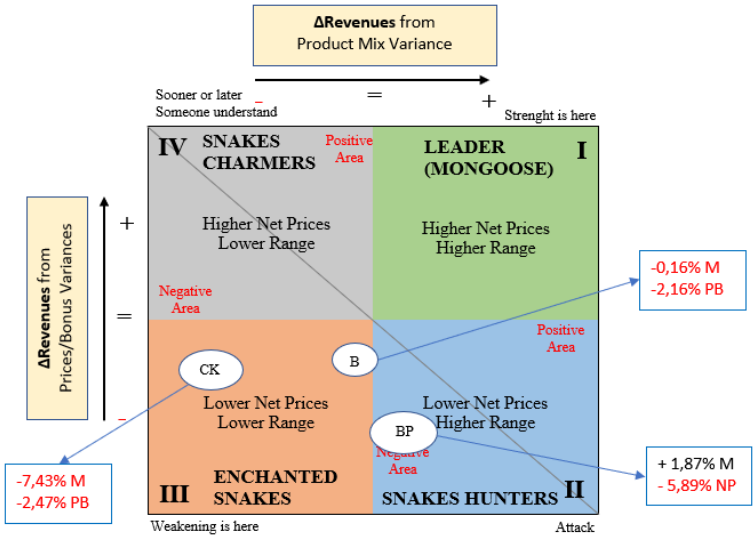


Figure 77 - Snakes Map for Period 2018-2019 showing all (3) Product Categories Positioning

Last but not least, we have the Snakes Map for the most recent period being analysed. At a glance we can realise that all products ended up to be situated at the left sight of the bisector, which means the negative area. Both, the Car Batteries and the Clutch Kit presented a double revenue contraction caused by the impoverishment of the mix quality and the general negative impact of ongoing products net prices; situated both as ENCHANTED SNAKED. For the Brake Pads, instead, comparing the 2019 data to the 2018 the mix quality effect to the revenue's variance appeared to be positive. Though, not as bis as to overcome the negative impact of the Net Prices effect, and that is the reason why the product is situated in the SNAKES HUNTERS quadrant.

6. Overall products positioning analysis

So far, we have made an analysis considering the competitive positioning of the three product categories by basically comparing just two determinants at the time. With the aim of having a more general idea of the product positioning, at follows three general possible macro status have been identified, and products can be positioned regarding their particular performances presented in the last four years.

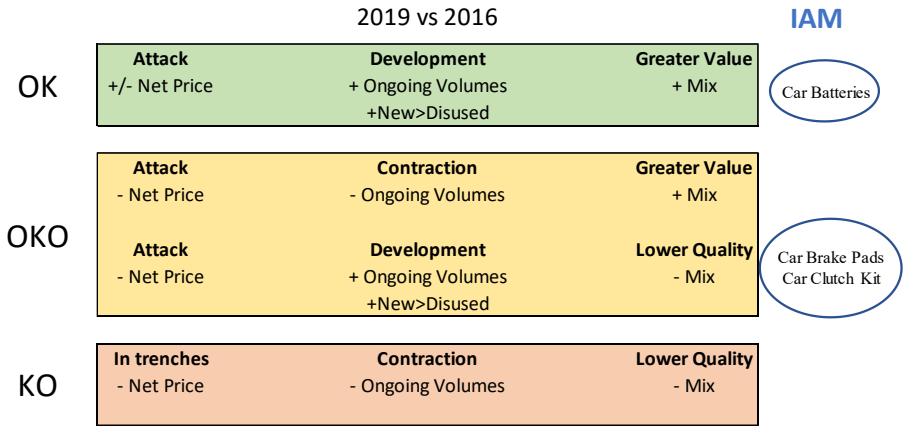


Figure 78 - General Product Categories Positioning Analysis (2019 vs 2016)

After all, the above figure helps us understand in a broader way the current position of the IAM product categories in comparison to their situation in the year 2016 (our starting point).

What we can deduct from the graph is that the best product positioning has been taken by "Car Batteries". This might be connected, partly by the overall development of the

Independent aftermarket, but for sure this highlighted situation has been also influenced by the market development of hybrid and electric vehicles.
On the other hand, the tendency nowadays of modern cars is to have more electronic functions and therefore they depend on more electronic components which consume more battery. This and the aforementioned facts help to understand the positioning of the product and is logical to expect the same situation for the following years.

In the case of Brake Pads and Clutch Kit they have presented the same competitive position, regarding their performance during the last four years.
They have shown a development attitude in connection to the increase in revenues due to higher volumes of products sold. This situation for sure has to be connected with the overall development of the independent aftermarket, which currently tends to be in permanent growth. It all goes back to the current situation introduced at the beginning of this thesis in which it was mentioned that the circulating fleet of cars has been increasing in the last years, and this for sure generates a higher spare parts demand; since, by simple statistics, there is a higher percentage of cars being damaged.

7. Conclusions

This research aimed to properly collect, process, elaborate, manage and analyse the most recent data (from beginning 2016 to the end of 2019) of a specific actual market (Italian Independent After-Market), but it is also true that to be able to reach the specific results, the accuracy of the models being applied has been a key point.
Despite the values of the final results and the respective single conclusions that have been derived from it, which have been shown and discussed all along each one of the chapters previously developed, the upcoming conclusion is going to be focused on what for the aim of study has been essentially important: the background of this results.

All along the thesis, for every single product category, one of the goals was to show the importance of the differences of applying the classic model and the new model for calculating the revenues variances.
As it has been mentioned before, Revenues (what has been practically the main object of study) are affected by a set of several determinants, and from a managerial point of view it is essential to know exactly each specific impact of these single determinants on the revenues change, meaning which are the sources/variables that are affecting the overall result, and to what extent.
It is important at this point to take into consideration how meaningful the analysis of variances is, as a control tool for managerial levels, in allowing them to become aware of changes in the organization and avoiding the risk of taking blind decisions due to the lack of information. The accuracy of the approach turns out to be fundamental in the control of the margin and of business costs every time it is essential to understand the causes of change in performance compared to the past and the planned objective.

As a result, the Classic Model of the revenues variances turns out to be no longer appropriate for this type of analysis and it was needed to be reshaped, by distinguishing volumes of the three types of products: Ongoing, New and Disused. Nevertheless, it is important to highlight that the Classic Model it might have been optimal in an “ideal” situation, like the hypothetical cases that we are used to studying in the literature, in which the products sold in the market are all or almost all Ongoing products, which means continuatively sold from one period to another. But the fact is that it is only when applying theoretical models to real cases when the shortcomings appear. In real cases, as the one under study in this thesis, the dynamics of the commercial world market do not allow this

"ideal" situation. Either because we might have products that are not competitive or turned to be obsolete, therefore they are no longer being sold; or because we have permanently products being developed and entering in the market chain (widening of the range) or it could be even associated to the merit of better commercial policies. Both situations are in point of fact an actual realistic description of how the Automotive IAM market, and so many others, works.

In summary, the New Model tends to be more accurate and preferred towards the Classic one; since, as it has been shown through the thesis, the distinction between the different volume effects has the great merit of clarifying the revenues performance attributable to the volumes and of supporting the management in correctly understanding how much revenues has been lost due to the volumes of products no longer sold (disused) as well as how much revenues has been achieved thanks to the sales volumes of the new products and ultimately to accurately measure, exclusively for ongoing products, the appropriate effects on prices and mix.

Correspondingly, to the limited extent of this particular study, it has helped in driving to a better and precise interpretation of the product categories performance.

As far as the objectives of this study are concerned, the importance of the quality in terms of accuracy of the results of the variances analysis have been essential for the development of the Market Competitive Positioning analysis, which was the second pillar of the thesis analysis. In this case, this tool has been nothing more than useful for illustrating how the market is performing and particularly for managerial levels to understand if a certain product or even the company is performing according to what was planned and consequently take the proper decisions connected to guiding strategies for the future performing.

In conclusion, despite the specific results that have been able to achieve for each specific product category, it is important to highlight that what is really relevant at the time of doing an analysis of the kind is to choose the right tools. With this methodology it has been possible to arrive to the most accurate results. To add, every methodology needs to be improved or reshaped to the context under analysis in order to reach the most accurate desired results.

What is not defined it cannot be measured.
What is not measured, it cannot be improved.
What is not improved, it degrades always.

(William Thomson Kelvin)

8. Glossary

ADAS: Advanced Driver Assistance Systems

AP: Actual Period

AV: Autonomous Vehicles

B: Bonus recognized to costumers in relation to the revenues achieved

BV: Bonus Variance

CP: Current Period

EV: Electric Vehicles

DVV: Disused Volumes Variance

M: Mix of products sold

MV: Mix Variance

NVV: New products Volumes Variance

OBV: Ongoing Bonus Variance

OMV: Ongoing Mix Variance

OPV: Ongoing Price Variance

OVV: Ongoing Volumes Variance

P: Selling prices recognized by the costumers

PP: Previous Period

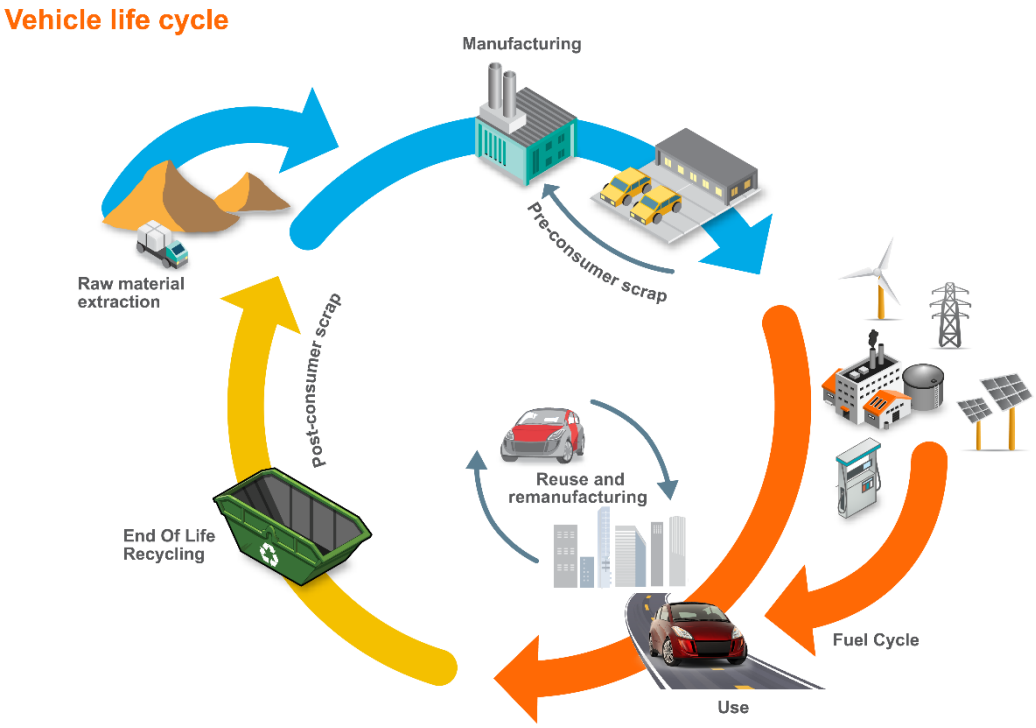
PV: Price Variance

RV: Revenues Variance

V: Volumes Sold

VV: Volumes Variance

9. Annexes



Annex 1 - Life Cycle of a Car. (Hickey , 2018)

	Classic Model					New Model						
	VV	MV	BV	PV	**RV**	NVV	DVV	OVV	OMV	OBV	OPV	**RV**
Car Brake Pads												
2016-2017	2,14%	1,78%	-0,99%	0,85%	**2,08%**	2,97%	1,93%	2,10%	3,76%	-0,99%	-3,82%	**2,08%**
2017-2018	9,91%	-1,96%	-0,65%	0,14%	**7,44%**	3,81%	-0,51%	9,86%	-1,40%	-0,65%	-3,68%	**7,44%**
2018-2019	4,43%	1,62%	-0,62%	-4,44%	**0,99%**	0,83%	-0,23%	4,42%	1,87%	-0,62%	-5,27%	**0,99%**
Car Batteries												
2016-2017	8,27%	-7,66%	-1,03%	12,66%	**12,23%**	8,92%	-3,54%	7,98%	-3,82%	-1,03%	3,73%	**12,23%**
2017-2018	-0,25%	-3,52%	0,50%	6,45%	**3,18%**	6,99%	-4,76%	-0,23%	1,23%	0,50%	-0,55%	**3,18%**
2018-2019	-1,04%	-2,80%	-0,60%	4,52%	**0,09%**	6,08%	-2,66%	-1,01%	-0,16%	-0,60%	-1,56%	**0,09%**
Car Clutch Kit												
2016-2017	4,10%	1,44%	-0,30%	-0,75%	**4,49%**	3,70%	-0,98%	4,06%	2,46%	-0,30%	-4,45%	**4,49%**
2017-2018	12,68%	-5,01%	-0,52%	0,46%	**7,61%**	5,44%	-1,50%	12,49%	-3,31%	-0,52%	-4,99%	**7,61%**
2018-2019	1,77%	-9,87%	-0,25%	4,99%	**-3,36%**	7,21%	-2,40%	1,73%	-7,43%	-0,25%	-2,22%	**-3,36%**

Annex 2 - Table grouping all the results which are singularly analysed along chapter 3, 4 and 5. The results of the Revenues Variances are highlighted in bold.

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