LUISS T

Department of Business and Management Major in Marketing Analytics and Metrics Chair of Statistics for Marketing

The Impact of Price Competitiveness on Brand Performance

A Comparative Analysis of Neoblanc and ACE in Portugal and Italy

SUPERVISOR

Prof. Francesco Salate Santone

CO-SUPERVISOR

Prof. Pierpaolo D'Urso

CANDIDATE

Elena Morelli

ACADEMIC YEAR 2023-2024

"Se ci credi ti basta perché poi la strada la trovi da te"

"E ti prendono in giro se continui a cercarla ma non darti per vinto perché chi ci ha già rinunciato e ti ride alle spalle forse è ancora più pazzo di te"

INDEX

Introduction	4
Chapter 1. The Role of Pricing Strategies and Price Competitiveness for Brand Performance	6
1.1 Theoretical Foundations of Price Corridors and Pricing Strategies	6
1.1.1 Price Corridors	6
1.1.2 Pricing Strategies	8
1.1.3 Price Competitiveness	9
1.1.4 Price Positioning: Competition and Market Segmentation	10
1.2 Impact on Brand Performance	12
1.2.1 Influence on Market Share	12
1.2.2 Effects on Brand Perception	13
1.2.3 Effects on Brand Loyalty	14
1.3 Identifying the Research Gap	15
Chapter 2. Market Analysis of the Portuguese and Italian Bleach Markets	16
2.1 Overview of the Bleach Market in Portugal	17
2.1.1 Competitive analysis	19
2.1.2 Pricing strategies and promotions	19
2.1.3 Current and future trends	20
2.2 Overview of the Bleach Market in Italy	21
2.2.1 Competitive analysis	23
2.2.2 Pricing strategies and promotions	24
3.2.3 Current and future trends	24
2.3 Comparative Market Analysis: Portugal and Italy	25
2.4 Neoblanc and ACE	27
2.4.1 Neoblanc Hypo	28
2.4.2 Neoblanc Gentile	32
2.4.3 АСЕ Нуро	35
2.4.4 ACE Gentile	39
2.5 Comparative Analysis: Neoblanc and ACE	42
Chapter 3: Data-Driven Insights: Statistical Analysis and Implications	44
3.1 Data Collection and Preparation	45
3.2 Statistical Analysis	46
3.2.1 Stationarity Verification (ADF), Variable Differencing, and First Regression Model	47
3.2.2 ARIMAX Model and Second Multiple Regression Model	49
3.2.3 Diagnostic Analysis for ARIMAX Model Validation	53
3.2.4 Breakpoint Analysis of Price Index Impact on Market Share	
3.3 Research discussion and main findings	60
3.4.1 Implications of ARIMAX Regression Models	61
3.4.3 Implications of the Break Point Analysis	63
3.4.5 Managerial Implications	03 66
Conclusion	68
Ribliogranhy	00
Annondir	/ 0
11ppcnux	

Introduction

In the fiercely competitive markets of today's global economy, the ability to craft an effective pricing strategy can determine a brand's success or failure. Pricing, often seen as a mere numerical adjustment, is, in reality, a nuanced mechanism that reflects consumer perceptions, market dynamics, and brand positioning. It plays a pivotal role in shaping brand performance, influencing both market share and brand equity. Yet, despite the profound impact of pricing strategies on brand success, there remains a significant gap in understanding how price competitiveness truly affects brand performance across different markets and product categories. This thesis seeks to unravel this complexity by delving deep into the bleach market in two distinct European countries: Portugal and Italy. Here, two prominent brands, Neoblanc and ACE, serve as the central subjects of an intricate comparative analysis. The choice of these markets is not arbitrary; they represent unique consumer behaviors, market structures, and competitive landscapes, providing a fertile ground for exploring how pricing strategies operate under varying conditions.

Bleach, while a common household product, serves as an ideal case study due to its dual role as a hygiene essential and a product influenced by consumer preferences. This makes it a valuable lens for examining the balance between price competitiveness and brand positioning. Following this exploration of the bleach market's complexity, this thesis is structured to provide a comprehensive analysis of how price competitiveness impacts brand performance, particularly focusing on the distinct cases of Neoblanc and ACE in Portugal and Italy. In the first chapter, the theoretical framework will be established, presenting existing literature on pricing strategies, brand competitiveness, and market dynamics. This foundation will provide the necessary context for understanding the factors that influence pricing decisions and their effects on brand performance. The second chapter presents a detailed market analysis of the bleach industry in Portugal and Italy, outlining the market dynamics, consumer behavior, and competitive landscape in these two countries, with a focus on the two product categories that will be analysed. Finally, the third chapter delves into the core of the research, offering a statistical analysis that examines the relationship between price competitiveness and brand performance for the brands Neoblanc and ACE. Here, advanced econometric models, including ARIMAX and breakpoint analysis, are employed to uncover how pricing strategies impact market share and brand positioning in both countries. Finally, the thesis concludes with a discussion of the key findings, limitations, managerial implications, and recommendations for future research, offering practical insights that extend beyond the bleach market to inform broader marketing and pricing strategies.

This thesis emerges from a personal and professional journey deeply rooted in my current internship experience at Fater, where I have the opportunity to work in marketing for the ACE brand at an international level. My responsibilities primarily involve overseeing markets in Central Europe and Iberia, including Portugal, where the Neoblanc brand operates. The decision to focus my thesis on pricing and pricing strategies was influenced not only by my desire to explore an area that, although not extensively covered in my university master's program, is highly relevant in a corporate context but also by a specific request from my team in Fater, that highlighted the importance of this topic for its strategic objectives. Through this research, I have been able to expand my academic understanding of pricing strategies, moving beyond theoretical concepts to gain insights into real-world applications. It has enabled me to analyse the performance of a brand I engage with professionally, and to understand the strategic nuances that contribute to its market positioning. Moreover, this thesis has allowed me to draw meaningful comparisons between the Portuguese market and the Italian market, where ACE maintains a dominant market position, providing a comprehensive understanding of how pricing strategies can impact brand competitiveness across different regions.

GLOSSARY

The inclusion of a glossary in this thesis serves to clarify key terms, abbreviations, and companyspecific terminology frequently used throughout the analysis. Given the technical nature of the subject matter, particularly concerning pricing strategies, statistical models, and market dynamics, as well as terms unique to the corporate context of Fater, the glossary aims to ensure clarity and facilitate understanding for readers who may not be familiar with these specialized concepts.

- SU (Standard Unit): A measure used by Fater to standardize different product units for analysis and comparison.
- **PL** (Private Label): Products that are manufactured by one company but sold under another company's brand.
- AO (All Other): Refers to all other competitors or brands within a particular market analysis not classified as private labels or the brand under study.
- **GRP** (Gross Rating Points): A measure of advertising impact, representing the sum of all ratings achieved by a media campaign.
- **HypoPT**: The analysis of the Hypo brand product in the Portuguese market.
- GentilePT: The analysis of the Gentile brand product in the Portuguese market.
- **HypoIT**: The analysis of the Hypo brand product in the Italian market.
- **GentileIT**: The analysis of the Gentile brand product in the Italian market.
- **ARIMAX** (Autoregressive Integrated Moving Average with Explanatory Variable): A statistical model used for time series analysis that combines ARIMA with external factors (explanatory variables) to better predict the outcome.
- **VIF** (Variance Inflation Factor): A measure used to identify multicollinearity in regression analysis.
- ACF (Autocorrelation Function): A tool used in time series analysis to measure how the data points in a series are related to previous data points over time.
- **PACF** (Partial Autocorrelation Function): A tool that measures the degree of association between a time series and lagged versions of itself, accounting for the influence of intervening lags.
- ADF (Augmented Dickey-Fuller Test): A statistical test used to check for stationarity in time series data.

Chapter 1. The Role of Pricing Strategies and Price Competitiveness for Brand Performance

In the very competitive markets of today, a company's whole performance is much influenced by the pricing strategy it employs. Of the several components of pricing strategy, price competitiveness is one that mostly stands out. Strategic price positioning not only defines the initial attraction of a brand to consumers but also affects its long-term survival in the market. However, understanding the true impact of a brand's pricing strategy requires more than just a surface-level analysis. Market pricing is a complex landscape, composed of multiple companies with different brands that behave and act in a heterogeneous way, requiring careful strategic positioning to maintain balance and competitiveness. To offer a clear, academically informed vision, this chapter will therefore show a review of the literature on these aspects.

Starting with the theoretical foundations of the concept of price corridors and pricing strategies, this chapter will then analyse the concept of price competitiveness. Later, it will also examine the relationship between price positioning and market segmentation, as well as the possible influence a pricing strategy may have on brand performance, including market share, brand perception, and brand loyalty, as components of brand equity. At last, the chapter will identify the existing research gap in this field of price competitiveness and its impact on brand performance by articulating the research question that will guide this study.

1.1 Theoretical Foundations of Price Corridors and Pricing Strategies

1.1.1 Price Corridors

The theory of price corridors refers to a defined range within which prices are set to maintain stability in the market and promote fair competition. This notion incorporates diverse economic principles and insights into consumer behavior, offering a comprehensive framework for establishing and modifying prices. Price corridors are fundamental because of their support to companies in navigating intricate market settings by creating a range of permissible prices that strike a compromise between profitability and competitiveness, facilitating well-informed and consistent pricing choices.

At the lower end of the price range, there are floor prices, which represent the minimal prices at which goods (or services) can be sold without experiencing any financial losses. Setting minimum prices is crucial for maintaining profitability and preventing harmful price disputes that could undermine market stability (Pricefx, 2023). Ceiling prices, on the contrary, establish the highest limit of the pricing range and represent the upper limit that can be charged without causing a noticeable decrease in demand as well as the highest value that consumers are prepared to assign to a product, considering aspects like brand perception and product quality (Zeithaml, 1988). Analyzing competition prices, market demand, and consumer willingness to pay is necessary to determine the appropriate ceiling prices, which allows the company to maintain competitiveness and optimize income. The target price, which is the best price point inside the corridor, is situated between the floor and ceiling prices and is formulated to achieve a harmonious equilibrium between profitability and competitiveness as well

as strategic business objectives, such as increasing market share, maximizing revenue, and establishing a strong brand position (Horváth & Fok, 2019).

The idea of price corridors is supported by various theoretical models that explain how consumers perceive and behave in relation to prices. According to Janiszewski and Lichtenstein (1999), the Range Theory of Price Perception suggests that customers form a price range by considering their previous purchases and the pricing of comparable products in the market. This hypothesis highlights that customers are inclined to view prices falling within this predetermined range as equitable and satisfactory, whereas prices exceeding or falling short of this range are perceived as excessively high or cheap. The Reference Price Theory, proposed by Biswas and Blair (1991), holds that consumers assess present prices by use of a reference price. Either an internal standard derived from past performance, or an external benchmark derived from market data this reference price can be used. This contrast has a substantial impact on their impression of worth and their readiness to make a payment. Moreover, the Prospect Theory developed by Kahneman and Tversky (1979) explains how consumers assess possible losses and rewards in relation to a reference point. According to this idea, customers feel the impact of losses more strongly than gains of the same size. This is why price rises are generally seen in a more unfavorable light compared to similar price declines. This model highlights the significance of keeping pricing stability within the boundaries to prevent adverse consumer responses.

Moreover, the theory of price corridors is closely linked to the theory of acceptable price range, which suggests that consumers have a spectrum of prices that they find acceptable for things. Perceiving prices as either excessively high or excessively cheap might have a detrimental effect on the perceived value and willingness to make a purchase (Biswas & Blair, 1991; Janiszewski & Lichtenstein, 1999). This concept underlines the requirement of following a particular pricing range to maintain customer confidence and the value of a brand. Studies underline even more how important brand image is in determining how much consumers buy depending on pricing. As customers usually correlate high costs with excellent quality and dependability, an influential brand image can rationalize increased pricing and strengthen consumer loyalty (Hermiyenti & Wardi, 2018). Moreover, marketing strategies greatly influence consumer behavior inside the range of pricing zones. Aguilar-Barrientos et al. (2021) discovered that the efficacy of price promotions such as coupons, loyalty programs, and discounts is impacted by a range of external and internal factors. The effectiveness of a price-promotion strategy relies not just on the immediate financial incentives but also on the wider environmental and organizational circumstances.

Since they define the range within which a brand may deliberately place its pricing to maximize market attractiveness and profitability, price corridors are intimately related to the competitiveness of a brand. Pricing that fit a reasonable range for consumers helps businesses to avoid price wars and keep a value that complements their competitive posture. This careful balancing act guarantees that the brand stays appealing for its target market and protects its market share and profitability, therefore immediately increasing its general competitiveness in the market.

1.1.2 Pricing Strategies

Price corridors are a concept within the broader framework of pricing strategies, helping businesses set and alter prices as part of a pricing strategy. Overall, the competitiveness of a brand depends mostly on pricing strategies, which mainly include cost-plus pricing, value-based pricing, penetration pricing, skimming pricing, and competitive pricing. In 2016, Nagle, Hogan, and Zale stress the need of a pricing plan that accurately captures customer value perspective. Every tactic has benefits and drawbacks; so, the choice of strategy will greatly affect the financial performance and market situation of a business.

A simple method known as cost-plus pricing involves adding a fixed margin to the manufacturing cost to ascertain the selling pricing. This approach assures a stable profit margin and covers all expenses. Its simplicity, which ignores consumer demand or competition pricing, may be a disadvantage in very competitive marketplaces, nevertheless (Nagle et al., 2016). Conversely, valuebased pricing is motivated by the perceived value of the good to the consumer instead of manufacturing costs. This approach lets businesses charge premium rates when the product is thought to be of great value. Value-based pricing, according to Hinterhuber (2008), can improve customer satisfaction and boost profit margins when prices closely correspond with the expected advantages of the good. Penetration pricing is basing a low starting price on rapid consumer attraction and market entrance. The objective of this approach is to quickly increase market share, even if initial gains may be reduced. Prices can be raised progressively once a sizable clientele has developed. In markets with minimal brand loyalty and great price sensitivity this method is very successful. Monroe (2003) advises, nonetheless, that penetration pricing might be dangerous if the business cannot maintain low rates long enough to attract a devoted customer base. Setting high initial prices for a new or unique product helps to optimize short-term revenues by means of skimming pricing. This approach appeals to early adopters ready to pay a premium since prices will progressively drop over time to draw in more people. Skimming pricing helps businesses to maximize the uniqueness of their products and rapidly recover research and development expenses. Long term, nevertheless, this strategy might not be viable when rivals arrive on the scene with less expensive substitutes (Nagle et al., 2016). Setting prices mostly depending on the prices of competitors rather than concentrating only on cost or consumer perceived value is the approach known as competitive pricing. This strategy can be effective in markets where consumers are quite sensitive to price variations and products are essentially comparable. In sectors marked by commoditization, where differentiation is low and price mostly determines consumer choice, competitive pricing is especially important.

Competitive pricing calls for businesses to be well-versed in the market, including customer behavior, price policies of major rivals, and industry trends. Companies can keep their market share and appeal to consumers who are price-sensitive by closely matching prices with those of rivals. This strategy, however, goes beyond just matching or undercutting rivals to include strategic choice on when and how to change pricing in reaction to shifting market conditions. Maintaining price parity with rivals helps competitive pricing to prevent price wars, hence one of its main benefits. Maintaining a competitive price point is crucial for keeping consumers and preventing loss of market share in very competitive markets because consumers may quickly move between brands depending on price.

Competitive pricing, according to Ingenbleek and Van der Lans (2013), helps businesses stay relevant in the perspective of consumers, particularly in cases when price is the key factor considered during the purchase decision. Competitive pricing does, however, also provide certain difficulties. It calls for ongoing attention to detail and quick reaction to competition pricing adjustments. This degree of reactivity can put a company's resources under pressure, especially in cases of aggressive pricing strategies by rivals. Moreover, the emphasis on rivals' prices can occasionally cause one to overlook other crucial elements including brand uniqueness, customer service, and product quality-all of which are very vital for long-term success. Many times, businesses use price intelligence technologies with market research to properly apply a competitive pricing strategy by tracking competition prices, and to better guide their decisions on price. Competitive pricing is determining prices based on rival behavior and market conditions, therefore directly affecting the limits of the price corridor-a strategic range within which the prices of a brand should preferably fall. Analyzing rival prices, consumer expectations, and market dynamics helps one to create a price range that guarantees the brand stays competitive and preserves profitability. Competitive pricing strategies help determine exactly where a brand puts itself in this corridor, therefore balancing the requirement to draw in pricesensitive consumers with the aim of keeping good margins. A brand may properly react to rival actions and changing market conditions by always observing the market and modifying its posture inside the corridor, therefore guaranteeing it stays both relevant and lucrative over the long run.

1.1.3 Price Competitiveness

Price competitiveness is a fundamental component of a brand's strategic positioning within the market, playing a crucial role in determining its overall performance and long-term sustainability. According to Porter (1980), attaining and preserving a good position within an industry depends on competitive strategy including pricing. Price competitiveness is about a whole approach that takes value proposition, cost control, and consumer perception into account rather than only determining lower pricing than rivals. Effective pricing strategies, especially competitive pricing strategies, should match the larger marketing objectives of the brand, according to Kotler and Keller (2016), so guaranteeing that the price approach helps to increase brand equity and market share. The degree of price competitiveness of a brand determines whether it can keep and grow in the market. The idea is intimately tied to how consumers see the value of a product in respect to its pricing when compared to other rival brands. Different aspects include perceived value, brand loyalty, and market segmentation define pricing competitiveness, claims Rao and Bergen (1992). Though consumers see their brand as providing superior value, companies that effectively control their price competitiveness typically do this by rationalizing pricing that might be higher than competitors using their brand equity. This is consistent with the results of Ailawadi, Lehmann, and Neslin (2003), who stress the need of brand equity in deciding how much a brand may charge over the average price while remaining considered as competitive in the market.

Within the scope of the pricing corridor, price competitiveness is the capacity of a brand to position its prices within a reasonable range that maximizes both profitability and market share. Maintaining the competitive pricing strategy of a brand depends on value-informed pricing, directly related with

price corridors, claims Ingenbleek (2007). This strategy is determining rates depending on the perceived value of the product by the customer, not only mirroring the pricing of competitors. This strategy will enable businesses to keep a competitive posture apart from their rates being the most affordable on the market. Furthermore, considering the strategic relevance of value-based pricing in increasing price competitiveness are Hinterhuber and Liozu (2012). They contend that businesses who match their value to consumers with their pricing strategy instead of concentrating just on cost or competitiveness rates will be more likely to have long-lasting competitive advantages. This strategy guarantees competitiveness in a congested market by helping businesses to set pricing that fairly represent their distinct value propositions. By stressing the need of maintaining a competitive edge through strategic pricing, especially in conditions marked by hypercompetition, Ghemawat (1986) and D'Aveni (1994) extend this debate. In such marketplaces, brand performance is largely influenced by the capacity to rapidly modify competitive pricing policies to offset competitive challenges. Strong cost control strategies and effective resource management help to promote this adaptability so that brands may provide competitive prices without compromising profitability. Moreover, Nagle and Müller (2017) contend that effective competitive pricing policies are ones that not only increase sales but also improve the perceived brand value. From this point of view, one emphasizes the need of including pricing competitiveness within a more comprehensive strategic framework including consumer service, brand reputation, and product quality. Therefore, price competitiveness is about providing outstanding value at a price point that appeals to consumers rather than only about being the lowest choice in the market.

1.1.4 Price Positioning: Competition and Market Segmentation

Focusing on the competition, essential strategies that enable companies to successfully negotiate competitive markets—where pricing decisions significantly influence success and long-term profitability—are price positioning and market segmentation. Pricing positioning is the process of deciding a product's pricing to fit the brand's intended market position as well as to match the financial expectations and perceived value of customer groups. This approach is intimately related with market segmentation, a procedure that divides a large market into smaller, more manageable groups of consumers depending on differentiating criteria, habits, or needs, allowing companies to adapt their pricing strategies to appeal to specific consumer groups. It is important to highlight that the precision of price positioning will determine the success or failure of a product in highly competitive marketplaces. Companies must carefully control the trade-off between safeguarding against the likely decrease of profit margins and brand value and utilizing competitive pricing strategies. According to Ingenbleek & Van der Lans (2013), companies who successfully use competitive pricing strategies may rapidly adjust to changes in competing pricing, therefore modifying their own rates to remain in line with market dynamics and consumer expectations.

By providing special value propositions and keeping premium pricing through innovation and outstanding product quality that competitors find difficult to replicate, companies can help to offset these negative effects (Kotler & Keller, 2016). This strategy not only lowers the possibility of price wars but also stops direct price comparison. However, innovation by itself is not enough; equally vital

is encouraging consumer loyalty. Companies may foster recurring purchases and lower the possibility of consumers moving to competitors depending just on pricing by building a feeling of exclusiveness through loyalty programs (Dowling & Uncles, 1997). Strong relationships and rewarding customers help companies in very competitive marketplaces lower price sensitivity. Moreover, Venkatesan & Kumar (2004) contend that tailored offers and individualized communications-especially meant to fit certain consumer preferences-can successfully reduce price sensitivity. This is so because consumers regard these tailored experiences as offering more value than just the good itself. Another important aspect to consider is the rise of e-commerce and digital transformation that has significantly increased price competitiveness, thereby altering brand approach to pricing policies. The general use of online platforms has let consumers quickly compare prices across several stores, therefore improving pricing transparency and driving more competitiveness. Brynjolfsson & Smith (2000) stress that dynamic pricing systems and online price comparison tools made possible by the digital environment are important for properly controlling price competitiveness. Organizations must devote resources toward data analytics and innovative pricing technologies if they are to remain competitive in the present corporate environment. These instruments permit quick changes in price in reaction to consumer behavior, rival activity, and market demand.

Brand equity is a fundamental idea in marketing also in the context of pricing strategies. It signifies the additional value that a brand provides to a product or service, and it is composed by five primary items: brand loyalty, brand awareness, perceived quality, brand associations, and other exclusive brand assets (Aaker (1991)). The collection of brand assets and liabilities connected with a brand that either enhance or diminish the value that a good or service offers to a business, or its consumers is known as brand equity. This definition emphasizes how brand equity is a tangible asset that may significantly raise the value of a company's goods or services, not only a theoretical idea. In this respect, a key component enabling brands to have premium prices even in very competitive markets is in fact a strong brand equity, as it is highlighted by Ailawadi, Lehmann, and Neslin (2003), making this concept crucial especially when evaluating price competitiveness. Consumers are willing to pay more for perceived reliability and quality, so companies can charge higher prices without losing market share. In markets prone to discounting and price wars, this advantage is especially beneficial. Strong brand equity also helps companies with greater financial performance by means of higher pricing, therefore underscoring the long-term advantages of such investments. While Keller (1993) emphasizes its importance in effective consumer impressions and market expansion through the concept of customer-based brand equity (CBBE), research by Yoo et al. (2000) indicates that brand equity improves attitudes of product quality and purchase inclinations. For businesses trying to remain competitive, then, brand equity is a major advantage.

Dynamic pricing has evolved into a necessary instrument in this context since it helps companies to quickly adjust to changes in the market and conflicting influences. Using data analytics and algorithms to make real-time price changes helps businesses maximize income and keep their competitiveness. According to Grewal et al. (2010), brands trying to successfully compete in the digital era depend on technology and pricing systems investments being vital. This approach guarantees that companies' pricing stays in line with consumer expectations and market reality in

addition to helping them to keep their competitiveness. Competitive pricing depends critically on psychological pricing strategies since they significantly affect consumer impressions and purchase behavior. Examining several pricing techniques including odd-even pricing, price anchoring, and bundling—that might affect consumers' view of value and alter their purchasing decisions—Anderson and Simester (2003). Even if the actual difference is small, the use of odd-even pricing—that is, setting prices somewhat below a whole number—e.g., \$9.99 instead of \$10.00—may provide the appearance of a more attractive deal. Price anchoring is the technique of arranging a less expensive item next to a more expensive one so that the lower-priced item seems to be a good value in comparison. In competitive markets, where little changes in consumer perception can significantly affect sales, these psychological strategies can be very powerful.

Case studies from several fields offer more proof of the need of strategic pricing positioning in advancing brand success. By constantly maintaining high price levels that improve their reputation for uniqueness, outstanding craftsmanship, and extraordinary quality, businesses like Rolex have become master in price positioning in the luxury goods sector. By always using a premium price strategy, Rolex has effectively developed its brand name and acquired great consumer loyalty. For its clients, this approach has developed a sense of exclusivity and perfection (Kapferer & Bastien, 2012). Rolex has been able to thrive in a very competitive market by using this approach since the preservation of a distinctive brand image is crucial for guaranteeing ongoing success. Conversely, IKEA's success in the reasonably priced market demonstrates how well price setting may draw a broad spectrum of customers and improve the market position of a brand. By supplying attractively designed furniture appealing to a wide spectrum of consumers, IKEA has established itself as a brand offering value and functionality at reasonable prices. Burt & Davies (2010) underline how well IKEA's brand commitment and pricing approach match each other, which has helped the business to be globally successful and maintain strong market presence. This situation emphasizes the need of establishing a strong market position by combining pricing positioning with brand values and consumer expectations.

1.2 Impact on Brand Performance

1.2.1 Influence on Market Share

Empirical studies repeatedly show that market share is substantially influenced by pricing strategies. According to Hoch, Kim, Montgomery, and Rossi (1995), consumer purchase decisions are much influenced by the store-level pricing elasticity. More easily modifiable prices from stores with more price elasticity would enable them to capture more of the market without so affecting their income. The flexibility of retailers enables them to effectively respond to competing price strategies, thereby assuring their continued presence in the market. Horváth and Fok (2019) expanded upon this comprehension by investigating in-store brand strategies, highlighting that proficient pricing methods improve both market share and financial success.

In 2008 Indrayani, Siringo, and Saptariani underlined the need of price sensitivity in determining brand loyalty and market dominance. Their studies revealed that companies using competitive pricing

strategies may attract price-conscious consumers, therefore improving their market share. Still, it is advisable to use this approach with care to avoid any detrimental effects on brand value, particularly in high-end market segments where the impression of quality and brand image is quite important. Moreover, prediction models, such as the ones created by Krishnamurthi and Raj (1991), offer useful insights into the correlation between pricing and market share. According to their econometric models, consumers who are loyal to a brand have a lower price elasticity, meaning that brands can keep their market shares constant by promoting loyalty through consistent pricing tactics. In 1999, Janiszewski and Lichtenstein developed a theoretical model to help explain how customers view and react to price fluctuations. This paradigm holds that customers view expenses within a given range as reasonable; any deviations from this range may significantly affect their purchasing behavior. Biswas and Blair (1991) examined the impact of reference pricing in retail marketing within a specific environment, emphasizing the significance of establishing suitable reference prices. The research indicates that reference prices have a major impact on customer purchasing decisions and, as a result, market share. This provides valuable information for retailers to shape their pricing strategy to maximize their market share.

An analysis of the available data on the impact of price corridors and pricing strategies on market share shows consistent patterns and a few variations. Companies can increase their market share by employing strategic pricing methods in established market categories, which allows them to attract price-conscious consumers and maintain loyal customers. The studies done by Hoch et al. (1995) and Horváth and Fok (2019) confirm that the ability to retain market share in competitive contexts relies on the implementation of competitive pricing strategies. Nevertheless, the degree of this influence differs among several market groups and types of products. According to Indrayani et al. (2008), the observation was made that competitive pricing is an effective strategy to enhance market share, particularly among consumers who are sensitive to price. However, the impact of this aspect may be less significant in high-end market sectors due to the increased importance placed on brand perception and quality.

1.2.2 Effects on Brand Perception

Several marketing theories clarify the connections between pricing and brand impression. According to the Zeithaml (1988) Means-End Model, purchasers perceive pricing as an indicator of product quality and worth. Increased pricing can occasionally indicate superior quality, leading to an enhanced opinion of the brand. Establishing pricing corridors helps a company to guarantee that its prices lie within a given range, so helping to position the company in the relevant quality category. Consistent pricing, according to Aaker and Keller (1990), improves brand equity by keeping consumer confidence and matching with expectations. They discovered that maintaining consistent pricing is essential for establishing a robust brand image, which is vital for the success of brand extensions. According to the study conducted by Xia, Monroe, and Cox (2004), fair pricing is crucial for how consumers perceive a brand. Consumers assess the value they perceive in a product by comparing its price to that of comparable products to evaluate if the pricing is fair. Implementing fair pricing strategies enhances the level of trust and happiness that consumers have towards a business. This

aligns with the concept of ethical branding, in which consumer loyalty and brand image are influenced by principles of justice.

Qualitative and quantitative research demonstrates the impact of pricing on brand perception. In their study, Lee and Hwang (2021) conducted qualitative research to investigate customer perspectives on ethical pricing systems. A study revealed that implementing fair and just pricing strategies enhances the way consumers perceive a business. Lee and Hwang discovered that ethical brands evoke trust. Establishing and upholding a positive brand image necessitates the presence of trust. Bottomley and Doyle (1996) measured the level of customer attitude towards brand extensions. According to their research, the perception of the brand was highly influenced by the pricing of justice. Brand reputation is enhanced by fair pricing. Taylor and Bearden (2002) investigated the impact of pricing stability on perceptions of brand expansion. Their empirical analysis demonstrated that the implementation of continuous pricing resulted in enhanced consumer evaluations and brand image. The finding emphasizes the significance of price uniformity in enhancing brand potency.

The examination of real-world data on pricing strategies and the impact on brand perception yields significant findings and identifies areas where further research is needed. Consistency in pricing within corridors enhances brand perception by fostering a sense of trustworthiness and quality. According to Zeithaml (1988) and Aaker and Keller (1990), smart pricing is effective in preserving brand reputation. Nevertheless, the lasting impact of dynamic pricing tactics on brand perception remains uncertain. Transient promotional prices can enhance sales, but their enduring effect on brand perception remains uncertain. Additional research is required to investigate the enduring impact of dynamic pricing on consumer trust and brand loyalty. Extensive study has been conducted on the impact of perceived pricing fairness on brand perception. Nevertheless, the examination of cultural and societal factors that shape these ideas is lacking in research. Gaining insight into these elements helps facilitate comprehension of how various client segments perceive pricing strategies and brand image.

1.2.3 Effects on Brand Loyalty

Some important theoretical models link pricing strategies with brand loyalty by emphasizing the need of perceived value and trust. Firstly, Chang and Park's 2020 Loyalty-Discount Theory suggests that that loyalty discounts serve to increase client retention and loyalty by offering a perceived value. On the same idea, Zeithaml's Means-End Model (1988) emphasizes that maintaining consistent pricing promotes trust and loyalty by upholding perceived value and quality. Finally, the Expectancy-Value Theory (1975) by Fishbein and Ajzen suggests that consumer loyalty is established when the anticipated and perceived values coincide, emphasizing the significance of pricing tactics that fulfill consumer expectations.

Case studies provide empirical evidence in support of these hypotheses. In their study, Indrayani, Siringoringo, and Saptariani (2008) discovered that implementing competitive pricing methods can effectively increase loyalty among consumers who are sensitive to price. Taylor and Bearden (2002) shown that maintaining a consistent pricing strategy has a beneficial effect on consumer evaluations

and loyalty. Chang and Park (2020) proved that loyalty discounts had the dual effect of increasing repeat purchases and enhancing emotional attachment to the brand.

Establishing pricing that is fair and consistent helps to cultivate customer loyalty by instilling trust and creating a sense of value, as evidenced by the research of Zeithaml (1988) and Taylor and Bearden (2002). Nevertheless, the lasting consequences of frequent discounting on brand loyalty remain questionable; although it may enhance immediate sales, it could gradually diminish the value of the brand. Pricing corridors are implemented to guarantee the stability of prices and promote fair competition. Brands may ensure consumer confidence and achieve long-term brand success by establishing precise price ranges, which help preserve perceived value and prevent price conflicts. Utilizing price corridors effectively ensures the retention of market share and enhances brand loyalty by implementing fair and consistent pricing strategies.

1.3 Identifying the Research Gap

Particularly when evaluated by market share, the analysis of pricing competitiveness and its impact on brand performance reveals a remarkable and understudied area within the present corpus of study. While numerous studies have looked at the larger effects of pricing policies—that is, their influence on consumer behavior, demand elasticity, and general brand perception—there is a clear gap of concentrated study on the impact of competitive pricing on a brand's market share. Comparative analyses spanning several marketplaces and product categories highlight this disparity notably. A lot of research nowadays concentrates on certain markets or sectors, sometimes ignoring the subtleties and complexities that result when assessing brand performance over several geographical areas. Furthermore, lacking in extensive investigation of the relationship between competitive price and market share is consideration of the unique characteristics of products and the different competitive situations they encounter in different nations.

This paper aims to rectify these flaws by means of comprehensive comparison research of two brands, Neoblanc and ACE, in both the Italian and Portuguese markets. This study looks at, under certain circumstances, how market share is affected by price competitiveness. It not only addresses a significant void in scholarly discussions but also offers helpful guidance for marketers working in various environments and brand managers. The results should help to clarify the degree to which competitive pricing policies can influence brand success in terms of market share, so enabling a more complete knowledge of the performance of many pricing methods in different competitive conditions. This study aims to greatly add to the present knowledge by providing a comprehensive analysis of price competitiveness. It transcends the general arguments on pricing strategies and offers further understanding of how price competition directly affects brand performance in competitive markets.

Chapter 2. Market Analysis of the Portuguese and Italian Bleach Markets

In the first chapter of this research, it was deeply investigated the existing literature on pricing strategies, exploring fundamental concepts such as price corridors, competitive pricing strategies, and their impact on brand performance. This theoretical foundation provided a solid basis for understanding how companies can strategically position their prices to maintain competitiveness while maximizing profit and market share. Additionally, it was identified a significant research gap concerning the specific effects of price competitiveness on brand performance, particularly in terms of market share and brand perception.

This second chapter introduces the specific case study of this research: a comparative analysis of the brands Neoblanc in Portugal and ACE in Italy. Therefore, it will focus on an empirical analysis of the bleach market in Italy and Portugal, with a detailed examination of the ACE and Neoblanc brands. But firstly, it is essential to understand the product under examination: bleach. Bleach is a multipurpose chemical agent that is commonly used for its disinfectant, bleaching, and stain-removal characteristics. The primary varieties of bleach are chlorine-based bleach, peroxide-based bleach, and oxygen-based bleach. Sodium hypochlorite, commonly known as chlorine-based bleach, is widely used in both residential and industrial settings. Instead, peroxide-based and oxygen-based bleaches, which are less harsh options, are preferred for specific uses, especially for treating sensitive fabrics and situations where a reduced environmental footprint is sought. This analysis aims to understand the market dynamics and performance of the two brands within two distinct product segments, which will be deeply analysed: Hypo and Gentile. These two specific products were selected as they account for most sales for Neoblanc and ACE, respectively 87% and 70%¹. All calculations are based on monthly data covering a period of the past three fiscal years (FY22, FY23, FY24). Moreover, there will be four different sections (Neoblanc Hypo, Neoblanc Gentile, ACE Hypo and ACE Gentile) in which it will analyse the brand in relation to its primary competitors, differentiated into private labels, that accounts for the biggest market share, and all the other competitors (AO).

Through this data, it will be explored the trends in market share, evaluated as the ratio between the brands' sales volumes and the total market volume, and which provides a measure of the competitive position of Neoblanc and ACE in their respective markets, as well as the influence of private labels and other competitors. We will also conduct an analysis of sales volumes using the Standard Unit (SU) measurement, specifically adopted by Fater to compare different products within the same brand, examining the sales volumes of Neoblanc and ACE in relation to the total market, considering the segments of private labels and the other competitors (AO). Additionally, the analysis of sales value will focus on the economic value of sales, offering an indication of the brands' ability to generate revenue in a competitive market context. It will be then examined the pricing strategies adopted by Neoblanc and ACE, assessing their impact on competitiveness and brand performance in a market

¹ The calculation of the 70% figure excludes ACE's detergent market, as it is not present in Portugal. The comparison is therefore based on the volumes of the two brands excluding detergents from the Italian market

where price sensitivity can vary significantly. Finally, the sales location analysis, which examines sales across different distribution channels—supermarkets, hypermarkets, discount stores, and alternative channels—will allow to understand the impact of distribution choices on sales results, exploring how the brands' presence in various channels contributes to their overall performance. A sales location is any point a business uses—physical or digital—where it contacts customers in a transactional capacity. The distribution strategy of a corporation mostly relies on sales sites, which impact client accessibility and convenience and hence influence buying behavior. Therefore, a basic need of modern sales and marketing strategies is strategic choice and management of these sites since companies may expand market penetration, improve customer satisfaction, and eventually drive income development by optimizing sales locations strategies. This empirical section not only provides a detailed context of the market conditions, and the strategies adopted by Neoblanc and ACE but also sets the stage for the statistical analysis presented in the third chapter. There, the central research question will be directly addressed: *what is the impact of price competitiveness on brand performance*?

2.1 Overview of the Bleach Market in Portugal

With sales volumes and prices consistently rising, Portugal's bleach market has demonstrated a stable and positive trend in recent years. To date, the bleach market in Portugal has a total volume of approximately 140,074 units and a total value of approximately EUR 3,522,233. Looking at the last three fiscal years (from 2021-2022 to the current fiscal year), as shown by the graph, the bleach market in Portugal has shown some volatility but with a positive trend in the value of sales, with an overall growth in the value of sales of 23.2%.



Figure 1 - Volume and Value of the Bleach Market in Portugal (FY2021-FY2024)

This increase indicates a positive trend in the value of the market, despite a rather volatile trend in sales volumes, which did not show net growth. It indicates that, despite variations in volumes, Portuguese consumers still consider bleach a fundamental product, hence enhancing the economic worth of the sector in Portugal. Supermarkets have become the most significant distribution channel for bleach products, accounting for the largest percentage of both sales volume (100,819 SU) and value (EUR 2,453.030), so attesting to their great market domination. The main cause of this dominance is the great coverage and convenience provided by supermarkets, which makes them the

preferred choice for most consumers as well as their wide distribution networks and regular promotional activities, which are so important in their significant market share. Though their influence is rather smaller than that of supermarkets, hypermarkets also play a major role, with a balance between value and quantity, highlighting the hypermarkets' capacity to maintain their share of the market despite different volumes. Hypermarkets take advantage of their extensive range of products and capacity for large-scale purchases to draw in a certain set of consumers seeking for a great range and good prices. Although conventional retail stores could have a decreased market share, they nonetheless greatly affect the general sales scene, emphasizing the need of consumer loyalty and specific market groups. The great increase of private label products, which have become popular and indicate a change in consumer tastes toward more affordable and high-value options, is one main factor driving the bleach industry in Portugal. As consumers became increasingly price-conscious and selective in their purchase selections, private label goods' increasing market dominance shows the industry's great competitiveness. The continuation of this trend most likely results from changing consumer behavior patterns and economic forces. The emergence of private labels marks the use of a price approach aimed at competition and the improvement of quality to satisfy customer expectations. It is also fundamental to briefly analyze the inflation rate trend, which is central to understand the macroeconomics movement which highly influence the bleach market in Portugal. Between January 2021 and July 2024 Portugal's inflation rate likewise clearly showed a definite upward tendency; the inflation index rose from 102.76 to 123.83, an overall increase of almost 20.5%. With periods of fast increases followed by stabilization or small falls, Portugal's inflationary pressures were far more erratic than those of Italy. Between March 2022 and July 2022, the most notable inflationary surge saw the index rise from 106.74 to 114.17—a 6.9% rise inside four months. This sudden rise points to a period of notable economic stress, maybe caused by comparable elements influencing Italy such policy changes, energy prices, or global supply chains problems. Portugal's inflation rate peaked in mid-2022 and then kept rising although at a slower rate. In June 2024 it peaked at 123.83 before somewhat dropping in July 2024. The late stage rises in 2024, where the index climbed by 3.2% in the first half of the year, imply that Portugal's inflationary pressures were more consistent and stronger than those of Italy.



Figure 2 - Portugal's inflation rate trend (FY2021-FY2024)

Particularly in terms of the value of sales, this inflationary trend most certainly had a major influence on the bleach market, which helped to generate rising pressure on pricing. Figures 1 and 2 clearly show that the inflationary environment could help to explain why sales value kept rising even in cases when volume was not regularly increasing. Stated differently, increased prices resulting from inflation may have offset any declines in volume, therefore raising the value of the market overall by 23.2% over the three fiscal years. Furthermore, the great impact of supermarkets as the main distribution channel and the development of private label goods point to Portugal's consumers growing price sensitivity. Consumers may have been drawn into more reasonably priced choices including private labels, which have acquired market share, under the inflationary pressures. Along with inflation, this change toward more reasonably priced goods most certainly helped to explain past trends in volume and value.

2.1.1 Competitive analysis

There is notable competitive dynamics in the market as multiple major companies compete for customer attention. Fater, with its brand Neoblanc, remains a well-recognized player, particularly known for its bleach products. However, Neoblanc experienced a decline of approximately 11% in sales volume and about 12% in value during the past financial year. This suggests that Neoblanc needs to adapt to evolving consumer preferences and increasing competitive pressures to maintain its market share. Reckitt Benckiser, a key competitor with a consistent market share, managed to retain its competitive edge due to its strong global presence and robust marketing strategies, despite a slight decrease in sales volume by roughly 5% and in value by around 12%. Henkel, while still visible, has a smaller market share compared to the top brands. Its sales volume decreased by about 23%, with a similar drop in value, highlighting the ongoing challenges faced by smaller brands in a market dominated by larger players. In contrast, Sodalis demonstrated resilience and growth, increasing its market share by approximately 53% in sales volume and around 16% in value, likely due to effective marketing and product diversification strategies. Unilever, although still a major player, saw a reduction in sales volume by roughly 27% and in value by around 17%. However, its strong competitive position is upheld by its extensive brand portfolio and wide distribution networks. Reflecting a growing consumer preference for more affordable options, private label products have become increasingly popular. Private label sales volume saw a significant increase of approximately 23%, while value rose by about 29%. This trend underscores the expanding influence of private labels as retailers broaden their product offerings to meet consumer demand, thereby challenging established brands.

2.1.2 Pricing strategies and promotions

The price strategies and bleach product promotions developed in Portugal aim to strike a harmonic balance between customer demand, market competitiveness, and profitability. Offering discounts, running loyalty programs, and running focused campaigns are just a few of the several marketing techniques companies employ to draw in and keep customers. With strategies including Buy One Get One Free (BOGOF), coupons, flash discounts, and segment-specific promotions heavily used, promotional pricing is quite preferred. These tactics help to increase customer footfall, reward devoted consumers, and clear extra supply. But if not properly controlled, overuse of these strategies might cause the brand to lose value. To improve their pricing and marketing campaigns,

manufacturers and retailers regularly use advanced data analytics and artificial intelligence-driven technology. These systems allow exact pricing changes depending on regional demand, competitor policies, and market situation. Strong artificial intelligence solutions, for instance, can help to find the ideal discount rates that boost sales without appreciably compromising profit margins or brand reputation. This strategy guarantees that promotions are not only efficient in enhancing immediate sales but also enduring in the long term. In addition, the bleach industry is progressively using identity marketing, a targeted promotional strategy that focuses on specific consumer groups, such as students, military personnel, and teachers. This strategy utilizes the profound interconnections among various consumer groups to cultivate loyalty and enhance the frequency of purchases without implementing widespread product discounts, hence safeguarding profit margins. For instance, providing customized promotions to identified segments can greatly enhance involvement and conversion rates, guaranteeing that discounts are used to establish enduring consumer connections rather than only attracting temporary bargain seekers.

2.1.3 Current and future trends

Regarding the present and future tendencies of this industry, we are seeing significant changes shaped by both long-term patterns and immediate needs. Bleaching agents-mostly used in the water treatment and paper sectors-are in increasingly demand right now. These sectors mostly depend on chlorine and sodium hypochlorite since, respectively, their capacity to bleach wood pulp and their very strong disinfecting properties. Allied industry Research indicates that this industry has great potential; so, the worldwide bleach market size was evaluated at \$3.1 billion in 2021 and is expected to reach \$4.5 billion by 2032, expanding at a CAGR of 3.5%. The market conditions in Portugal mirror a larger European trend toward more stringent regulatory norms, which are changing under increasing focus on environmental compliance and sustainability. Companies are under more and more pressure to follow strict reporting guidelines that guarantee little environmental effect, therefore promoting the acceptance of more sustainable goods and methods. For instance, coming into effect in 2024 the EU's Corporate Sustainability Reporting Directive (CSRD) requires thorough sustainability disclosures from businesses (Euromonitor, 2024). Supported by technological advancements aiming at increasing efficiency and reducing the environmental impact of bleaching operations, this regulatory push is driving a market shift towards eco-friendly bleaching agents like hydrogen peroxide, considered to be less harmful to the environment than conventional chlorinebased products. Innovations in recycling and reusing bleaching agents will not only assist to minimize waste and promote a circular economy but also enable the expansion of the industry outside traditional applications. Indeed, the food industry is clearly diverse where many types of bleach are used for food-grade purposes based on the increasing need for hygiene and safety in food processing plants. Globally, manufacturing prices and inflation affect the bleach market as well from economic standpoint. From 6.2% in 2023, the International Monetary Fund (IMF) predicts worldwide inflation rates to moderate to 4.1% in 2024, therefore impacting the cost structure of bleach manufacture and pricing policies all around (IMF, 2024). By 2024, inflation rates in Portugal are predicted to settle around 2.5%, down from the highs seen in 2022-2023 (Banco de Portugal, 2024), hence increasing the likelihood of a more consistent market situation for bleach manufacturers and users. With a

forecast GDP growth rate of 1.8% in 2024, which will help to boost consumer expenditure and industrial activity, the general trends in Portugal also show a good picture for economic development (Banco de Portugal, 2024). Rising environmental awareness combined with this economic backdrop should stimulate constant demand for environmentally friendly bleaching solutions. Ahead, the emphasis on sustainability should becoming more intense. Driven by consumer demand for openness and the necessity to avoid greenwashing, companies are probably going to spend more in certifications and outside verifications to support their sustainability claims. This tendency will affect the marketing and manufacturing techniques of bleaching agents, therefore bringing them into line with worldwide sustainability criteria and improving brand reputation (Euromonitor, 2024).

2.2 Overview of the Bleach Market in Italy

Valued at EUR 20,136,541 with a total volume of 765,883 units, the Italian bleach market is a dynamic part of the household cleaning goods sector marked by changing growth trends impacted by consumer behavior, economic situations, and legislative changes.



Figure 3 - Volume and Value of the Bleach Market in Italy (FY2021-FY2024)

As Highlighted in the chart, the bleach market in Italy, as it was in Portugal, showed a slight contraction in sales volumes, but a positive growth in sales value, with an overall increase of 38.7% in sales value. Again, it is highlighted that despite the stability or slight reduction in volumes, the market continued to grow in value terms, underlining the importance of factors such as inflation, price increases, and the shift towards higher-end products by Italian consumers. Right before, during the COVID-19 epidemic, the market showed great volatility; demand surged due in great part to bleach's acknowledged efficacy as a disinfectant. As homes all throughout Italy stocked up on cleaning supplies to keep hygiene and safety, this spike saw sales volumes reach hitherto unheard-of heights. Reflecting the more consumer attention on disinfection during the epidemic, data from Euromonitor International shows that bleach sales volumes rose by over 20% in 2020 compared to 2019 (Euromonitor International, 2024). But as the immediate effects of the epidemic faded, the market started to steady; sales volumes in 2022 dropped by about 3% as they recovered to pre-pandemic levels. The general market value stayed steady despite this drop because of inflationary pressures that drove price increases, therefore balancing the loss in sales volumes (Market Research.com, 2024). Consumer knowledge of environmental problems shapes the course of the bleach market in Italy more

and more. Traditionally dominating the market, chlorine-based bleach is under investigation currently because of its environmental effects, especially its contribution to water pollution and possible damage to aquatic ecosystems. Consequently, there has been a slow but notable change toward more environmentally friendly substitutes including peroxide-based and oxygen-based bleachers. Though still a small portion of the market, Altroconsumo (2023) claims that these substitutes have been becoming more and more popular especially among urban consumers who are ecologically sensitive. Growing customer demand for goods that not only efficiently but also fit with more general environmental and health issues supports this trend. Additionally, very important in determining the market have been economic considerations. Like most of Europe, Italy has been struggling with economic difficulties including inflationary pressures influencing the cost of energy and basic goods. These pressures have caused bleach product prices to rise generally, which affects consumer buying patterns. Tighter finances have many Italian homes looking more and more for private label goods that provide comparable efficacy at a reduced price. Making major gains into the industry and accounting for a rising portion of sales, private labels A reflection of the growing price sensitivity among Italian customers, a report by Pambianco Strategie di Impresa (2023) claims that private label bleach products have seized about 30% of the market. The success of bleach brands in Italy depends still mostly on distribution. The main outlets are supermarkets and hypermarkets, which account for around seventy percent of bleach sales. These retail stores gain from great geographic coverage and the convenience they provide to customers, who can quickly acquire a large variety of bleach goods on their frequent buying visits. ISTAT (2023) data shows that, despite a little drop in overall market quantities, consumer expenditure in these channels has stayed strong. Accelerated by the epidemic, e-commerce has also grown to be a quite crucial distribution method. Driven by its convenience, particularly for customers in rural locations or those trying to avoid packed places, online saleswhile still a smaller portion-have been consistently rising. But the nature of bleach as a somewhat dangerous substance presents difficulties for online sales, especially with relation to shipping and packing. Though improvements in packaging and logistics should assist overcome these obstacles in the future, issues such spillage risk and the proper handling of bleach during delivery have somewhat hindered the expansion of this channel. Particularly in rural areas where consumers value the personal care and convenience these outlets provide, traditional retail establishments-including discount stores and smaller, individually owned businesses-continue to be quite important in the distribution of bleach. Particularly in view of growing living expenses, discount businesses have witnessed more foot traffic as people search for methods to save money. Usually combining branded products with private labels, these stores let customers select depending on their budget and tastes (Pambianco Strategie di Impresa, 2023). In Italy, as well, it is crucial to analyse the inflation rate trend to give a more comprehensive analysis of the macroeconomic factors influencing the bleach market. From January 2021 to July 2024, Italy's inflation rate steadily rose, suggesting continuous inflationary pressures over the three- and a-half-year period. Starting at 103.3 in January 2021, the inflation index climbed to 121.2 by July 2024, showing a total rise of practically 17.3%. With the index climbing from 106.6 in January 2022 to 113.9 in July 2022, therefore reflecting a 6.8% increase over a sixmonth period, the most noticeable jump occurred from early 2022 to mid-2022. This notable increase points to a phase of increased inflationary force, maybe brought on by internal factors like rising energy costs or supply chain interruptions or outside economic events. Following the unexpected rise, Italy's inflation rate stayed rather consistent, with little fluctuations, and usually settled between the range of 119–120 on the index from mid-2023 to mid-2024. This implies that, despite still existent inflationary pressures, their intensity has dropped. The slight increase in 2024 shows that, although inflation still causes concerns, it is now more predictable and under control.



Figure 4 - Italy's inflation rate trend (FY2021-FY2024)

The Italian inflationary trend has surely had a significant impact on the bleach sector, especially on sales value, which has increased pricing pressure. Figures 3 and 4 clearly show that, despite steady or somewhat declining volumes, the inflationary background probably explains the continuous rise in sales value. Thus, increased prices brought on by inflation might have offset any declines in volume, so producing a total market value increase of 38.7% over the three fiscal years.

2.2.1 Competitive analysis

Several major companies, each with a unique market position, define the competitive scene of the Italian bleach market. Produced by Fater, ACE is the market leader and has virtually come to represent bleach exclusively in Italy. Strong brand recognition, aggressive marketing campaigns, and a large product line that meets different cleaning needs help to preserve the brand's supremacy. The fact that ACE is so widely available across big retail outlets-including hypermarkets and supermarketshelps to confirm its market dominance. Federchimica (2023) claims that ACE is a household name all throughout the nation since it holds a big part of the market. Another major competitor in the market under Gruppo Desa is Chanteclair, a brand recognized for its strong cleaning ability and unique scent. Particularly in southern Italy, where it is preferred for heavy-duty cleaning jobs, Chanteclair has carved out a significant market share. The brand's strong consumer base and good brand positioning (Euromonitor multinational, 2024) are shown by its ability to keep its market position among rising competition from both multinational brands and private labels. One of the most obvious changes in the Italian bleach market over the past ten years has been the emergence of private labels. Typically, less expensive than branded options, supermarket groups including Coop, Esselunga, and Conad have launched their own bleach products. Particularly among consumers who value cost above brand loyalty, these private label products have become rather popular very quickly. Pambianco Strategie di Impresa (2023) clearly shows the larger change in consumer behavior towards more price sensitivity: private brands currently account for almost thirty% of bleach sales in Italy.

Apart from these main participants, smaller regional brands and environmentally friendly substitutes have also gained notable penetration into the market. Particularly people who are environmentally concerned and ready to spend more for goods that fit their ideals, these companies often appeal to niche markets. Gradually taking front stage are environmentally friendly bleaches, which contain biodegradable components and are promoted as safer for human health as well as the surroundings. Still, Altroconsumo (2023) reports that they account for a lesser share of the whole market.

2.2.2 Pricing strategies and promotions

In the Italian bleach market, consumer tastes, economic situation, and competition all greatly impact pricing policies. Using their great brand equity to support more prices, major brands like ACE keep a premium pricing approach. Frequent marketing campaigns, especially at supermarkets where discounts, loyalty programs, and bundle offers are utilized to draw customers and keep market share encourage this approach. For example, ACE frequently runs aggressive marketing initiatives to boost sales during high-traffic shopping seasons like holidays, therefore helping the company to keep its top position (MarketResearch.com, 2024.). Conversely, private labels appeal to cost-conscious consumers less focused on brand names since they are positioned as more reasonably priced substitutes. Usually priced less than branded choices, these products are pushed through in-store discounts and bulk-buy campaigns. These campaigns' success shows Italian consumers' growing price sensitivity—especially considering the current situation. Driven by these competitive pricing techniques, private brands have witnessed notable rise in market share according to Pambianco Strategie di Impresa (2023). Pricing policies for smaller brands-especially those with environmentally friendly products-especially highlight the added value of sustainability and health benefits. Because of their unique approach and premium that consumers are ready to pay for goods that fit their environmental beliefs, these businesses sometimes demand more costs. These more expensive rates, however, can restrict the market size since they mostly draw a particular group of consumers that give environmental issues top priority over price. Notwithstanding this, the increasing demand for sustainable products points to eco-friendly brands maybe continuing to proliferate on the market even with their premium price (Federchimica, 2023).

3.2.3 Current and future trends

Looking ahead, the Italian bleach industry is projected to keep changing in reaction to numerous important trends. Among the most important are growing European Union regulatory pressure aimed at higher environmental requirements. With businesses concentrating on creating less detrimental to the environment bleaches, these rules are probably driving creativity in product compositions. This can call for more environmentally friendly packaging solutions as well as biodegradable materials. Federchimica (2023) claims that businesses trying to keep their market share in the next years would have great need of following these rules. Furthermore, predicted to be vital for the direction of the market are technological developments. New kinds of bleach that provide the same degree of cleaning ability as conventional solutions but with less environmental impact could result from creative ideas in product compositions. Furthermore, better packaging—including more robust materials and spill-proof designs—may assist to solve some of the difficulties in selling bleach online. These

developments will be crucial to grab a bigger portion of the industry as e-commerce keeps expanding (Altroconsumo, 2023). Furthermore, influencing the market will be economic aspects. Consumers are projected to remain price-sensitive given inflation and economic uncertainties likely to linger, which will help the private label market develop even more. The growing focus on sustainability, however, could cause the industry to split with both more reasonably priced conventional bleaches finding their niche and luxury environmentally friendly solutions. Companies who can successfully negotiate these changes by providing a mix between cost and environmental conscience will probably be in a good position to thrive in this changing market (Euromonitor International, 2024). In the Italian bleach market, consumer choices are progressively shaped by environmental, safety, and health issues. The possible risks connected to conventional chlorine-based bleaches-including respiratory problems, skin irritation, and environmental damage-are becoming more and more well known. Younger consumers and families with dogs or children, who are more prone to search for safer substitutes, especially exhibit this awareness. Consequently, advertised as being milder and more ecologically friendly, oxygen-based and peroxide-based bleachers have clearly taken front stage. Customers seeking efficient cleaning solutions free of compromise on safety or environmental impact will find attraction in these items. Though demand for these substitutes is rising, chlorinebased bleach is still extensively used, especially among elderly users who depend on its efficacy and are less inclined to change to newer products. Choice of packaging also reflects the tendency toward sustainability. Customers are seeking for goods with less plastic or recyclable packaging more and more. Companies who can match these ideals will probably appeal to the rising group of ecologically minded consumers. Furthermore, there is growing desire in versatile cleaners that can replace bleach in serving purposes without running the related hazards. Urban locations, where space is limited and consumers want the ease of having one product that can perform several tasks, are especially where these goods are most sought for.

2.3 Comparative Market Analysis: Portugal and Italy

The bleach markets in Portugal and Italy, while sharing overarching trends, are influenced by distinct local dynamics, economic conditions, and consumer behaviors, resulting in varied market landscapes. Both markets experienced growth in sales value despite a slight contraction or stability in volumes, a phenomenon mainly attributable to the inflationary pressures of recent years. In Portugal, inflation contributed substantially to the increase in market value, offsetting fluctuations in sales volumes. This is evident from the fact that, despite the volatility in quantities sold, the Portuguese market has seen a 23.2% growth in sales value over the last three fiscal years. In Italy, the context is similar, with 38.7% growth in sales value, an even stronger increase due to persistent but more controlled inflationary pressures than in Portugal, and a greater propensity of Italian consumers towards highend products. In fact, inflationary pressures have differentiated the two markets. Portugal has experienced more erratic inflationary trends, with significant spikes, particularly in mid-2022, creating a challenging environment for pricing strategies. The inflation rate in Portugal rose nearly 20.5% between January 2021 and July 2024, with sharp increases impacting consumer purchasing power and market stability. In contrast, Italy's inflation rate, though also rising, has been more stable, with a 17.3% increase over the same period. This steadier inflationary environment has allowed for

more predictable market conditions, although it has also necessitated adjustments in pricing strategies, particularly for premium brands that rely on maintaining higher price points.



Figure 5 - Portugal and Italy's inflation rate trend (FY2021-FY2024)

Both countries have seen a significant rise in the popularity of private label products, driven by increasing price sensitivity among consumers. However, the pace and impact of this trend differ between the two markets. In Portugal, private labels have steadily gained ground, reflecting a broader shift toward affordable, high-value options as consumers become more selective in their purchases. This shift is partly fueled by the consistent performance of supermarkets, which dominate the distribution of bleach products, accounting for the most of share of both sales volume and value. On the contrary, the Italian market is more fragmented, with significant contributions from hypermarkets, traditional retail outlets, and an emerging e-commerce sector. While supermarkets and hypermarkets remain the primary sales channels, the pandemic has accelerated the growth of online sales, despite the challenges associated with shipping bleach products. Finally, sustainability has emerged as a critical driver in both markets, though with different levels of intensity. In Italy, there is a clear and growing demand for environmentally friendly bleach products, driven by both consumer awareness and stringent European Union regulations. Brands that offer eco-friendly alternatives, such as peroxide-based bleaches, are gradually gaining market share, appealing particularly to urban, environmentally conscious consumers. This trend is reinforced by Italy's strong regulatory framework, which is pushing companies to innovate and adopt more sustainable practices. In Portugal, the shift towards sustainability is present but less pronounced. The market is beginning to move towards eco-friendly products, supported by increasing regulatory pressures and consumer awareness. However, the adoption of these products is still in its early stages compared to Italy. Looking forward, both markets are expected to continue evolving under the influence of these trends. In Portugal, the emphasis will likely remain on balancing competitive pricing with the gradual integration of more sustainable products. The use of advanced data analytics and AI-driven pricing strategies will be crucial for companies to navigate the volatile inflationary environment and maintain profitability. In Italy, the focus will likely be on maintaining premium branding while expanding the market for eco-friendly products. The ongoing economic uncertainties are expected to sustain the growth of private labels, but the increasing demand for sustainability could lead to a bifurcation of the market, with both budget-friendly conventional bleaches and premium environmentally friendly solutions coexisting.

2.4 Neoblanc and ACE

ACE stands as the overarching brand within Fater's extensive portfolio, encompassing the Neoblanc product line, which retains its distinct name and presence in Portugal. Despite their different origins, ACE and Neoblanc are now both running under the strategic umbrella of Fater, which is itself a joint venture between Procter & Gamble and Angelini Industries. Both of them have grown to signify reliability, innovation, and quality in the bleach and domestic cleaning indust industries across their respective markets, with Neoblanc prominent in Portugal and ACE leading in Italy.

Originally a local success story with the building of a production plant in Porto, Neoblanc was founded in 1975 by a family of entrepreneurs in Portugal. The brand quickly became synonymous with bleach in Portugal, known for its powerful disinfection capabilities and trusted by generations of consumers. Procter & Gamble (P&G) bought the brand together with its Porto facility in 1989 after seeing Neoblanc had created a strong market presence and, since it gave Neoblanc access to P&G's worldwide product development and marketing knowledge, this acquisition represented a turning point in the company's history. Understanding that Neoblanc's local origins and brand loyalty were vital to its ongoing success, P&G took a deliberate choice to keep the brand's identity despite purchase. In 2013, Neoblanc was transferred to Fater as part of a strategic move by P&G to streamline its operations and focus on core markets. Already a successful joint venture with thorough knowledge of the European market, Fater recognized huge possibilities in Neoblanc making the brand part of its larger plan to increase its portfolio in the home care market. This allowed Neoblanc to transform from a bleach-oriented brand into a complete fabric and home care megabrand. Neoblanc has not only kept its market leadership in Portugal but also entered new product areas and international markets, providing over forty items across five categories now since joining Fater. These include creative products like Neoblanc Spray Mousse and WC Gel, which honor the brand's dedication to satisfy changing consumer wants while adopting eco-friendly methods in response to mounting environmental issues. Furthermore, clear evidence of Neoblanc's innovative approach is its packaging improvements, which include ergonomic bottles and child-resistant lids so improving user ease and safety. From a locally respected bleach brand to a key participant in the European fabric and home care market, this development highlights Neoblanc's capacity for adaptation and success under Fater's direction.

On the other hand, for decades ACE has been an institution in Italian homes. Originally created by Procter & Gamble, ACE—like Neoblanc in Portugal—became to represent bleach in Italy. Renowned for its strong cleaning and disinfecting qualities, ACE became the market leader promptly and developed a reputable name all throughout the country, also thanks to its reputation for trustworthiness and efficiency, which developed from its brand equity. Under a more general strategic move, ACE was acquired by Fater in 2013 to increase its presence in the European household cleaning industry. This acquisition allowed Fater to leverage ACE's strong brand recognition and integrate it into its portfolio, where it could benefit from Fater's expertise in product innovation and market

expansion. Under Fater's management, ACE has continued to dominate the Italian market while expanding its product range to meet the changing needs of consumers. The product lines of the brand now comprise both more specialist solutions like ACE Gentile, which provides a softer, fabric-safe bleaching option, and classic bleach products like ACE Hypo. From those looking for the best possible disinfection to those who give fabric care and environmental sustainability priority, this growth has let ACE serve a larger audience. ACE's dedication to innovation is shown in its ongoing creation of fresh goods and packaging ideas, therefore guaranteeing the brand's relevance in a very competitive industry. Fater's calculated environmental expenditures have also helped ACE fit more general market trends, especially as consumers seek environmentally friendly cleaning solutions more and more.

Under Fater's management, both brands—Neoblanc leading in Portugal and ACE commanding a significant share in Italy—have managed to adapt to the needs of their respective markets. Their histories of local success, strategic acquisitions, and continuous innovation highlight Fater's ability to manage and grow iconic brands, so ensuring their continued relevance and leadership in the always changing household cleaning sector. Though distinct in their identities and market focuses, they share a commitment to innovation, quality, and sustainability under Fater's stewardship.

2.4.1 Neoblanc Hypo

Representing the main strength of the Neoblanc brand in the Portuguese market, Neoblanc Hypo is the flagship product range. Originally introduced as a strong bleach for domestic use, Neoblanc Hypo has evolved into a must-have item in many Portuguese houses. It is quite successful for deep cleaning and disinfection over many surfaces, including bathrooms, kitchens, and laundry because of its great concentration of active chlorine. Neoblanc Hypo's fast acting solution guarantees complete cleansing and helps customers save time by producing instant effects. The product line is available in multiple formats to cater to different consumer needs, including Hypo thin in 1L, 2L, and 4L bottles, Hypo thick, a more specific and dense formula, in 1L and 2L bottles, as well as specialized forms like spray mousse and Hypo tabs. These developments have given Neoblanc more freedom and convenience, which has helped them to keep a leading share in the market. The brand's creative ideas, such the Fabric Safety System, guarantee that materials are kept safe during washes, therefore avoiding damage and providing outstanding cleaning power. Neoblanc's thickened formulations-available in both regular and scented forms-also help to lower the chance of splashing, therefore improving user ease and safety. Maintaining its competitiveness has mostly depended on the pricing strategy of the brand, which provides premium items at reasonable rates and usually combined with promotional discounts fostering consumer loyalty. For example, the 4L box is a common choice for budgetconscious buyers since it usually shows notable price cuts during specials. With so many people depending on Neoblanc Hypo for their cleaning needs, this mix of creativity, strategic pricing, and great distribution has solidified Neoblanc Hypo's leadership in Portugal. Beginning at about 18% in July 2021, Neoblanc Hypo's market share showed rather steady performance with minor swings until mid-2022. Starting in August 2022, however, market share visibly dropped; by the end of 2023 and into early 2024, it had decreased by roughly 14%. Though there are occasional small rebounds, overall, the pattern shows a gradual decline over the time.



Figure 6 - Market Share Trend of Neoblanc Hypo in Portugal

As shown in the following graph, Neoblanc's performance for the product Hypo in terms of sales volume (SU) shows a noteworthy variation over the past three fiscal years. Specifically, sales decreased of approximately 13.6% from FY22 to FY23, followed by a slight recovery to 206,004 SU in FY24, reflecting a modest increase of about 2.3% from FY23 to FY24. Overall, this trend reflects a total decline of approximately 11.6% during the three fiscal years.



Figure 7 - Comparative Sales Volume (SU) Trend for Hypo in Portugal

Although Neoblanc's sales have dropped, this little increase in FY24 points to some attempts by the brand to consolidate its market position following the first fall. By contrast, the private labels (PL) have shown a significant increase in sales, with a growth of roughly 28.7% over the three years, including a 11.7% rise from FY22 to FY23, and a further 15.2% increase from FY23 to FY24. As private labels keep taking a bigger share of the market, this shows a clear change in customer inclination for private label items, thereby stressing the increasing competitiveness for Neoblanc. Meanwhile, other competitors (AO) in the market have also seen a steady increase in sales with a starting 6.2% increase from FY22 to FY23 and then a further growth of about 12.4% in FY24.

Similarly, Neoblanc's performance in terms of total sales value, as depicted in Figure 5, reflects a period of slight fluctuation followed by stabilization over the three fiscal years.



Figure 8 - Comparative Sales Value Trend for Hypo in Portugal

As can be seen, Neoblanc Hypo's sales value firstly decreased of approximately 5.8% between the first two fiscal years, then regaining momentum in FY24, with sales value climbing to \notin 10,905,958, representing a 9.0% increase from the previous year and an overall growth of 2.7% from FY22 to FY24. This slight recovery suggests that while Neoblanc faced challenges in FY23, it managed to retain a stable market position by FY24. With a cumulative rise of 45.3% over the whole described period, the private labels (PL) displayed a significantly more aggressive growth path. This notable increase highlights a strong consumer movement toward private label goods, so offering a serious competitive challenge to well-known companies such as Neoblanc. Finally, other competitors (AO) in the market demonstrated steadier, albeit slower, increase in their total sales value with an overall growth of 14.9%, showing a stable presence in the market but highlights that the more dynamic changes are occurring within the private label segment. Over the observed period, Neoblanc Hypo's pricing approach clearly shows a concentration on progressively raising the price of the product to support its premium brand status in the bleach industry.



Figure 9 - Comparative Pricing Strategy for Hypo in Portugal

The accompanying graph demonstrates this approach, starting at €1.95 in the initial period and showing slight fluctuations but consistently trending upwards, reaching approximately €2.50 by July 2024, showing a significant overall increase of around 31.6%. Throughout the timeline, Neoblanc Hypo maintained its position as the highest-priced product compared to its competitors, including private labels and other brands (AO). Particularly between early 2023 and mid-2024, the constant price rises point to an intentional focus on maintaining the brand's premium quality. For example, the price increased from almost €2.10 in early 2023 to almost €2.50 by mid-2024, hence underlining Neoblanc Hypo's emphasis on leveraging its significant market position and customer loyalty. On the contrary, private label products showed much more modest price increases, starting at €1.14 and reaching €1.29 by the end of the period, with an increase of only 13.2%. Similarly, the other competitors saw their prices rise from €1.47 to €1.94, a 31.9% increase, yet remained below Neoblanc Hypo's pricing. More precisely, Neoblanc Hypo's pricing trend is visually shown by the red line in the graph above. The most substantial price increases occurred from late 2022 onwards, with the price beginning to rise more sharply in early 2023, refelcting a strategic decision to push the price higher, likely in response to market conditions and to further solidify the brand's premium positioning. Neoblanc's pricing approach seems to be more oriented on preserving a price premium that reflects the perceived quality and market positioning than on competing on price. This strategy could be used to appeal to consumers who are ready to spend more for a product they consider to be better quality or more dependable, therefore ensuring that Neoblanc Hypo stays unique in a market getting more competitive with less-priced substitutes. To conclude the Neoblanc Hypo's market description, it is crucial to analyse its sales location strategy, which is mostly dependent on supermarkets; between FY22 and FY24, these account for over 57% of the total sales. This brand's strong presence in supermarkets highlights its reliance on them to attract a significant client base. However, this big concentration might become dangerous if consumer buying patterns start favouring different retail environments. To differentiate, Neoblanc Hypo generates 19% of its sales in hypermarkets, larger retail environments catering to consumers seeking variety and wholesale offers. The 24% of sales linked to livre servicios shows a constant but unchanging presence in these channels of distribution. This suggests Neoblanc Hypo might not be optimizing its opportunities in these specialized markets. Neoblanc relies significantly more on Portuguese supermarkets than ACE products, which are more fairly distributed in many types of retailers. This suggests a possibility for strategic adaptation to develop other sales channels and reduce dependence on supermarkets.



Figure 10 - Sales Location Analysis Neoblanc Hypo Portugal

2.4.2 Neoblanc Gentile

Neoblanc Gentile provides a softer, color-safe bleach solution fit for contemporary homes, so complementing the Hypo range. Fater created Neoblanc Gentile to close this void in the market after seeing there was a need for a bleach that could efficiently clean without harming delicate or vivid fabrics. Along with bleach tabs with controlled dosing and simplicity, the product line comprises several sizes of bottles such as 1L, 2L, and 5L. Advanced technologies like Protect-Fiber help Neoblanc Gentile create formulations that guarantee clothes maintain their brightness and softness even after several washings. Customers who are ecologically aware and give safety and efficacy top priority in their cleaning solutions have especially found resonance in this product range. Offering a dependable and mild substitute for conventional bleach, Neoblanc Gentile is perfect for homes with small children, delicate skin, or environmental concerns. Particularly popular products are the tabs since they offer a mess-free, simple solution that lowers the chance of over-bleaching and fabric damage. Strong market performance has been observed by Neoblanc Gentile, especially in supermarkets and hypermarkets where it gains from clever shelf placements and focused promotions raising its visibility and appeal. From 22.9% in 2022 to 28.4% in 2023, the price approach of the product-which comprises in-store discounts and promotions-has been successful in boosting market share development. From those looking for a mild bleach for delicate clothing to those wanting for a safe and efficient cleaning solution for daily use, this success highlights Neoblanc Gentile's capacity to satisfy a varied customer base. As indicated in the graph, in July 2021 Neoblanc Gentile's market share was at 35%. It did, however, steadily decrease, falling to 27% by February 2022. This decline persisted; the market share dropped to 21% between April 2022 and November 2022, indicating a more notable fall. Without any significant comeback, the market share settled at 22% to 24% by 2023 and into 2024.



Figure 11 - Market Share Trend of Neoblanc Gentile in Portugal

Talking about the sales volume for Neoblanc Gentile, as depicted in the accompanying chart, the trend keeps showing a significant decrease over the last three fiscal years. Sales volume declined of approximately 37.3% between FY22 and FY23, a drop that continued into FY24, with sales further reducing of about 7.7% from the previous year. Overall, Neoblanc Gentile saw its sales volume decrease by approximately 42.1% from FY22 to FY24, suggesting that Neoblanc Gentile is encountering considerable difficulties in retaining its market share, likely due to intensified competition and shifts in consumer behavior.



Figure 12 - Comparative Sales Volume (SU) Trend for Gentile in Portugal

In contrast, the private label (PL) segment has exhibited much greater stability. Sales for private label products declined only slightly from 356,376 SU in FY22 to 345,243 SU in FY23, and then remained almost unchanged at 345,076 SU in FY24, resulting in a total decline of just 3.2% over the three-year period. This minimal decrease highlights the resilience of private labels in maintaining their market position despite the overall reduction in demand for Gentile bleach products. Other competitors also experienced a drop in sales, leading to a total decrease of 40.4% over the three years. On the contrary, total sales value for Neoblanc Gentile Bleach remained relatively stable between FY22 and FY23, with a slight decrease from €3,031,708.03 to €3,015,909.21, a marginal decline of 0.5%.



Figure 13 - Comparative Sales Value Trend for Gentile in Portugal

The graph clearly shows how FY24 marked a significant recovery and growth for Neoblanc Gentile, with a substantial growth of 14.9% from FY23, implying that Neoblanc Gentile successfully capitalized on market opportunities or implemented effective strategies to regain and even exceed its previous sales value. By contrast, the private labels experienced consistent growth across the three fiscal yearsm with a steady overall increase of 9.9%. This indicates that private labels continue to strengthen their position in the market, offering consistent competition to Neoblanc Gentile. Other competitors in the Gentile Bleach category, experienced a decline in sales value with a reduction of 19.4%. By analysing now Neoblanc Gentile's pricing strategy. it is possible to see similarity with Neobalnc's Hypo, therefore demonstrating a consistent approach across the two types of products.



Figure 14 - Comparative Pricing Strategy for Gentile in Portugal

As reflected in the graph, the brand shows a strategy for keeping and improving the premium position of the brand inside the Gentile bleach market. Starting at \notin 4.01 in the initial period, the price for Neoblanc Gentile showed some fluctuations but overall followed an upward trend, reaching \notin 5.01 by the end of the observed period, with an overall increase of approximately 24.9%. Throughout the

timeline, Neoblanc Gentile consistently maintained a significantly higher price point compared to its competitors, including private labels and other brands (AO). Also in this case, private label products showed much more modest price changes, starting at around €1.03 and ending at €1.27, a rise of only 23.3%. Meanwhile, the other competitors displayed a more varied pricing trend, with prices fluctuating between €2.62 and €3.51, indicating a less consistent pricing strategy compared to Neoblanc Gentile. This method fits a premium branding strategy in which the goal is to support higher pricing by means of strong brand loyalty and supposed better quality of the product. Consistent price increase by Neoblanc Gentile indicates confidence in its brand equity and market orientation. The brand could be testing the market's capacity for more expenses by progressively raising prices, hence strengthening its premium image. This approach is especially pertinent in a competitive environment where private labels, usually less expensive, keep constant prices, therefore Neoblanc Gentile must differentiate itself by quality and brand reputation instead than participating in price competition. The analysis of sales locations reaffirms that supermarkets serve as the primary distribution channel for Neoblanc Gentile Bleach products, similarly to Neoblanc Hypo, accounting for 52% of total sales from FY22 to FY24. Notwithstanding the significance of supermarkets, this indicates a little drop in compared to Neoblanc Hypo, suggesting that Neoblanc Gentle may face more fierce competition or changes in consumer preferences inside this distribution channel. With 24% of revenues, hypermarkets equal the sales produced by Neoblanc Hypo, suggesting in bigger retail environments a regular and dependable performance. The consistent 24% sales share from livre servicios channels matches the Hypo version and implies that Neoblanc Gentle stays somewhat similar in smaller, independent companies.



Figure 15 - Sales Location Analysis Neoblanc Gentile Portugal

2.4.3 ACE Hypo

ACE Hypo is the cornerstone of the ACE brand in Italy, embodying the brand's commitment to providing powerful cleaning and disinfection solutions. ACE Hypo is a reliable solution for houses that need thorough cleaning, especially in families with children or pets where hygiene is most important because of its great concentration of active chlorine. The wide range of products of the

company gives customers freedom to select the format most appropriate for their cleaning needs, ranging from products like ACE Hypo Gel and ACE Hypo Spray, as well as liquid bleach in 1L, 2L, and 4L bottles. As for Neoblanc Hypo products, Protect-Fiber technology and thicker are examples of innovations to improve safety and simplicity of use of the products. Fater's calculated strategy to ACE Hypo consists in regular promotions during the busiest shopping seasons, providing notable discounts that support consumer trial and strengthen the value proposition of the brand. Strategic instore placements and these specials have helped ACE Hypo stay competitive in a sector where private brands are growingly common. The brand's ongoing attention on consumer requirements and innovation has guaranteed its relevance in the Italian market, thereby preserving its household staple reputation. Differently from Neoblanc, ACE Hypo had significant market share fluctuation. It started about 42% in July 2021, peaked close to 46% in late 2022 and early 2023, as highlighted by the graph.



Figure 16 - Market Share Trend of ACE Hypo in Italy

But from mid-2023, the market share gradually dropped; by mid-2024 it closes at roughly 40% to 42%. Though it had peaks and valleys, the product finally trended down. On the contrary, the sales volume data for ACE Hypo in Italy over the past three fiscal years presents a picture of relative stability, despite some minor fluctuations.



Figure 17 - Comparative Sales Volume (SU) Trend for Hypo in Italy
From the graph, it is evident that ACE Hypo started with a strong sales volume of 2,354,642 units in FY22, slightly decreasing of 2.8% in FY23. However, the brand managed to recover in FY24, reaching 2,343,087 units, marking a modest increase of 2.4% from FY23. Overall, the three-year trend shows a very slight decline of 0.5% from FY22 to FY24, indicating that ACE Hypo has largely maintained its market presence in Italy over this period. Regarding private label products, they showed a more pronounced fluctuation in sales volumes, with a notable decline of 8.6% after the firs fiscal year and a following recovery of 13.2% in FY24, making it an overall increase of 3.5% over the three-year period. Other competitors (AO) in the market, however, experienced a steady decline in sales volumes, with a total decrease of 8.9% over the three fiscal years, indicating a gradual loss of market share in this segment. Building on the sales volume analysis, based on the data in the graph, ACE Hypo in Italy over the same three fiscal years underscored the brand's ability to translate its stable volume performance into significant revenue growth.



Figure 18 - Comparative Sales Value Trend for Hypo in Italy

ACE Hypo's sales value began at €87,284,874 in FY22 and experienced a robust increase to €94,879,877 in FY23, which marks an impressive growth of 8.7%. This positive trend continued into FY24, where the sales value reached €102,604,261, reflecting a further increase of 8.1% from the previous year. Cumulatively, ACE Hypo's sales value grew by 17.6% from FY22 to FY24, reinforcing the brand's strong market position and effective pricing strategy. In comparison, the private label segment also showed substantial growth, though at a faster pace than ACE Hypo, with a cumulative growth of 27.7% over the three years. This renforces the growing competitive threat from private labels, which are rapidly gaining ground in terms of revenue. Meanwhile, the other competitors displayed a much more modest growth trajectory, reflecting an overall growth of 7.5% over the three fiscal years. This shows their struggle to match the pace set by ACE Hypo and private labels. Aligned with Neoblanc, also ACE Hypo Bleach has positioned itself as a premium brand in the Italian market, with a pricing strategy that emphasizes its superiority over competitors.



Figure 19 - Comparative Pricing Strategy for Hypo in Italy

From July 2021 to July 2024, ACE Hypo's price per unit increased by approximately 15.8%, rising from $\notin 2.03$ to $\notin 2.35$, as represented in the graph. Checking on the competition, the price of private label bleach increased by 20%, from $\notin 0.95$ to $\notin 1.14$ per unit, while other branded competitors (AO) saw their prices rise by about 28.8%, from $\notin 1.39$ to $\notin 1.79$ per unit over the same period. Despite the more significant percentage increases among competitors, ACE Hypo maintained a substantial price premium. By July 2024, ACE Hypo's price was approximately 104% higher than that of private labels and about 31.3% higher than other brands (AO). Moreover, while private labels and the other competitors narrowed the price gap slightly with ACE Hypo, they still trail significantly, indicating that ACE's premium pricing strategy remains effective in differentiating it from the competition. ACE Hypo's strategy appears to be one of gradual price increases to match inflation and market conditions, without eroding its competitive edge. Moreover, ACE Hypo's distribution strategy in Italy is different and more diverse than that of Neoblanc goods in Portugal.



Figure 20 - Sales Location Analysis ACE Hypo Italy

The graph shows that, comparatively to Neoblanc's reliance on supermarkets as the main distribution location, supermarkets for ACE Hypo account for just 32% of total sales from FY22 to FY24. This suggests that ACE has a more balanced approach, thereby reducing dependency on any one channel,

especially in cases of supermarkets' indispensable importance. Given that hypermarkets account for 23% of sales, these larger retail stores obviously exhibit a strong and consistent performance—which is crucial for drawing a large audience including those looking for mass purchases. Particularly 10% of sales originate from low-cost outlets, which highlights ACE Hypo's reach to consumers in an area where Neoblanc's products barely find application. Having a 35% share from other channels, such as minimarkets and drugstores, ACE Hypo has successfully entered alternative retail environments including large, specialized stores or internet markets.

2.4.4 ACE Gentile

ACE Gentile was developed in response to the expanding need for milder bleach chemicals meant for fabrics that nonetheless have cleaning power. Although this product range is made to be as clean as ACE Hypo, its formulation is suitable for use on delicate and colored fabrics. ACE Gentile comes in several configurations. ACE Gentile was developed in response to the expanding need for milder bleach chemicals meant for fabrics yet still powerful for cleaning. Although this product range is made to be as clean as ACE Hypo, its formulation is suitable for use on delicate and colored fabrics. Liquid bleach and bleach tabs are among the several forms ACE Gentile comes in, giving customers choices to fit their tastes and cleaning demands. Also here, advanced technology plays a central role to gather more consumers, also those who worry about the possible damage conventional bleach could inflict on their clothes especially depend on this technology. Particularly for younger homes and those emphasizing environmental friendliness, ACE Gentile's market success has been rather robust. Fater's attempts to lower the environmental effect of its packaging and formulations indicate the product's dedication to sustainability, in line with more general market trends toward greener consumer options. The success of ACE Gentile is supported by its strategic marketing and pricing strategies, which include in-store promotions and discounts that enhance its visibility and consumer appeal. The product has seen significant growth in market share, reflecting its ability to meet the needs of Italian consumers who prioritize both fabric safety and environmental responsibility. ACE Gentile's strong performance in supermarkets and hypermarkets highlights the effectiveness of Fater's approach in positioning the product as a leading choice for consumers seeking a safe and reliable bleach for their laundry and household cleaning needs.



Figure 21 - Market Share Trend of ACE Gentile in Italy

Starting in July 2021 at 62%, ACE Gentile has the largest market share among the goods. The market share displayed swings between 60% and 70% over the time; peaks in different periods of 2022 and 2023 around 70%. Though there were significant declines, mostly in late 2023, the product kept a firm hold on the market ending at roughly 64% to 67% in mid-2024. It is good to highlight how ACE Gentile sales volume has experienced a significant and steady increase over the past three fiscal years, starting from a rise of 12.8% from FY22 to FY23. The graph outlines this growth trend that continues into FY24, with a further 14.2% increase from the previous year, making ACE Gentile's sales volume expanded by 28.8% over the three-year period in total.



Figure 22 - Comparative Sales Volume (SU) Trend for Gentile in Italy

On the other hand, private labels displayed more fluctuation, starting with a decrease of 3.5% and then a significant 28.4% rise from the previous year, culminating in an overall growth of 23.8% over the three years. Other competitors (AO) showed a more moderate and stable performance, with an overall growth of 16.3% from FY22 to FY24. The positive trend in sales volume for ACE Gentile is mirrored in its sales value, which saw substantial growth across the same period. With the same trajectory, starting at €44,279,908 in FY22, ACE Gentile's sales value increased to €51,693,644 in FY23, marking a 16.7% rise. This upward trend continued into FY24, where sales value reached €63,817,260, reflecting an additional 23.5% increase from the previous year, as the graph shows.



Figure 23 - Comparative Sales Value Trend for Gentile in Italy

Over the three-year span, ACE Gentile's sales value rose by 44.1%, highlighting the brand's effective market positioning and pricing strategy. In comparison, private labels also saw significant growth in sales value, despite the earlier fluctuations in volume, with a cumulative 42.9% increase in sales value over the three years, reflecting their competitive presence in the market. On the other hand, the other competitors (AO), while less dynamic, still achieved growth in sales value, starting with a marginal growth of 0.4%, before jumping to a further increase of 25.0% in FY24. As it was for Neoblanc and ACE Hypo, also ACE Gentile Bleach has adopted a clear premium pricing strategy. From July 2021 to July 2024, the price of ACE Gentile increased by approximately 15%, rising from €2.86 to €3.29 per unit. Comparing this with the competitors, private labels saw their prices increase by about 23.6%, from €1.27 to €1.57, and other brands (AO) increased their prices by 28%, from €1.50 to €1.92. Despite these significant percentage increases, ACE Gentile still commands a substantial price premium. By the end of the period, ACE Gentile's price was about 109% higher than private labels and 71% higher than other brands (AO), reinforcing its strong positioning as a premium product. The following chart indicates that while ACE Gentile maintained a relatively stable price trajectory, with some fluctuations, it significantly outpaces its competitors in terms of absolute price levels.



Figure 24 - Comparative Pricing Strategy for Gentile in Italy

ACE Gentle Bleach in Italy reflects the varied approach taken with ACE Hypo but with much more focus on alternate channels. According to the following bar chart, supermarkets account for 30% of total sales from FY22 to FY24, slightly less than ACE Hypo, suggesting ACE Gentle may be positioned more as a premium product with wider appeal beyond conventional retail environments. Hypermarkets provide 19% of sales, somewhat less than the Hypo version, while discount store only 10% of sales, suggesting that ACE Gentle is targeting a different consumer base that may prioritize quality over quantity purchase. The most remarkable feature of ACE Gentle's sales location is the 41% sales share from other channels, such as minimarkets and drugstores, the highest of all the goods examined, confirming the ability of ACE Gentle in attracting niche consumers



Figure 25 - Sales Location Analysis ACE Gentile Italy

2.5 Comparative Analysis: Neoblanc and ACE

The comparative analysis of the Neoblanc brand in Portugal and ACE in Italy, focusing on their respective products Hypo and Gentile, offers an in-depth perspective on how varying market dynamics, economic situations, and consumer behaviors have influenced the success of these prominent brands. In Portugal, Neoblanc Hypo and Gentile have both faced challenges in sustaining their market positions because to inflation, which has escalated by 20.5% from January 2021 to July 2024. This financial pressure has significantly changed consumer buying power, which has led to a clear shift towards more affordable solutions, particularly private brands, which have seen significant expansion in both sales volume and value. Neoblanc's goal of sustaining a premium pricing model, featuring substantial price escalations of 31.6% for Hypo and 24.9% for Gentile over three years, aimed to strengthen its brand image as a high-quality product. This strategy seems to have failed in a market increasingly influenced by price-sensitive consumers, leading to a significant reduction in market share—11.6% for Hypo and an alarming 42.1% for Gentile. The brand's significant dependence on supermarkets, representing over 57% of total sales for Hypo and 52% for Gentile, has intensified its issues, constraining its capacity to engage a wider audience and respond to changing customer preferences.

On the other hand, ACE's success in Italy has been far more consistent. Though there is similar inflationary pressure, the Italian market, worth around €200 million, has shown more resistance towards premium-priced goods, particularly those backed by consistent advertising campaigns and strong brand loyalty. ACE Hypo and Gentile have both succeeded in preserving or enhancing their market positions, with Hypo exhibiting a constant market share and a slight 0.5% decrease in sales volume, while Gentile has achieved a substantial 28.8% gain. ACE's pricing plan, featuring price escalations of 15.8% for Hypo and 15% for Gentile, has proven more effective, mostly attributable to the brand's diverse distribution approach. In contrast to Neoblanc, which predominantly depends on supermarkets, ACE products are disseminated over other channels, including hypermarkets, discount stores, and various retail settings, collectively representing 68% of sales for Hypo and 70% for Gentile. This multifaceted strategy expands ACE's market presence and bolsters its adaptability to changes in consumer behavior, guaranteeing that price hikes do not estrange its clientele.

The efficacy of ACE's pricing strategy in Italy is also due to its capacity to convey the brand's perceived value to consumers, who consistently regard ACE as a reliable, high-quality product justifying the premium price. The Italian market's growing focus on sustainability and eco-friendly products has enhanced the attractiveness of ACE Gentile, especially among younger consumers and families. Conversely, Neoblanc's difficulties in Portugal underscore the perils of a rigid pricing strategy and excessive dependence on a singular distribution channel in a market characterized by more price-sensitive customers and the swift ascendance of private labels. The rapid expansion of private labels in Portugal, which provide comparable products at considerably reduced rates, has diminished Neoblanc's competitive advantage, highlighting the necessity of adjusting pricing and distribution methods to align with local market dynamics.

Chapter 3: Data-Driven Insights: Statistical Analysis and Implications

In this chapter, we conduct a detailed quantitative analysis to evaluate the impact of price competitiveness on brand performance, specifically focusing on the Neoblanc and ACE brands in the Portuguese and Italian markets for Hypo and Gentile products. Following the literature review and market analysis presented in previous chapters, this empirical approach employs advanced statistical models to uncover the relationships between economic variables and market share. The analysis follows a rigorous methodological sequence, starting with data collection and preparation using datasets sourced from Nielsen², ISTAT (Italian National Institute of Statistics), INE (Instituto Nacional de Estatística), and internal company resources. The initial phase of the analysis ensures that the datasets meet the stationarity assumptions required for time series models. Stationarity is verified using the Augmented Dickey-Fuller (ADF) test, and differencing techniques are applied where necessary to meet the criteria. We then perform multiple linear regressions to assess the relationship between market share and key independent variables, including price indices, volatility, inflation, and media exposure. Considering autocorrelation in the residuals for the first set of regression models, we further refine the analysis by implementing ARIMAX models to improve the predictive accuracy and account for autocorrelated structures. Additionally, segmented regression models are employed to investigate breakpoints in the relationship between price indices and market share, allowing us to determine threshold points where significant changes in market share occur relative to price competitiveness. These breakpoints provide deeper insight into how competitive pricing influences brand performance across different scenarios. The results of these analyses are discussed in the context of their practical implications for pricing management and marketing strategies, with a particular focus on the unique dynamics of the bleach markets in Portugal and Italy. As this chapter forms the core of the empirical analysis, it provides a comprehensive understanding of how price competitiveness shapes brand success across varied market conditions.

In conducting this analysis, several fundamental assumptions are made to ensure the validity and reliability of the model's outcomes. First, it is assumed that all-time series data, including both the dependent variable (market share) and independent variables (price index, volatility, inflation, and media exposure), are stationary or have been made stationary through differencing techniques. The linearity of the relationship between the variables is also assumed, implying that the effect of each independent variable on market share is constant. To avoid multicollinearity, Variance Inflation Factor (VIF) tests are conducted to ensure that the independent variables are not excessively correlated with one another. Furthermore, the model assumes that there is no autocorrelation of residuals and that the residuals exhibit homoscedasticity and follow a normal distribution, as tested through residual plots, the Shapiro-Wilk test, and QQ-plots. Additionally, the segmented regression models assume the existence of breakpoints in the relationship between price index and market share, identifying specific threshold points where the impact of price changes becomes more significant. Data quality and representativeness are critical to the analysis, if the datasets accurately reflect market conditions. Lastly, but most importantly, the main assumption pertains to the accuracy of results to address the

² The process of data extraction from Nielsen and the structure of the datasets will be detailed in the following chapter.

research question: while the study analyzed two countries, thereby providing a wider and potentially generalizable response, the findings are still limited to the case study, namely the bleach market. While the study offers a comprehensive insight into the market dynamics, it is crucial to underscore that the conclusions are intricately tied to the temporal framework and the scenario studied. Market conditions might experience swift and substantial fluctuations, necessitating continuous monitoring and regular evaluation of the models to ensure their correctness and usefulness. Moreover, although the results provide some degree of generalizability, they may not be immediately relevant to other markets exhibiting distinct characteristics. It is presumed that the parameters calculated in the models remain consistent over time; nevertheless, significant alterations in market or economic dynamics may necessitate recalibration of the models to assure their continued efficacy.

3.1 Data Collection and Preparation

The data used in the analysis comes from a Nielsen company database, which makes it accessible to companies and individuals through a subscription. Fater S.p.A. has access to this data and has allowed the researcher, in their capacity as an employee, to consult it for this purpose. The downloaded dataset has been organized as follows to better understand the market dynamics of the Neoblanc and ACE brands in the countries of Portugal and Italy. The dataset is divided by country and product, ensuring a detailed and precise analysis of each specific context, and was exported into Excel in the form of four distinct worksheets: "*Hypo Portugal*", "*Gentile Portugal*", "*Hypo Italy*", and "*Gentile Italy*", each containing 160 observations and 167 columns. These worksheets provide a comprehensive view of monthly sales in different markets, covering a period of three fiscal years, from July 2021 to July 2024. The key variables in the dataset include:

- **Markets:** With 5 unique values corresponding to the various market types considered. For Portugal, the analyzed markets include total market, supermarkets, hypermarkets, supermarkets + hypermarkets, and self-service; for Italy, the markets also include the discount segment.
- Facts: This variable has 8 unique values that describe the essential sales metrics for the analysis, including:
 - Sales (SU): The number of standardized units sold.
 - Sales Value: The total sales value in euros.
 - Sales Units: The number of units sold.
 - Share of Sales: The percentage of total sales attributed to each product, expressed in terms of SU, Value, and Units.
 - Price per Sales (SU): The price per standardized unit sold.
 - Price per Sales Unit: The price per sales unit unit.
- **Products:** This variable includes 4 unique values representing the key players in the market, such as total bleach, Neoblanc or ACE bleach, Private Labels (with the largest share among competitors), and other market competitors, which vary by country and product.

The monthly time variables are represented by columns containing data with names in the format "1 w/e dd/mm/yy" (for example, "1 w/e 02/05/21"), thus providing a detailed and structured temporal

analysis. This type of organization allows for precise and detailed monitoring and analysis of the brands' market performance over time. After downloading the main dataset, it was necessary to carry out a thorough process of data cleaning and data preparation to ensure that the subsequent statistical analysis was based on a clean and consistent database. This process involved collecting, organizing, and cleaning the data from various sources, ensuring that the data was complete, accurate, and free from errors. Such preparation was essential to obtaining valid and reliable statistical results. During the construction of the database in Excel, some of the key variables used in the subsequent regression analyses were created. These variables are central to understanding the research question and analyzing the dynamics of price competitiveness. Specifically:

- **Market Share** was calculated by dividing the sales volumes of Neoblanc or ACE by the total bleach volumes in the reference market, providing a direct measure of the market share held by each brand.
- **Brand vs PL** was calculated as the ratio between the price per unit sold of the brand (either Neoblanc or ACE, depending on the dataset) and that of private labels (PL), allowing for a measurement of the brand's price competitiveness against private labels.
- **Brand vs AO (All Others)** was calculated as the ratio between the price per unit sold of the brand (either Neoblanc or ACE) and the weighted average price per unit sold of competitors in the market. The competitors' price is weighted by their sales volumes, excluding the brand in question and Private Labels. This variable provides a measure of the brand's price competitiveness relative to other market competitors.
- **Price Volatility** was measured as the standard deviation of prices, capturing price fluctuations over time and their potential impact on consumer perception and market share.

In addition to these variables, the Inflation variable was added, obtained from ISTAT data for the Italian market and from INE data for the Portuguese market. This variable, labeled as X4, represents the monthly inflation rate in each market and serves to control for the effect of inflation on price dynamics and, consequently, on the market performance of the analyzed brands. Finally, a variable was included to measure the impact of Media, expressed in GRPs (Gross Rating Points), collected through internal company sources and labeled as X5. GRPs represent a measure of the impact of an advertising campaign through a given medium or schedule, quantifying impressions as a percentage of the target population, multiplied by the frequency. This variable captures the impact of advertising campaigns on market share, allowing for an analysis of the role of marketing in determining brand competitiveness.

3.2 Statistical Analysis

Once the database was constructed in Excel, the data was imported into R using the readxl library to carry out the necessary analyses and diagnostic checks. This step allowed for the application of advanced statistical models to analyze the relationships between the independent variables and market share, thus providing an in-depth understanding of the impact of price competitiveness on the performance of the Neoblanc and ACE brands in the Portuguese and Italian markets. Initially, a preliminary check of the data's accuracy and completeness was conducted, an essential step to ensure

that no errors or anomalies were introduced during the Excel formatting process that could influence the results of the subsequent analyses. The check was performed by examining the first rows of each dataset with R's *head()* function, which confirmed that the data was correctly formatted and ready for the next phases of analysis. Following the organization of the initial datasets downloaded from Nielsen, the dataset loaded into R, which was previously structured in Excel, is organized into four distinct worksheets, each representing a specific context, that will be named as follow:

- 1. HypoPT (Portugal, Hypo product)
- 2. GentilePT (Portugal, Gentile product)
- 3. HypoIT (Italy, Hypo product)
- 4. GentileIT (Italy, Gentile product)

Each dataset contains the same variables, allowing for a uniform investigation of the impact of the independent variables on the dependent variable:

- **Dependent Variable Market Share (Y),** which represents the market share of Neoblanc or ACE products in the specific market.
- Independent Variable Brand Vs PL (X1), which measures the price ratio between the brand (either Neoblanc or ACE, depending on the dataset) and private labels (PL)
- Independent Variable Brand Hypo vs AO (X2), which measures the price ratio between the brand (either Neoblanc or ACE, depending on the dataset) and other competitors (AO) in the market.
- Independent Variable Volatility (X3), which represents the price volatility of the brand, measured as the standard deviation of prices.
- Independent Variable Inflation (X4), which represents the monthly inflation rate, obtained from ISTAT for Italy and INE for Portugal.
- Independent Variable Media (X5), which measures the impact of advertising campaigns through GRPs (Gross Rating Points).

3.2.1 Stationarity Verification (ADF), Variable Differencing, and First Regression Model

The verification of stationarity for both the dependent and independent variables is a crucial and necessary step before proceeding with regression analysis, as it ensures that the models, including time series models such as ARIMAX, are valid and that the results obtained are reliable. Without this verification, regression models could produce biased and misleading results, compromising the validity of the entire analysis. For this reason, the Augmented Dickey-Fuller (ADF) test was applied to each of the variables in the HypoPT, GentilePT, HypoIT, and GentileIT datasets to assess whether the variables were stationary or contained a unit root, indicative of a non-stationary series. The variables tested included market share (Y), the price ratio relative to private labels (X1), the price ratio relative to other offers (X2), price volatility (X3), inflation (X4), and the impact of media (X5). Differencing was applied to the non-stationary variables, particularly the dependent variable, by calculating the difference between consecutive values in the time series using the *diff* function in R.

This approach reduces long-term fluctuations and stabilizes the mean, thus making the series suitable for regression analysis.

The main analysis of this study, aimed at understanding the impact of price competitiveness on the performance of the Neoblanc and ACE brands in the Portuguese and Italian markets, was conducted through the estimation of multiple regression models. This type of model allows for the examination of the relationship between a dependent variable-in this case, market share-and several independent variables simultaneously, enabling control over the effect of each variable while accounting for the influence of others. Specifically, the dependent variable, market share, is a key indicator of brand performance, reflecting its competitive position in the market. The independent variables were carefully selected to represent the main economic and marketing factors that could influence market share, with particular attention given to the price index of the brand vs. private labels (PL) and vs. other competitors in the market, in line with the research question. Overall, the models allowed for the quantification of the impact of the price ratio relative to private labels (X1), the price ratio relative to other competitors (X2), price volatility (X3), inflation (X4), and media exposure measured in GRPs (X5). Unfortunately, after conducting an initial series of regressions on the four datasets (HypoPT, GentilePT, HypoIT, and GentileIT), diagnostic analysis of the residuals revealed several issues requiring corrective adjustments to the models. The Residuals vs. Fitted Plots clearly showed the presence of non-linear patterns, evidenced by a "U"-shaped curve, indicating that the models did not adequately capture the true relationships between the independent variables and the dependent variable, Market Share (Y). This issue was particularly pronounced in the HypoPT and GentilePT models, where certain observations (e.g., observations 37 and 140 for HypoPT, and observation 10 for GentilePT) displayed significant residual clustering, suggesting possible model misspecification or the need for appropriate non-linear terms. While the HypoIT and GentileIT models also exhibited a slight "U"-shaped curve, the pattern was less pronounced, suggesting a better adherence to the expected linearity, though further adjustments are still necessary. The analysis of QQ-Plots confirmed deviations from normality in the residuals, particularly at the tail ends. The HypoPT model showed pronounced deviations with extreme values at the tails, suggesting the presence of outliers not accounted for by the model. The GentilePT and HypoIT models performed relatively better, with distributions closer to normality, though some deviation issues persisted at the extremes, notably in observations like 23 and 28 for GentileIT. Additionally, the Durbin-Watson Test revealed the presence of autocorrelation in all models, with Durbin-Watson values far from the optimal value of 2. This issue was particularly severe in the HypoPT (Durbin-Watson = 1.1) and GentileIT (Durbin-Watson = 1.3) models, where the p-values were statistically significant, indicating strong residual autocorrelation. The HypoIT and GentilePT models also showed autocorrelation (Durbin-Watson = 1.4 and 1.2, respectively), albeit to a slightly lesser extent. In light of these findings, the models need to be revised to improve their accuracy and ensure that the residuals better conform to the assumptions of linearity and normality.

3.2.2 ARIMAX Model and Second Multiple Regression Model

Given the issues that emerged in the initial regression analyses—such as autocorrelation of residuals, non-linearity, and deviation from normality-it was decided to adopt the ARIMAX model (AutoRegressive Integrated Moving Average with eXogenous variables) to improve the modeling of time series and the interpretation of relationships between variables. The ARIMAX model combines the autoregressive and moving average components of ARIMA with the inclusion of exogenous variables, allowing it to capture both the intrinsic temporal dynamics of the data and the effect of independent variables on changes in the dependent variable. The implementation of the model involved several crucial steps to ensure the accuracy and validity of the results. First, proper typing of the variables was ensured, converting all necessary columns to numeric format using the convert to numeric function. This step is essential to avoid errors when applying the statistical model. Subsequently, it was verified that all variables were appropriately differenced beforehand. This process allowed for the stabilization of the mean and variance of the time series, making them suitable for analysis with ARIMAX models. For each of the four datasets-HypoPT, GentilePT, HypoIT, and GentileIT-a specific ARIMAX model was built using the auto.arima function from the forecast package. This function automates the selection of optimal parameters (p, d, q) based on informational criteria such as the Akaike Information Criterion (AIC). The exogenous variables were included in the model via the xreg argument, allowing for the assessment of the impact of each independent variable on the dependent variable while accounting for the temporal structure of the data. Similarly, models for the other datasets were constructed, adapting the exogenous variables according to the statistical significance observed in the preliminary analyses. The multiple regression analyses on the four datasets (HypoPT, GentilePT, HypoIT, GentileIT) using the ARIMAX model allow for the examination not only of the effect of the independent variables on market share but also of temporal dynamics, such as autoregressive components. The results of each regression are reported below, with an evaluation of the AIC and BIC values to compare the model's goodness of fit and a detailed analysis of p-values to interpret the significance of the variables. However, since the ARIMAX model does not provide a direct R-squared value, we used the Adjusted R-squared from the linear regression models to assess the explanatory power of the exogenous variables. This approach makes sense since the exogenous variables in the ARIMAX model are the same as those in the linear regressions, and the Adjusted R-squared helps us understand how well these variables explain the variability in market share, isolating the effect of the autoregressive and moving average components that ARIMAX captures separately. Moreover, it is important to specify that in the ARIMAX model, the term arl represents the first-order autoregressive component, which accounts for the relationship between past values of the dependent variable (e.g., market share) and its current value. The intercept, on the other hand, indicates where the regression line crosses the y-axis and represents the expected average value of the dependent variable when all independent variables are zero. These terms are not always included in every ARIMAX model, as their presence depends on the data's characteristics. For instance, if the model detects no significant autocorrelation in the data or if the data is already stationary, the arl term is not necessary. Similarly, the intercept is excluded if the data suggests no significant deviation from zero.

Variable	Coefficients	Standard Error	P-value	AIC	BIC	Adjusted R [^]
ar1	0,9227	0,0626	3.04e-49			
Intercept	37,2218	2,517	1.74e-49	69,87584	84 8254399	0.804
Indipendent Variable ACE Gentile vs PL (X1)	-0,0508	0,0048	2.04e-26			
Indipendent Variable ACE Gentile vs AO (X2)	-0,0347	0,0088	0.0001			
Indipendent Variable Price Volatility (X3)	-0,0085	0,0061	0.1667			
Indipendent Variable Inflation (X4)	-0,1999	0,0884	0.0237			
Indipendent Variable Media (X5)	-0,0002	0,0003	0.4452			

Analysis of Model 1 - Country: Portugal - Product: Hypo

Table 1 - Regression Analysis for Hypo in Portugal (Arimax Model)

The ARIMAX model for HypoPT yielded very interesting results, demonstrating a strong fit with the data. The AIC value of 69.88 and BIC value of 82.54 clearly indicate that the model successfully captures the market dynamics, maintaining a good balance between complexity and explanatory power. In terms of the exogenous variables, the associated linear model has an adjusted R-squared of 0.804 (80%), confirming that these variables explain a significant portion of the variability in market share. One of the key results is related to the "Neoblanc Hypo vs PL" variable (X1), which showed a very significant negative effect (coefficient = -0.0508, s.e. = 0.0048) with an extremely low p-value $(p = 2.04 \times 10^{-26})$. This suggests that an increase in price compared to private labels (PL) immediately reduces Hypo's market share. This is an expected outcome, considering that private labels are often a cost-effective choice for price-sensitive consumers, and implies that the Neoblanc brand must maintain a competitive price positioning to avoid market share losses. The "Neoblanc Hypo vs AO" variable (X2) also had a significant negative effect (coefficient = -0.0347, s.e. = 0.0088), with a pvalue of 0.000087. Here too, price increases relative to other competitors (AO) lead to a contraction in market share, highlighting the importance of competitiveness with key competitors. The "Price *Volatility (X3)*" variable was not significant (p = 0.1667), suggesting that price fluctuations do not significantly influence consumer choices for Hypo. Regarding inflation (X4), the model shows a significant effect (p = 0.0237), suggesting that rising inflation could make consumers more price sensitive. Lastly, the "Media (X5)" variable did not show a significant impact (p = 0.4452), indicating that advertising intensity did not have a direct influence on market share during the analyzed period. In addition, the autoregressive parameter (arl) in the table has an exceptionally significant p-value (3.04E-43), indicating that the autoregressive component is critical for explaining the behavior of the dependent variable over time in the GentileIT model. This suggests that past values of the dependent variable (market share) significantly influence current values, reinforcing the importance of including this term to capture the time-series dynamics and improve the model's accuracy.

Analysis of Model 2 – Country: Portugal – Product: Gentile

Variable	Coefficients	Standard Error	P-value	AIC	BIC	Adjusted R [^]
Indipendent Variable Price Volatility (X3)	-0,1179	0,0871	0.1758			
Indipendent Variable Inflation (X4)	-0,079	0,289	0.7846	152,7731	158,9945	0.747
Indipendent Variable Media (X5)	0	0,001	0.9676			

Table 2 - Regression Analysis for Gentile in Portugal (Arimax Model)

The ARIMAX model for GentilePT presents some intriguing insights. In this case, price index variables were excluded from the model, as they did not show relevant statistical significance in the preliminary analyses. This may suggest that, for the GentilePT brand, consumers are not particularly sensitive to price variations compared to competitors, or that GentilePT's positioning is already stable enough to not be affected by short-term price fluctuations. As for Hypo, the associated linear model has an adjusted R-squared of 0.747 (75%), confirming again that these variables explain a significant portion of the variability in market share. Moving on to the model results, the AIC value of 152.77 and BIC of 158.99 indicate a good fit, even without the inclusion of price-related variables. However, the exogenous variables such as "Price Volatility (X3)" (p = 0.1758), Inflation (X4) (p = 0.7846), and Media (X5) (p = 0.9676) did not show significant statistical relevance. This could reflect the stability of the GentilePT market, where consumers are not particularly affected by price fluctuations, inflationary pressure, or the intensity of advertising campaigns. Despite the lack of variable significance, it is important to note that these results do not necessarily imply that these variables are irrelevant. Rather, they suggest that in this specific market context, further investigations may be needed to identify the factors that most influence GentilePT's market share, such as consumer loyalty or alternative marketing strategies.

Anal	vsis	of	`Model	3 –	Countr	y: Ita	lv -	Pro	duct:	Hypo
		-								

Variable	Coefficients	Standard Error	P-value	AIC	BIC	Adjusted R [^]
Indipendent Variable ACE Gentile vs PL (X1)	-0,0515	0,0311	0.0975			
Indipendent Variable ACE Gentile vs AO (X2)	-0,1538	0,044	0.0005	98,71847	108,0506	0.893
Indipendent Variable Price Volatility (X3)	-0,4328	0,2344	0.0649			
Indipendent Variable Inflation (X4)	-0,4361	0,1459	0.0028			
Indipendent Variable Media (X5)	0,0006	0,0009	0.5201			

Table 3 - Regression Analysis for Hypo in Italy (Arimax Model)

The ARIMAX model for HypoIT showed an excellent ability to capture market dynamics, with AIC (98.72) and BIC (108.05) values indicating a solid model fit. Furthermore, the linear model has a very good adjusted R-squared of 0.893 (89%), meaning the variables capture a substantial portion of the variation in market share. Notably, the "ACE Hypo vs AO" variable (X2) produced a highly significant p-value of 0.000474, suggesting that a price increase compared to other competitors (AO) has a direct and negative impact on market share. This result is consistent with what has been observed in other models, reinforcing the idea that consumers are very price-conscious when it comes to direct comparisons with major market players. "Inflation (X4)" also proved to be significant (p = 0.0028), indicating that fluctuations in inflation rates have a tangible effect on Italian consumer behavior. This result can be interpreted as a sign that, during periods of high inflation, consumers may become more price-sensitive, pushing them to seek cheaper alternatives or private labels. The ACE "Hypo vs PL (X1)" (p = 0.0975) and "Price Volatility (X3)" (p = 0.0649) variables are approaching the threshold of significance, suggesting that they could have a more significant impact under conditions or with additional observations. These results indicate that, although they may not be the main drivers of market share variation, they could still play an important role in the medium to long term. Also here, "Media (X5)" variable, with a p-value of 0.5201, did not show an immediate significant effect.

Variable	Coefficients	Standard Error	P-value	AIC	BIC	Adjusted R^
ar1	0,6781	0,1236	4,06E-02			
Intercept	106,0988	5,374	9,20E-81	137,8851	150,5532	0.521
Indipendent Variable ACE Gentile vs PL (X1)	-0,1076	0,0431	0.0125			
Indipendent Variable ACE Gentile vs AO (X2)	-0,1849	0,046	0.0001			
Indipendent Variable Price Volatility (X3)	-0,204	0,2645	0.4406			
Indipendent Variable Inflation (X4)	0,1089	0,2904	0.7076			
Indipendent Variable Media (X5)	0,0004	0,0009	0.6412			

Analysis of Model 4 – Country: Italy – Product: Gentile

Table 4 - Regression Analysis for Gentile in Italy (Arimax Model)

The ARIMAX model for GentileIT produced robust results, with AIC (137.89) and BIC (150.55) values indicating a good fit to the data. However, the linear model shows an adjusted R-squared of 0.521 (52%), indicating that the variables explain a moderate portion of the variability in market share. The variable "ACE Gentile vs PL" (X1) showed a significant negative effect (coefficient = -0.1076, s.e. = 0.0431, p = 0.0125), suggesting that price variations compared to private labels influence market share. This result highlights the importance of maintaining price competitiveness for Gentile, especially in a market where private labels present strong competition. Similarly, the variable "ACE Gentile vs AO" (X2) yielded a highly significant p-value (p = 0.000059), with negative effect (coefficient = -0.1849, s.e. = 0.0460) demonstrating how price comparisons with other market competitors (AO) significantly impact market share dynamics. These findings suggest that pricing strategies relative to key competitors are critical for the success of the Gentile brand. The other variables, such as Price Volatility (X3) (p = 0.4406), Inflation (X4) (p = 0.7076), and Media (X5) (p= 0.6413), did not show statistical significance. This might indicate that, in the specific context of GentileIT, these variables do not play a primary role in determining market share, although they could have an influence under different market conditions or with a more targeted marketing strategy. Moreover, in the table, the autoregressive parameter, (ar1), has a significant p-value (4.06e-08) suggesting that the autoregressive component is highly significant in explaining the behavior of the dependent variable over time for the GentileIT model. To further analyze the insignificance of the media variable (GRPs) across all models, it's important to consider the business implications of these results. From a practical standpoint, it may seem counterintuitive that media exposure, measured in GRPs, doesn't significantly impact market share in any of the models. GRPs typically capture the reach of advertising campaigns, and while their effect often manifests with a delay, even when introducing lagged variables, no significant correlation was found here. This raises the possibility that GRPs may not be the most appropriate measure in this context, or that the effectiveness of the media may already have plateaued. However, it is also crucial to acknowledge that the regression models explain a significant portion of the variance in market share through other variables, which may overshadow the contribution of media. For instance, in the model for HypoPT, we observe the following:

- R² of the complete model (with Media X5): 0.8041
- R² of the model without Media (X5): 0.7913
- Difference in R²: 0.0100

This indicates that adding media (X5) to the model explains only 1% more variance in market share than the model without it. This marginal improvement in explanatory power suggests that while media does contribute slightly, its overall impact is relatively minor compared to other variables. The same applies to the other models (GentilePT, HypoIT, and GentileIT), where media consistently fails to show statistical significance, further indicating that its contribution to market share in these contexts is limited. The likely reason for this insignificance is that other independent variables, particularly those related to price indexes, play a much more substantial role in determining market share. Variables such as the price index "*vs Private Labels*" (X1) and "*vs All Others*" (X2) have consistently shown significant negative impacts on market share across all models, indicating that the competitiveness of the product's pricing is a crucial determinant of brand performance. For example, in the HypoPT model, the variable "*Neoblanc Hypo vs PL*" (X1) had a highly significant p-value of 2.04×10^{-26} , and "*Neoblanc Hypo vs AO*" (X2) had a similarly significant p-value of 0.000087. This highlights that pricing strategy relative to competitors and private labels is a far more critical factor than media exposure in driving market share outcomes.

3.2.3 Diagnostic Analysis for ARIMAX Model Validation

To validate the estimated ARIMAX models, a series of diagnostic analyses were conducted, which provide an important indication of the model's goodness of fit. As seen from the residuals analysis, all the models are well-fitted to their respective datasets, with only minor residual fluctuations that do not significantly compromise the overall validity of the analyses. The suggests that the models effectively capture the relationships between the variables and the temporal dynamics, ensuring a good level of predictive accuracy, as it is captured by the following graphs:



Figure 26 – Residuals Analysis for Hypo in Portugal

In the case of HypoPT, the residuals are distributed around zero with fluctuations that do not suggest any obvious structural issues. Despite a few isolated oscillations, no clear signs of heteroscedasticity or violations of the model's fundamental assumptions were detected, as the graph shows. The "Residuals vs. Fitted" plot also confirms that the residuals are randomly distributed, with no recurring patterns, which indicates a good overall fit of the model. Although there are some points slightly distant from the reference line, these do not significantly compromise the model's predictive accuracy.



Figure 27 – Residuals Analysis for Gentile in Portugal

For GentilePT, the residuals plot shows greater variability, with significant peaks at the beginning of the time series. However, this increased dispersion does not appear to substantially compromise the model's performance, as no strong signals of autocorrelation or systematic patterns emerge. The "Residuals vs. Fitted" plot also shows a residual distribution that, despite a few outliers, does not highlight any critical issues requiring significant adjustments.



Figure 28 – Residuals Analysis for Hypo in Italy

For HypoIT, the residuals behave quite regularly, fluctuating around zero without showing significant peaks. The lack of clear trends or patterns indicates that the model can capture the temporal dynamics of the dataset well. The "Residuals vs. Fitted" plot also suggests that the residuals are randomly distributed, with no indications of significant issues, reinforcing the idea that the model is well-calibrated for the HypoIT data. The few values distant from the line do not significantly compromise the model's accuracy.





Figure 29 – Residuals Analysis for Gentile in Italy

Finally, for GentileIT, although the residuals plot shows greater variability compared to HypoIT, the distribution does not suggest any significant issues. Despite a few broader oscillations, the residuals are still distributed sufficiently randomly, and the observed peaks seem to reflect normal data variability rather than a modeling issue. The "Residuals vs. Fitted" plot confirms this impression, with residuals that, although showing slight dispersion, do not indicate a systematic error in the model. Subsequently, the Shapiro-Wilk test was conducted to check for the normality of the residuals. For HypoPT, the p-value of 0.8501 indicates that the residuals follow a normal distribution, as is the case for GentilePT (p-value of 0.4697), HypoIT (p-value of 0.6167), and GentileIT (p-value of 0.9689). In addition, the QQ-plots visually confirmed the results of the Shapiro-Wilk test, with the residuals aligning correctly along the theoretical line, indicating a consistent distribution with normality.



Figure 30 – QQ-Plots of Residuals for Normality Check of the Models

Regarding autocorrelation in the residuals, ACF and PACF plots were generated for each dataset, supported by the Ljung-Box test³. Overall, the evaluated ARIMAX models proved to be robust, and the results of the Ljung-Box test support the absence of significant autocorrelations in the residuals. In the case of the HypoPT model, the ACF plot shows a significant correlation only at lag 0, while the subsequent lags remain within the confidence limits. This suggests that the model effectively captures the temporal structure of the data. The PACF plot further confirms the absence of significant autocorrelations in the residuals. The Ljung-Box test, with a p-value of 0.6491, indicates that there is no significant autocorrelation, confirming the model's validity in capturing the data dynamics. For the GentilePT model, the ACF plot generally shows a good fit, although the PACF plot presents a few small fluctuations. However, these remain within the confidence limits, indicating that there is no strong autocorrelation. The Ljung-Box test reveals a p-value of 0.0178, suggesting a slight autocorrelation, but overall, the model remains reliable and well-structured. In the HypoIT model, the ACF and PACF plots show a linear pattern, free of significant autocorrelation signals, confirming that the ARIMAX model has correctly captured the temporal dynamics. The Ljung-Box test, with a pvalue of 0.7549, further confirms the absence of autocorrelation, demonstrating the robustness of the model. For the GentileIT model, both the ACF and PACF plots indicate no significant autocorrelations. The Ljung-Box test, with a p-value of 0.4043, further confirms that the residuals do not exhibit autocorrelations, reinforcing the model's reliability in correctly adhering to the data. Finally, multicollinearity among the independent variables was evaluated using the Variance Inflation Factor (VIF), a key indicator for detecting potential high correlations between explanatory variables. A high VIF can hinder the interpretation of coefficients, making it difficult to distinguish the effect of each variable. In the analyzed models, all VIF values are below the critical threshold of 10, indicating that multicollinearity does not pose a significant issue. Specifically, in the HypoPT model, VIF values range from 1.03 to 1.25, with an average of 1.15. In the GentilePT model, VIF values range from 1.02 to 1.03, with an average of 1.03. For the HypoIT model, VIF values range from 1.09 to 1.15, with an average of 1.12, while for the GentileIT model, they range from 1.10 to 2.03, with an average of 1.47. These results suggest that there is no strong collinearity among the independent variables in the models, allowing for a precise and reliable estimation of their effects.

3.2.4 Breakpoint Analysis of Price Index Impact on Market Share

Following the ARIMAX model, a second analysis was conducted using segmented regressions to identify breakpoints in the relationships between the price index and market share for each dataset, considering both the "*vs PL*" and "*vs AO*" price indices. Segmented regressions divide the data into multiple segments, if the relationship between the dependent and independent variables may change within each interval. Essentially, a linear regression is estimated for each segment, and breakpoints are identified, marking where the relationship shifts. This approach highlights significant changes in the slope of the regression line, revealing different dynamics based on the independent variable values. These breakpoints indicate critical thresholds beyond which the relationship between price

³ The detailed ACF and PACF plots for each dataset are presented in Appendix A (Figures A1 to A8), which further support the absence of significant autocorrelations in the residuals.

index and market share undergoes significant changes, showing that the impact of price on market share is not linear across all values. The breakpoints mark the levels at which the effect of price on market share may become less pronounced or even reverse. In other words, this analysis pinpoints the price levels at which the price's effect on market share changes. The analysis was conducted on the same four datasets used previously: HypoPT, GentilePT, HypoIT, and GentileIT. For each dataset, segmented regressions were run using the *segmented* function. Initially, a linear model was built to estimate the relationship between the price index and market share, followed by segmenting the model to identify breakpoints where the price's effect on market share shifts in direction or intensity. These breakpoints were found for both price indices ("*vs PL*" and "*vs AO*"), offering insights into the specific price levels where a significant impact on market share occurs. The analysis of breakpoints for the various products—HypoPT, GentilePT, HypoIT, and GentileIT—revealed interesting variations in market sensitivity to price increases, providing valuable insights into the competitive dynamics in both Portugal and Italy.

Breakpoint Analysis 1 – Country: Portugal - Product: Hypo



Figure 31 – Segmented Regression Plot for Hypo in Portugal

For Hypo in Portugal, both in relation to private labels and to the other, the results reveal a marked market sensitivity to price increases. The breakpoint for Hypo in relation to private labels (PL) was identified at a price index of approximately 277, after which the market share dropped from 17.69% to 14.21%, representing a significant decrease of 19.65%. This decline suggests that the market is particularly vulnerable to price increases beyond this threshold, leading to a reduction in the product's competitiveness. A similar result was observed for Hypo with the other competitors (AO), with a breakpoint at 274.911 and a market share reduction from 17.01% to 14.26%, a 16.19% decrease. These figures indicate that for Hypo in Portugal, surpassing certain price levels triggers a significant negative market reaction, reflecting relatively high demand elasticity. This could suggest that Portuguese consumers are sensitive to price hikes and that keeping prices below these breakpoints might be crucial to maintaining market share.



Figure 32 – Segmented Regression Plot for Gentile in Portugal

In the case of Gentile in Portugal, the analysis reveals a similar dynamic but with some notable differences. In the private label's context, the breakpoint was identified at approximately 211.037, with a market share decrease from 30.61% to 23.26%, corresponding to a 24.01% reduction. This significant decline highlights the importance of competitive pricing for Gentile, as exceeding the identified price threshold results in an even more pronounced loss of market share compared to Hypo. Regarding the other competitors (AO), the breakpoint was identified at 274.911, with a market share decrease from 27.41% to 22.86%, representing a 16.59% reduction. Again, the analysis suggests that the Portuguese market is highly sensitive to price increases, with significant effects on Gentile competitive position. Overall, the results for Gentile in Portugal indicate that price positioning is a critical factor for maintaining market share in Portugal, and price increases must be handled with great caution.



<u>Breakpoint Analysis 3 – Country: Italy - Product: Hypo</u>

Figure 33 – Segmented Regression Plot for Hypo in Italy

Moving on to the analysis of Hypo in Italy, the results indicate market sensitivity to price increases, but it is less pronounced compared to Portugal. In the private labels context, the breakpoint was identified at 168.761, with a market share decrease from 44.40% to 42.63%, representing a 3.99% reduction. This suggests that although there is some sensitivity to price increases, the Italian market

reacts less drastically compared to the Portuguese market. For the other competitors (AO), the breakpoint was identified at approximately 148.349, with a market share decrease from 43.62% to 42.95%, equating to a 1.54% reduction. These results indicate that the Italian market for Hypo is relatively more stable than Portugal, with lower demand elasticity in response to price increases. However, even though the impact is more contained, there is still a tendency for the market share to decrease when prices surpass certain thresholds.

Breakpoint Analysis 4 - Country: Italy - Product: Gentile



Figure 34 – Segmented Regression Plot for Gentile in Italy

Finally, for Gentile in Italy, the analysis reveals a moderate sensitivity to price increases. Regarding the private labels, the breakpoint was identified at 188.564, with a market share reduction from 66.69% to 64.92%, corresponding to a 2.65% decrease. This suggests that, while there is some market responsiveness to price increases, the impact is less significant compared to the Portuguese contexts. In the context of the other brands (AO), the breakpoint was identified at 104.94, with a market share reduction from 67.11% to 63.52%, representing a 5.35% decrease. These results indicate that, although Gentile in Italy shows some sensitivity to price increases, the Italian market overall is less reactive compared to Portugal, allowing for greater pricing flexibility without substantial losses in market share.

3.3 Research discussion and main findings

The statistical analysis conducted yielded significant results for each of the datasets considered, offering a detailed view of market dynamics in the Portuguese and Italian contexts for the Neoblanc and ACE brands. In this section, the main results from the ARIMAX model regressions and the breakpoint analysis will be presented, to subsequently provide an answer to the research question. It is important to specify how the regression analyses and the breakpoint analysis are complementary and provide an integrated view of price competitiveness and its impact on brand performance. The regressions focus on the direct and continuous impact of the price index, i.e., how competitive the brand is relative to private labels and other competitors, to observe and understand how price variations progressively influence the brand's market share, offering insights into competitiveness. In contrast, the breakpoint analysis identifies critical thresholds beyond which price variations cause significant and sudden changes in market share. In other words, while the regression analysis assesses

the gradual influence of price variations on brand competitiveness, the breakpoint analysis identifies the market's tolerance limits, defining how far pricing policies can be pushed before generating significant losses in market share. Together, these analyses provide a comprehensive view, both for the continuous monitoring of price competitiveness and for strategic planning, helping brands avoid crossing critical thresholds that would lead to a drastic market reaction.

3.4.1 Implications of ARIMAX Regression Models

First of all, the regression analysis for Hypo and Gentile products in the Italian and Portuguese markets revealed important differences and similarities in the factors influencing the brands' market share, highlighting how competitive dynamics and consumer preferences vary significantly between the two countries.

Comparative Analysis of Hypo and Gentile in the Portuguese Market

In the Portuguese context, the analysis of variables for Hypo shows a significant correlation between the price index relative to private labels (PL) and market share. The negative coefficient associated with this variable indicates that any price increase of Hypo compared to private labels immediately causes a reduction in market share. This suggests that, in terms of price competitiveness, Hypo must maintain pricing closely aligned with private labels' offerings, as Portuguese consumers perceive private labels as valid and, above all, more economical alternatives. The price index directly affects the brand's performance, demonstrating that more aggressive pricing by private labels can quickly compromise Hypo's market position. The price index relative to other competitors (AO) is also significant, though it has a less pronounced impact compared to private labels. This indicates that Hypo must maintain a certain level of competitiveness with established brands, but the greatest pressure comes from private labels, which represent a more immediate threat to market share. For Gentile, however, the price index relative to private labels and AOs is not significant. This implies that, for Gentile, price competitiveness is not the main factor determining market share. The brand seems to occupy a more differentiated position, where consumers do not make strict price comparisons with private labels or other competitors. This situation suggests that Gentile follows a more premium positioning strategy, which shields it from competitive pressures based solely on price. As for the other variables, in the case of Hypo, inflation (X4) is significant, indicating that during periods of general price increases, consumers become more price-sensitive, negatively affecting the brand's market share. Price volatility (X3) and media (X5) were not significant, suggesting that price fluctuations and advertising intensity did not have a relevant impact on Portuguese consumers' purchasing decisions for Hypo. This highlights that price remains the main factor in purchasing decisions, while other marketing elements play a secondary role.

Comparative Analysis of Hypo and Gentile in the Italian Market

In Italy, Hypo (ACE Hypo) shows a similar price sensitivity, with the price index relative to private labels proving significant. However, the impact is not as severe as in Portugal, suggesting that Italian consumers have greater trust in the brand and are less likely to immediately switch to private labels due to small price increases. This strategic positioning allows Hypo to operate within a wider price

corridor, where moderate price increases do not immediately compromise market share. However, the brand must remain vigilant regarding in relation to private labels competition, which continues to gain ground. The price index relative to AOs was not significant, suggesting that Hypo maintains solid standing against mid-range brands without facing the same intense competitive pressure as with private labels. For Gentile, the situation in Italy is more complex. The price index relative to AOs is highly significant, indicating that Italian consumers closely compare Gentile's price with that of other premium brands. This suggests that Gentile competes directly with other high-end brands, and price competitiveness is essential to maintaining market share. The price index relative to private labels, however, is not significant, indicating that consumers do not consider Gentile as an alternative to private labels, but rather as a superior product, where the comparison is made with other prestigious brands. The other variables for Hypo in Italy confirm that inflation (X4) has a significant impact, indicating that, as in Portugal, Italian consumers are more price-sensitive during periods of high inflation. This reflects rational consumer behavior, where they tend to seek cheaper options in a context of rising living costs. Price volatility (X3) and media (X5) were not influential, suggesting that price fluctuations and advertising intensity do not significantly affect market share in this context. However, it is possible that advertising plays an indirect role, as in the case of customer loyalty, which may not immediately translate into an impact on sales.

Comparative Analysis of Portugal and Italy

When comparing the results between the two countries, some key differences in consumer behavior emerge that reflect different market dynamics. In Portugal, Hypo consumers are strongly influenced by the price relative to Private Labels, suggesting that the market is highly competitive, and consumers are ready to switch to cheaper options if Hypo's price increases. This behavior may be due to a perception of the Hypo brand as a utility product rather than a luxury one, where cost is a determining factor. The strong responsiveness to inflation also suggests that Portuguese consumers are particularly sensitive to general economic conditions, which could reflect more limited disposable income or greater economic uncertainty. In Italy, although Hypo consumers are also price-sensitive, their reaction is slightly less pronounced compared to Portuguese consumers. This could indicate that, despite the competitiveness of the market, Italian consumers still see some value in the Hypo brand, though this is closely tied to maintaining a competitive price. For Gentile, however, the high sensitivity to price comparisons with other premium brands indicates that Italian consumers are willing to pay a higher price, but only if they perceive that the product offers superior value compared to other high-end brands. This direct competition between premium brands reflects a more mature and segmented market, where perceived quality, safety, and brand positioning play a fundamental role. From the consumer's point of view, these differences indicate that in Portugal, consumers are more price-sensitive and likely have lower brand loyalty, while in Italy, there is a clearer segmentation between premium products and Private Labels, with consumers willing to pay more for products they perceive as superior, supporting Hinterhuber's (2008) argument that value-based pricing can enhance brand perception, as ACE successfully maintains its premium positioning despite competitive pressures.

3.4.3 Implications of the Break Point Analysis

The breakpoint analysis of the relationship between the price index and market share for Neoblanc and ACE products in Portugal and Italy identified critical thresholds beyond which market share changes significantly, always in a negative direction. These breakpoints were identified both in relation to competition with private labels (PL) and with other competitors (AO), highlighting important differences in consumer sensitivity between the two countries and across individual products. The goal is to understand how far pricing strategies can be pushed before incurring significant market share losses, providing strategic insights for brand management in distinct competitive contexts.

The difference between the two countries revealed by the analysis shows a greater tolerance among Portuguese consumers for price increases, both for Hypo and Gentile, with average breakpoints for Hypo (275.96) and Gentile (242.97) being significantly higher than those observed for the same products in Italy. This difference can be partly explained by the lower presence of valid alternatives in the Portuguese market, both in terms of private labels and other direct competitors. Portuguese consumers, not finding comparable alternatives to Neoblanc in terms of quality, are more willing to accept price increases without significantly changing their purchasing habits, thus ensuring greater market share stability for the brands. In contrast, in Italy, where there is greater competitiveness, consumers have a wider range of private labels and competing brands of quality, such as Lysoform. This scenario contributes to a lower price sensitivity since Italian consumers have more options to choose from, allowing them to easily switch from one brand to another in the case of significant price increases. However, this suggests that the potential entry of a significant new competitor in the Portuguese market could significantly lower the threshold and increase consumer price sensitivity, replicating the behavior observed in Italy. It is important to note that once the identified critical thresholds are exceeded, market share losses in Portugal tend to be much more drastic compared to those observed in Italy. For example, in the case of Hypo in Portugal, exceeding the breakpoint of 275.96 results in a 19.65% decrease in market share, highlighting the strong reactivity of Portuguese consumers to price increases once this threshold is crossed. In Italy, however, the market share decline is more contained: for Hypo in Italy, exceeding the threshold of 158 leads to a much more moderate decrease, about 3.99%. This reflects a substantial difference between the two countries, with Portuguese consumers, while initially more tolerant, reacting much more sharply once the maximum acceptable price threshold is reached.

Focusing on the difference between the influence of private labels and other competitors, the analysis in Italy highlighted greater variability in breakpoints between the comparison with private labels and with other market competitors for Hypo and Gentile products, compared to what was observed in Portugal. For Hypo the breakpoints were 168.76 for private labels and 148.34 for other competitors, with a difference of about 20 points. This variability is even more pronounced for Gentile, where the breakpoint for private labels is 188.56, while for other competitors it is 104.94, with a difference of about 84 points. These significant divergences indicate that Italian consumers react differently to price increases depending on the type of competitor the brand is facing. They seem to be more sensitive to increases when the comparison is with other market brands, while showing greater tolerance when

the reference is toward private labels. This suggests that, in Italy, private labels are not perceived as as strong a competitive threat compared to other brands, allowing products like Gentile more flexibility in price positioning relative to private labels. However, when the prices of Gentile or Hypo approach those of other market competitors, Italian consumers seem to react more sharply, likely preferring cheaper alternatives or switching brands, indicating greater complexity and selectivity in purchasing behavior. This scenario is not observed in Portugal, where private labels are particularly competitive. The breakpoints for Hypo and Gentile in Portugal in comparison with private labels are 277 and 242, respectively, slightly higher but very close to the values observed in comparison with other competitors (274 and 239). This highlights that Portuguese consumers perceive private labels as valid alternatives to established brands, limiting the ability of brands to adjust prices without risking a loss in market share. A price increase beyond the breakpoint quickly leads to a significant reduction in market share, demonstrating the strong competitive pressure exerted by private labels in the Portuguese market. From a strategic perspective, this implies that, in Portugal, brands must face competition with private labels and other market competitors with equal intensity. In Italy, however, greater attention must be paid to direct competition with major brands. These results also demonstrate that the effect of price on market share does not follow a linear or uniform pattern but varies depending on the competitive context. Therefore, it is essential that pricing strategies be flexibly adapted, considering the specifics of the market and competitive dynamics.

Lastly, comparing the products within the same country, considering both the average breakpoints relative to private labels and other competitors, as well as the changes in market share after surpassing these thresholds, provides a more comprehensive view of consumer price sensitivity. This type of analysis helps understand not only at what price level a market share reduction occurs but also how drastic that decrease is. In Portugal, the data shows higher price sensitivity for the Gentile product compared to Hypo, with average breakpoints for Gentile significantly lower than those for Hypo. The average breakpoint for Gentile is around 242, while for Hypo it is about 276, suggesting that the second can tolerate more substantial price increases before suffering a negative impact on market share. However, the reaction after surpassing the threshold for Gentile is more drastic: market share decreases by 24.01% compared to private labels and by 16.59% compared to other competitors, signaling an extremely sensitive consumer reaction to price increases for this product. For Hypo, the reduction in market share is less pronounced, with a decline of 19.65% compared to private labels and 16.19% compared to other competitors. This confirms that although Hypo also experiences a reduction in market share, it is better able to withstand price increases than Gentile. In Italy, the differences between Hypo and Gentile in Italy are less pronounced compared to Portugal, with greater uniformity in tolerance to price increases. The average breakpoint for Hypo is around 158, while for Gentile it is 146. Although Gentile shows a slightly lower breakpoint, the reductions in market share are more contained compared to Portugal. For Gentile, market share decreases by 2.65% compared to private labels and by 5.35% compared to other competitors, while for Hypo, the decline is 3.99% compared to private labels and 1.54% compared to other competitors. Therefore, it can be said that in Portugal, consumers are more sensitive to price increases, especially for the Gentile product, which experiences a much more significant impact on market share compared to Hypo. In Italy, on the other hand, consumers seem more resilient to price increases, and the differences between the two products are less pronounced. However, even in Italy, Hypo demonstrates a greater ability to maintain stability, with less significant reductions in market share compared to Gentile. These results highlight the need to tailor pricing strategies carefully, considering not only the peculiarities of national markets but also the specifics of individual products, as price sensitivity varies depending on the competitive context and the type of product in question. However, there is an important element to further consider when discussing the behavior of Portuguese consumers toward Gentile as just described. Although there are not many valid alternatives to Hypo and Gentile in Portugal, it is surprising to observe how Gentile's market share drastically decreases once the price threshold is surpassed. This could be explained by the nature of the product itself: while Hypo has a more specific and necessary use, including for disinfection and cleaning, Gentile is perceived as a complementary product, whose use can be postponed or avoided without consequences for the consumer. Despite Gentile being an important and leading product in the country, its non-essential nature makes it particularly vulnerable to price increases once the critical threshold is exceeded. Therefore, although Portuguese consumers initially show a certain tolerance toward price increases, once this threshold is surpassed, they tend to drastically reduce their purchases. It is important to note that this reduction in market share likely does not translate into a shift toward a direct competitor but rather a general decrease in demand for the product, given its non-essential nature. In general, the breakpoint analysis identified the thresholds at which Neoblanc and ACE's market share experiences a sharp decline, reflecting the influence of ceiling prices within the price corridor framework, as presented in the precious literature review. This finding supports Janiszewski and Lichtenstein's (1999) Range Theory, as consumers perceive prices beyond this point as excessive, leading to reduced willingness to purchase. Thereofre, maintaining prices within this corridor is essential for sustaining the brand's competitive position.

3.4.6 Limitations of the Analysis

The analysis presented in this study, despite its comprehensive approach, is subject to certain limitations. Firstly, there are some limitations regarding the dataset. The data used in this analysis are limited to a fiscal period of three years, which, while sufficient for observing certain trends, may not be entirely adequate for capturing long-term changes in consumer behavior, market trends, or the impact of external economic factors. Additionally, it is important to specify that the fiscal years considered (2021, 2022, 2023, 2024) were characterized by various exogenous phenomena, such as the final stages of the Covid pandemic and the outbreak of the war in Ukraine, which led to an energy crisis and a significant increase in inflation, especially in Europe. The research mainly focused on price competitiveness, potentially overlooking other influential variables such as brand loyalty, marketing campaigns, or external factors like changes in consumer preferences or macroeconomic conditions, which could also significantly impact brand performance. Moreover, given that the analysis aimed to use data already provided by the company, it was difficult to obtain some key data necessary for a more complete market evaluation, especially for Portugal. This challenge led to a focus on the specific available metrics, particularly those related to price competitiveness and market share, which were the most accessible and reliable information. The lack of data on other factors, such as marketing investments or brand perception, might have limited the analysis's ability to capture all elements influencing brand performance. However, this selection of metrics was made to ensure a

solid analysis based on accurate data, avoiding the inclusion of variables for which sufficiently valid information was unavailable, and focusing on the main research question. Furthermore, it is essential to specify that the adopted ARIMAX model emerged as the most suitable option, as it balanced statistical validity with practical applicability in the business context, effectively capturing the dynamic relationship between price competitiveness and market share. Previously, alternative regression models were also tested, which integrated lag variables, both specific to certain variables and applied uniformly to all. However, these models often encountered significant challenges, such as issues of multicollinearity, autocorrelation, or a lack of alignment with business realities and expectations. Nonetheless, relying on the ARIMAX model entails certain limitations linked to the inherent assumptions of this model, such as stationarity and linear relationships, which may not fully reflect the complexities of consumer behavior and market dynamics. Indeed, while the ARIMAX model is robust in analyzing time-series data, it has limitations in managing potential structural changes in the market, such as sudden shifts in consumer sentiment or unexpected economic events. Therefore, the results might be less applicable in predicting future market dynamics during periods of significant volatility or disruption. Finally, the findings are related to the bleach market in Portugal and Italy, for two specifc product categories and while they provide valuable insights, they may not be entirely generalizable to other markets or product categories. Future research could expand to more varied markets or employ more advanced modeling techniques, such as machine learning, to address the nonlinearities and complexities that traditional models may not capture.

3.4.5 Managerial Implications

Based on the findings of this research, numerous essential managerial implications have been identified, offering specific operational recommendations for organizations operating in comparable markets. These insights convert the analytical findings into practical approaches and tangible measures that can successfully inform managerial decision-making. Companies in competitive markets should formulate accurate and flexible pricing strategies that account for the unique characteristics of each market and the nature of the product. This facilitates a rapid response to market dynamics and consumer reactions, particularly as the impact of price on market share is non-linear and contingent upon the competitive landscape. It is essential to consistently monitor competitors, particularly private labels, which are frequently regarded as credible and more price-competitive alternatives, utilizing complex statistical analysis methods and market surveillance technology such as pricing intelligence software. Moreover, it is essential to allow regular modifications in reaction to shifts in the economic and competitive environment. Along with that, businesses should underscore their value proposition to rationalize elevated prices despite intense market competition. Factors like quality and sustainability can distinguish a brand and justify a premium price, while implementing focused promotional methods can be especially effective in price-sensitive areas, provided the overall strategy does not rely exclusively on discounts and promotions. In addition, this research has facilitated the development of managerial implications that extend beyond conventional pricing strategy recommendations, as written before, providing a more comprehensive and strategic framework. The study has revealed not only how progressive price variations influence market share but has also identified the precise points at which these changes become critical, providing a level of detail that is rare in pricing analyses. This has highlighted the importance of understanding the differences in consumer behavior across different markets. In the specific case study, it was shown how consumers in Portugal and Italy respond differently to price increases, thereby providing valuable insights for the company in defining tailored pricing strategies for each market. Consequently, this level of detail enables companies to avoid "one-size-fits-all" approaches and adopt more effective strategies. Beyond the direct impact of price, the research demonstrated how the perception of product quality and essentiality can influence consumer tolerance to price changes, offering a more comprehensive picture that goes beyond simple price competition. Most importantly, the study emphasizes the need to adopt integrated marketing strategies. Indeed, pricing strategies should not be isolated but should be an integral part of a broader marketing and communication strategy. In a competitive context, where price is just one of the factors-albeit a particularly impactful one, as shown in the analyses-that determine brand perception, it is crucial for companies to invest in building and communicating their brand's value through a coherent brand narrative. By doing so, companies can justify a premium price positioning, reduce consumer price sensitivity, and build greater brand loyalty, shifting the consumer's focus from price to perceived value and allowing to maintain higher margins and compete on differentiation elements rather than solely on price leverage. This more holistic and strategic approach enables companies to strengthen their competitive position and build brand loyalty that goes beyond mere price comparison.

Conclusion

The journey of this thesis began with a very clear objective: to understand the impact of price competitiveness on brand performance, particularly when measured in terms of market share. The ambitions behind conducting this type of research were both to deeply investigate a topic of great importance in marketing theories and to contribute to them, as well as to provide companies with strategies that allow them to compete effectively in certain contexts. The reasons for choosing this topic stem from both practical and academic motivations. From a practical perspective, understanding the impact of price competitiveness on brand performance offers valuable insights to managers of companies operating in increasingly complex and competitive markets. In an era where consumers are more informed and demanding, pricing strategies must be carefully developed not only to attract customers but also to maintain profitability and market share. From an academic point of view, this research aimed to contribute to existing literature by filling the gap in comparative studies on pricing strategies across different markets, thereby offering a more nuanced understanding of how price competitiveness affects brand performance. The importance of this study emerged from the recognition that, in today's highly competitive markets, pricing strategies play a crucial role in determining a brand's trajectory, influencing not only immediate sales but also its long-term position within the market. Despite the vast amount of research available on pricing strategies, a significant empirical gap was identified in understanding how price competitiveness influences the performance of the same brand in different market contexts. To address this gap, and drawing on my current experience at Fater, I had the opportunity to explore this topic in the bleach sector-a market that might seem ordinary but represents an interesting case study for pricing theories due to its dynamic and competitive nature. Specifically, to fill this gap, the study focused on two distinct but comparable markets: Portugal and Italy. By selecting these markets, which feature both unique and shared characteristics, the research aimed to capture the nuances of how price competitiveness impacts brand performance in different contexts. In particular, the comparative analysis between Neoblanc in Portugal and ACE in Italy provided an ideal lens through which to examine the effects of pricing strategies, given that both brands hold significant positions in their respective markets but face different competitive pressures. The initial chapters of the thesis provided a solid theoretical foundation, exploring fundamental concepts such as price corridors and pricing strategies, and how these relate to brand performance. This exploration highlighted that price competitiveness is not simply about setting a price but represents a strategic reflection of the brand's value, market segmentation, and the ability to navigate competitive environments. Moving forward, the second chapter offered a detailed market analysis, presenting an overview of the bleach sector in Portugal and Italy, followed by an in-depth examination of the brands analyzed in the case study. This analysis was crucial in contextualizing the study, as it shed light on market structures, consumer behaviors, and competitive dynamics that influence pricing strategies. By assessing factors such as sales volumes, sales values, pricing trends, inflation rates, and the influence of private labels, the study provided a comprehensive understanding of how each market operates and the specific challenges faced by Neoblanc and ACE. The third chapter then delved into the heart of the statistical analysis, utilizing both classic models such as multiple regressions and more advanced models like ARIMAX and breakpoint analysis, which allowed an in-depth investigation of how price competitiveness influences market share, offering a deeper understanding of how pricing strategies directly impact brand performance in different market contexts. Summarizing the key insights from the two analyses,

we can state the following: In Portugal, the influence of price competitiveness varies between brands and is significantly reduced for unique and differentiated products that have no direct alternatives. Instead, in Italy, classic, multi-purpose products perceived as premium are mainly influenced by the price competitiveness of alternative private label products, while complementary products, designed for a specific and primary use, are more affected by broader competition from similar and comparable products. An additional point of differentiation between the two countries concerns the threshold of the price index. In Portugal, this threshold is higher compared to Italy, allowing for more aggressive pricing strategies, as consumers, with fewer options available, are willing to tolerate higher prices. However, once this threshold is surpassed, changes in market share become more drastic in Portugal. In Italy, although the threshold is lower, the impact on market share is less pronounced even when the limit is exceeded, reflecting a more elastic market and a wider distribution of competition among brands. In attempting to answer the question of whether price competitiveness influences brand performance, the analysis provided a very clear response. It confirmed that there is indeed a significant influence between price competitiveness within a sector and the performance of the brands operating in it. Furthermore, the analysis, by comparing Italy and Portugal, revealed how this influence varies depending on the characteristics of different markets, both geographic and productrelated, thus highlighting the importance of adopting targeted and integrated pricing strategies that reflect the specific characteristics and dynamics of each market.

Bibliography

- Aaker, D. A., & Keller, K. L. (1990). Consumer Evaluations of Brand Extensions. Journal of Marketing, 54(1), 27-42. Retrieved from: <u>Consumer Evaluations of Brand Extensions</u> (jstor.org)
- Aaker, D. A. (1991). Managing brand equity: Capitalizing on the value of a brand name. Free Press. Retrieved from: <u>PII: 0148-2963(94)90009-4 (sciencedirectassets.com)</u>
- Aguilar-Barrientos, S., Gómez-Suárez, M., & Sanjuán-Moreno, J. M. (2021). The effectiveness of price promotions: The moderating effect of brand loyalty and promotion depth. *Journal of Retailing and Consumer Services*, 62, 102653. Retrieved from: <u>a2adf65b58adcb044b463e631572c7588e03.pdf (semanticscholar.org)</u>
- Ailawadi, K. L., Lehmann, D. R., & Neslin, S. A. (2003). Revenue premium as an outcome measure of brand equity. *Journal of Marketing*, 67(4), 1-17. Retrieved from: <u>Revenue Premium as an</u> <u>Outcome Measure of Brand Equity (sagepub.com)</u>
- Allied Market Research. (2024). Bleach market size, share and industry forecast 2027. Retrieved from <u>https://www.alliedmarketresearch.com</u>
- Altroconsumo. (2023). *Candeggina: come scegliere il prodotto giusto*. Altroconsumo. Retrieved from <u>https://www.altroconsumo.it</u>
- Baltas, G. (1997). Determinants of Store Brand Choice: A Behavioural Analysis. Journal of Product and Brand Management, 6(5), 315-24. Retrieved from: pdf (emerald.com)
- Banco de Portugal. (2024). Economic bulletin. Retrieved from https://www.bportugal.pt
- Bhatia, A. (2020). A multi-level contrastive analysis of promotional strategies in the healthcare industry. English for Specific Purposes, 59, 44-57. Retrieved from <u>A multi-level contrastive</u> analysis of promotional strategies in specialised discourse ScienceDirect
- Biswas, A., & Blair, E. A. (1991). Contextual Effects of Reference Prices in Retail Advertisements. Journal of Marketing, 55(3), 1-12. Retrieved from: <u>Contextual Effects of Reference Prices in Retail Advertisements (jstor.org)</u>
- Bottomley, P. A., & Doyle, J. R. (1996). The Formation of Attitudes Toward Brand Extensions: Testing and Generalizing Aaker and Keller's Model. International Journal of Research in Marketing, 13(4), 365-377. Retrieved from: <u>The formation of attitudes towards brand extensions: Testing and generalising Aaker and Keller's model - ScienceDirect</u>
- Chang, Y., & Park, J. (2020). Loyalty discounts and price competition in consumer markets. International Journal of Industrial Organization, 69, 102588. Retrieved from <u>Effectiveness of</u> <u>Loyalty Programs in Customer Retention: A Multiple Mediation Analysis - Andy Chin Woon</u> <u>Fook, Omkar Dastane, 2021 (sagepub.com)</u>

- Chaudhuri, A., & Holbrook, M. B. (2001). The chain of effects from brand trust and brand affect to brand performance: The role of brand loyalty. *Journal of Marketing*, 65(2), 81-93. Retrieved from: <u>The Chain of Effects from Brand Trust and Brand Affect to Brand Performance: The Role of Brand Loyalty (sagepub.com)</u>
- Dinastires.org. (2021). Model of brand image and purchasing: Price perception and product quality. Retrieved from <u>Model of Brand Image and Purchasing: Price Perception and Product Quality</u> (Literature Review of Marketing Management) | Journal of Accounting and Finance <u>Management (dinastires.org)</u>
- Euromonitor International. (2024). Bleach in Italy: Market Research Report. Retrieved from https://www.euromonitor.com/bleach-in-italy/report
- Euromonitor International. (2024). Bleach in Portugal. Retrieved from <u>https://www.marketresearch.com/Euromonitor-International-v746/Bleach-Portugal-</u><u>36334136/</u>
- Euromonitor. (2024). Sustainability trends 2024: Key shapers for a greener future. Retrieved from Sustainability Trends 2024: Key Shapers for a Greener Future - Euromonitor.com
- Federchimica. (2023). *L'industria chimica in Italia: Focus sul settore dei detergenti e dei disinfettanti*. Federchimica. Retrieved from <u>https://www.federchimica.it</u>
- Fishbein, M., & Ajzen, I. (1975). Belief, attitude, intention and behavior: An introduction to theory and research. Addison-Wesley. Retrieved from: (PDF) Belief, attitude, intention and behaviour: An introduction to theory and research (researchgate.net)
- Harvard Business Review. (2023). Research: How Price Changes Influence Consumers' Buying Decisions. Retrieved from <u>Research: How Price Changes Influence Consumers' Buying</u> <u>Decisions (hbr.org)</u>
- Hoch, S. J., Kim, B. D., Montgomery, A. L., & Rossi, P. E. (1995). Determinants of Store-Level Price Elasticity. Journal of Marketing Research, 32(1), 17-29. Retrieved from: <u>Determinants of Store-Level Price Elasticity - Stephen J. Hoch, Byung-Do Kim, Alan L. Montgomery, Peter E. Rossi, 1995 (sagepub.com)</u>
- Horváth, C., & Fok, D. (2019). Developing in-store brand strategies and relations to market share and financial performance. Journal of Retailing and Consumer Services, 50, 73-80. Retrieved from <u>Developing in-store brand strategies and relational expression through sales promotions -ScienceDirect</u>
- Horváth, C., & Fok, D. (2019). Moderating factors of immediate, gross, and net cross-brand effects of price promotions. *Journal of Marketing Research*, 56(6), 1024-1044. Retrieved from: <u>Moderating Factors of Immediate, Gross, and Net Cross-Brand Effects of Price Promotions (jstor.org)</u>

- Horváth, C., & Fok, D. (2019). Pricing and price competition in consumer markets. Journal of Retailing and Consumer Services, 50, 73-80. (PDF) Pricing in practice in consumer markets (researchgate.net)
- IMF. (2024). World economic outlook. Retrieved from https://www.imf.org
- Indrayani, E., Siringoringo, H., & Saptariani, T. (2008). Impact of Price on Brand Loyalty Sensitivity. Delhi Business Review, 9(2), 17-25. Retrieved from: (PDF) IMPACT OF PRICE O CT OF PRICE ON BRAND LOYALITY (researchgate.net)
- Ingenbleek, P. T. M., & Van der Lans, I. A. (2013). Relating price strategies and price-setting practices. *European Journal of Marketing*, 47(1/2), 27-48. Retrieved from: <u>153947 27..48</u> (emerald.com)
- ISTAT Istituto Nazionale di Statistica. (2023). *Consumi delle famiglie*. ISTAT. Retrieved from <u>https://www.istat.it/it/archivio/consumi</u>
- Janiszewski, C., & Lichtenstein, D. R. (1999). A Range Theory Account of Price Perception. Journal of Consumer Research, 25(4), 353-368. Retrieved from: <u>A Range Theory Account of Price</u> <u>Perception on JSTOR</u>
- Kahneman, D., & Tversky, A. (1979). Prospect theory: An analysis of decision under risk. *Econometrica*, 47(2), 263-291. Retrieved from: <u>Prospect Theory: An Analysis of Decision</u> <u>under Risk (mit.edu)</u>
- Keller, K. L. (1993). Conceptualizing, measuring, and managing customer-based brand equity. Journal of Marketing, 57(1), 1-22. Retrieved from: <u>Conceptualizing, Measuring, and</u> <u>Managing Customer-Based Brand Equity on JSTOR</u>
- Krishnamurthi, L., & Raj, S. P. (1991). An Empirical Analysis of the Relationship Between Brand Loyalty and Consumer Price Elasticity. Marketing Science, 10(2), 172-183. Retrieved from: (PDF) An Empirical Analysis of the Relationship Between Brand Loyalty and Consumer Price Elasticity (researchgate.net)
- Lee, J. A., & Hwang, Y. (2021). The impact of consumers' perceptions regarding the ethicality of retailers' pricing practices. International Journal of Consumer Studies, 45(3), 325-337. Retrieved from <u>The impact of consumers' perceptions regarding the ethics of online retailers</u> and promotional strategy on their repurchase intention - <u>ScienceDirect</u>
- MarketResearch.com. (2024). *Bleach in Italy: Industry Analysis and Market Trends*. Retrieved from <u>https://www.marketresearch.com/Euromonitor-International-v746/Bleach-Italy-36334589/</u>
- Monroe, K. B. (2003). *Pricing: Making profitable decisions*. McGraw-Hill/Irwin. Retrieved from: <u>Pricing: Making Profitable Decisions</u> | Journal of Revenue and Pricing Management <u>(springer.com)</u>
- Mussola, S., Aurier, P., & Séré de Lanauze, G. (2019). Developing in-store brand strategies and relational expression through sales promotions. *Journal of Retailing and Consumer Services,*
47, 241-250. Retrieved from: <u>Developing in-store brand strategies and relational expression</u> through sales promotions (sciencedirectassets.com)

Nielsen. (2024, September 19). Audience is everything ®. https://www.nielsen.com/it/

- Nirmalya, K. (2018). Pricing and promotion: A literature review. Journal of Retailing and Consumer Services, 45, 92-103. Retrieved from (PDF) Pricing and promotion: A literature review (researchgate.net)
- Pambianco Strategie di Impresa. (2023). *Il mercato dei prodotti per la pulizia della casa in Italia*. Pambianco News. Retrieved from <u>https://www.pambianconews.com</u>
- Pitta, D. A., & Katsanis, L. P. (1995). Understanding Brand Equity for Successful Brand Extension. Journal of Consumer Marketing, 12(4), 51-65. Retrieved from: (PDF) Understanding brand equity for successful brand extension (researchgate.net)
- Pricefx. (2023). Price corridors: What are they & how are they built? Retrieved from <u>Price Corridors:</u> <u>What Are They & How Are They Built? | Pricefx</u>
- ScienceDirect. (2021). Brand loyalty and price promotion strategies: An empirical analysis. Retrieved from Brand Loyalty and Price Promotion Strategies: An Empirical Analysis ScienceDirect
- SpringerLink. (2021). Sales promotion effectiveness: The impact of category brand level price promotions on sales performance. Retrieved from <u>Sales Promotion Effectiveness: The Impact</u> <u>of Category – Brand Level Price Promotions on Sales Performance of a Large Retailer |</u> <u>SpringerLink</u>
- Statista. (2023). *Household Cleaning Products Market in Italy*. Retrieved from https://www.statista.com/statistics/1018335/bleach-household-usage-in-italy/
- Statistics
 Portugal
 Web
 Portal.
 (n.d.-b).

 https://www.ine.pt/xportal/xmain?xpid=INE&xpgid=ine_main
 Web
 Portal.
 (n.d.-b).
- Suci Hermiyenti, & Yunia Wardi. (2018). A literature review on the influence of promotion, price, and brand image on purchase decision. Retrieved from (PDF) A Literature Review on The Influence of Promotion, Price and Brand Image to Purchase Decision (researchgate.net)
- Smith, D. C., & Park, C. W. (1992). The Effects of Brand Extensions on Market Share and Advertising Efficiency. Journal of Marketing Research, 29(3), 296-314. Retrieved from: jstor.org/stable/pdf/1251446.pdf?refreqid=fastlydefault%3A671f955651f0d9e82458e32428e997b5&ab_segments=&origin=&initiator=&acc eptTC=1
- Taylor, J. (n.d.). Sales Promotions: The influence on consumer purchasing behavior and brand choice. *Journal of Marketing and Consumer Research*.
- Taylor, V. A., & Bearden, W. O. (2002). The Effects of Price on Brand Extension Evaluations: The Moderating Role of Extension Similarity. Journal of the Academy of Marketing Science,

30(2), 131-140. Retrieved from: <u>The effects of price on brand extension evaluations: The</u> moderating role of extension similarity | Journal of the Academy of Marketing <u>Science(springer.com)</u>

- Technavio. (2023). Bleach Market Size, Trends and Forecast 2023-2027. Retrieved from <u>https://www.technavio.com</u>
- Thomson, M., MacInnis, D. J., & Park, C. W. (2020). Premiums paid for what you believe in: The interactive roles of price and belief congruence. Journal of Consumer Psychology, 30(1), 82-102. Retrieved from <u>Premiums Paid for What You Believe In: The Interactive Roles of Price Promotion and Cause Involvement on Consumer Response ScienceDirect</u>
- Rotemberg, J. J. (2003). Customer Anger at Price Increases, Changes in the Frequency of Price Adjustment and Monetary Policy. Journal of Monetary Economics, 50(5), 1187-1212. Retrieved from: <u>doi:10.1016/j.jmoneco.2005.03.004</u> (sciencedirectassets.com)
- Xia, L., Monroe, K. B., & Cox, J. L. (2004). The price is unfair! A conceptual framework of price fairness perceptions. *Journal of Marketing*, 68(4), 1-15. Retrieved from: <u>The Price is Unfair!</u> <u>A Conceptual Framework of Price Fairness Perceptions (sagepub.com)</u>
- Yoo, B., Donthu, N., & Lee, S. (2000). An examination of selected marketing mix elements and brand equity. *Journal of the Academy of Marketing Science*, 28(2), 195-211. Retrieved from: <u>An</u> <u>examination of selected marketing mix elements and brand equity | Journal of the Academy of Marketing Science (springer.com)</u>
- Zeithaml, V. A. (1988). Consumer Perceptions of Price, Quality, and Value: A Means-End Model and Synthesis of Evidence. Journal of Marketing, 52(3), 2-22. Retrieved from: jstor.org/stable/pdf/1251446.pdf?refreqid=fastlydefault%3A671f955651f0d9e82458e32428e997b5&ab_segments=&origin=&initiator=&acc eptTC=1

Appendix

Appendix A

Figure A1 - ACF HypoPT





Figure A2 - PACF HypoPT



PACF Residui - HypoPT ARIMAX

Figure 3 - ACF GentilePT





Figure 4 - PACF GentilePT



PACF Residui - GentilePT ARIMAX

Figure 5 - ACF HypoIT



ACF Residui - HypoIT ARIMAX

Figure 6 - PACF HypoIT



PACF Residui - HypoIT ARIMAX

Figure 7 - ACF GentileIT



ACF Residui - GentileIT ARIMAX

Figure 8 - PACF GentileIT



PACF Residui - GentileIT ARIMAX

Appendix B

<u>Script R</u>

Loading necessary libraries that provide essential functions for data manipulation, # statistical testing, time series forecasting, regression analysis, and visualization library(readxl) # For reading Excel files # For conducting diagnostic tests on linear models library(lmtest) library(forecast) # For time series forecasting and analysis library(car) # For regression diagnostics library(stargazer) # For creating publication-quality tables library(tseries) # For conducting time series analysis library(dplyr) # For data manipulation using data frames library(segmented) # For segmented regression models # For data visualization and plotting library(ggplot2) library(janitor) # For data cleaning # For arranging multiple 'ggplot2' plots library(gtable) library(knitr) # For formatting tables and plots in reports

```
# Loading the datasets from an Excel file where each sheet represents different segments of our analysis.
# These sheets correspond to different brands/products (Hypo and Gentile) across
# enabling a comprehensive comparison of market share performance in response to
HypoPT <- read_excel("/Users/Morelli.E/Desktop/Regressions Dataset For R.xlsx", sheet = "Regression Hypo PT")
GentilePT <- read_excel("/Users/Morelli.E/Desktop/Regressions Dataset For R.xlsx", sheet = "Regression Gentile PT")
HypoIT <- read_excel("/Users/Morelli.E/Desktop/Regressions Dataset For R.xlsx", sheet = "Regression Gentile PT")
GentileIT <- read_excel("/Users/Morelli.E/Desktop/Regressions Dataset For R.xlsx", sheet = "Regression Hypo IT")
GentileIT <- read_excel("/Users/Morelli.E/Desktop/Regressions Dataset For R.xlsx", sheet = "Regression Gentile IT")
# To ensure our visualizations later in the analysis are not distorted by layout
# we adjust the plotting parameters here. The 'par' function sets the graphical
# errors,
# we adjust the plotting parameters here. The 'par' function sets the graphical
par(mfrow = c(1, 1)) # Setting layout to display only one plot at a time
par(mar = c(4, 4, 2, 1)) # Adjusting margins: bottom, left, top, right
```

```
# Now, we inspect the data by viewing the first few rows using the 'head' function.
# This step is critical as it allows us to confirm that the data has been imported correctly
# and the variables are structured as expected, which helps to avoid errors in the subsequent analysis.
head(HypoPT) # Display the first few rows of the HypoPT dataset
head(GentilePT) # Display the first few rows of the HypoIT dataset
head(HypoIT) # Display the first few rows of the HypoIT dataset
head(GentileIT) # Display the first few rows of the GentileIT dataset
head(GentileIT) # Display the first few rows of the GentileIT dataset
```

```
# Cleaning column names by removing unwanted characters, such as line breaks (\r\n)
# This ensures column names are clean and consistent for easier reference in the analysis
colnames(HypoPT) <- gsub("\r\n", "", colnames(HypoPT))
colnames(GentilePT) <- gsub("\r\n", "", colnames(GentilePT))
colnames(HypoIT) <- gsub("\r\n", "", colnames(HypoIT))
colnames(GentileIT) <- gsub("\r\n", "", colnames(GentileIT))</pre>
```

```
# Before proceeding to the regression analysis, it's crucial to ensure that our time series data
# is stationary. The Augmented Dickey-Fuller (ADF) test helps us determine this. If a variable
# is found to be non-stationary (p-value > 0.05), we apply differencing to transform it into
# a stationary form, which is a necessary condition for time series modeling.
check_stationarity_and_difference <- function(data, var) {</pre>
  # Removing any missing values (NA) to avoid errors in the test
 temp_data <- na.omit(data[[var]])</pre>
  # Performing the ADF (Augmented Dickey-Fuller) test for <u>stationarity</u>, if there's enough data
  if (length(temp_data) > 1) {
    adf_test <- adf.test(temp_data, alternative = "stationary")</pre>
    # Checking if the variable is stationary based on the p-value
    if (adf_test$p.value > 0.05) {
      # If not stationary (p-value > 0.05), create a differenced version to achieve stationarity
      data[[paste0(var, "_Diff")]] <- c(NA, diff(data[[var]]))</pre>
    } else {
      # If stationary (p-value \leq 0.05), retain the original values for analysis
      data[[paste0(var, "_Diff")]] <- data[[var]]</pre>
    3
 } else {
    # If there's insufficient data, keep the original values unchanged
    data[[paste0(var, "_Diff")]] <- data[[var]]</pre>
 }
 # Returning the modified dataset with the stationarity adjustment
 return(data)
}
# Applying the stationarity check across all datasets ensures that each variable is correctly prepared
# for our regression analysis. This step involves looping through each dataset and applying our function
# to handle stationarity for all relevant variables.
datasets <- list(HypoPT = HypoPT, GentilePT = GentilePT, HypoIT = HypoIT, GentileIT = GentileIT)</pre>
all_vars <- c(dependent_var, independent_vars)</pre>
for (dataset_name in names(datasets)) {
  # Iterating over each specified variable to check for stationarity and adjust if necessary
  for (var in all_vars) {
    datasets[[dataset_name]] <- check_stationarity_and_difference(datasets[[dataset_name]], var)</pre>
 }
  # Removing rows with any missing values (NA) introduced during differencing
  # This step ensures that the dataset is clean and complete for regression analysis
  datasets[[dataset_name]] <- datasets[[dataset_name]] %>% na.omit()
  # Displaying a summary of the dataset after differencing to confirm the process was successful
  # This provides an overview of the data's structure and variable distributions post-adjustment
  cat("\nSummary of", dataset_name, "after differencing:\n")
  print(summary(datasets[[dataset_name]]))
}
# Reassigning the modified datasets back to their original variable names
# This step ensures that the updated data, now processed for stationarity, is ready for further analysis
HypoPT <- datasets$HypoPT
GentilePT <- datasets$GentilePT</pre>
HypoIT <- datasets$HypoIT
GentileIT <- datasets$GentileIT</pre>
##### FIRST REGRESSION ANALYSIS #####
#With our data properly prepared, we proceed to fit multiple linear regression models for each dataset.
# Here, the goal is to understand how the independent variables (price indices, volatility, inflation, and media)
# impact the market share of each product/brand in the respective countries.
# Note: The first column (Date) and the dependent variable (Market Share) column are excluded from the predictor set
# Fitting the regression model for HypoPT dataset
model1HypoPT <- lm(HypoPT[[2]] \sim ., data = HypoPT[, -c(1, 2)])
```

```
# Fitting the regression model for GentilePT dataset
model2GentilePT <- lm(GentilePT[[2]] ~ ., data = GentilePT[, -c(1, 2)])</pre>
# Fitting the regression model for HypoIT dataset
model3HypoIT <- lm(HypoIT[[2]] \sim ., data = HypoIT[, -c(1, 2)])
# Fitting the regression model for GentileIT dataset
model4GentileIT <- lm(GentileIT[[2]] ~ ., data = GentileIT[, -c(1, 2)])</pre>
# To interpret these models, we generate summaries that provide comprehensive details
# such as the estimated coefficients for each independent variable, their statistical significance,
# and overall model fit metrics like R-squared.
summary(model1HypoPT)
summary(model2GentilePT)
summary(model3HypoIT)
summary(model4GentileIT)
# Visual inspection is a vital part of validating regression models. By plotting residuals against
# fitted values, we assess whether assumptions like homoscedasticity and linearity hold.
plot(model1HypoPT, which = 1, main = "Residuals vs Fitted - HypoPT")
plot(model2GentilePT, which = 1, main = "Residuals vs Fitted - GentilePT")
plot(model3HypoIT, which = 1, main = "Residuals vs Fitted - HypoIT")
plot(model4GentileIT, which = 1, main = "Residuals vs Fitted - GentileIT")
# We further assess normality by generating QQ-Plots, which help us evaluate whether
\# residuals follow a normal distribution – a key assumption for valid inference in regression models.
plot(model1HypoPT, which = 2, main = "QQ-Plot of Residuals - HypoPT")
plot(model2GentilePT, which = 2, main = "QQ-Plot of Residuals - GentilePT")
plot(model3HypoIT, which = 2, main = "QQ-Plot of Residuals - HypoIT")
plot(model4GentileIT, which = 2, main = "QQ-Plot of Residuals - GentileIT")
# Conducting the Durbin-Watson test checks for autocorrelation in residuals.
# The presence of autocorrelation indicates that the model may be missing some dynamics in the data.
dw_test1 <- dwtest(model1HypoPT)</pre>
dw_test2 <- dwtest(model2GentilePT)</pre>
dw_test3 <- dwtest(model3HypoIT)</pre>
dw_test4 <- dwtest(model4GentileIT)</pre>
# We print the test results to identify any potential issues with autocorrelation.
print("Durbin-Watson Test for HypoPT:")
print(dw_test1)
print("Durbin-Watson Test for GentilePT:")
print(dw_test2)
print("Durbin-Watson Test for HypoIT:")
print(dw_test3)
print("Durbin-Watson Test for GentileIT:")
print(dw_test4)
# Generating ACF (Autocorrelation Function) and PACF (Partial Autocorrelation Function) plots for residuals
# These plots help identify if there is any remaining autocorrelation in the residuals,
#which would suggest that the model may need further refinement
residuals1 <- residuals(model1HypoPT) # Extracting residuals from the HypoPT model
residuals2 <- residuals(model2GentilePT) # Extracting residuals from the GentilePT model
residuals3 <- residuals(model3HypoIT) # Extracting residuals from the HypoIT model
residuals4 <- residuals(model4GentileIT) # Extracting residuals from the GentileIT model
# Plotting ACF and PACF for HypoPT residuals
acf(residuals1, main = "ACF of Residuals - HypoPT") # ACF plot shows the degree of autocorrelation at different lags
```

pacf(residuals1, main = "PACF of Residuals - HypoPT") # PACF plot shows partial autocorrelation at different lags

```
# Plotting ACF and PACF for GentilePT residuals
acf(residuals2, main = "ACF of Residuals - GentilePT")
pacf(residuals2, main = "PACF of Residuals - GentilePT")
# Plotting ACF and PACF for HypoIT residuals
acf(residuals3, main = "ACF of Residuals - HypoIT")
pacf(residuals3, main = "PACF of Residuals - HypoIT")
# Plotting ACF and PACF for GentileIT residuals
acf(residuals4, main = "ACF of Residuals - GentileIT")
pacf(residuals4, main = "PACF of Residuals - GentileIT")
# Since the first round of diagnostic analysis of the residuals revealed several issues requiring corrective adjustments
# to the first regression models, we proceed with the ARIMAX model construction,
##### ARIMAX MODELING #####
# After validating our initial regression models, we proceed to the ARIMAX (AutoRegressive Integrated Moving Average
# with <u>eXogenous</u> inputs) model. This is a more advanced time series model that accounts for both <u>autoregressive</u> elements
# (the dependence of a variable on its own past values) and the influence of external factors (our independent variables).
# Displaying the column names of each dataset for verification
# This step ensures that we have the correct variables available for analysis
colnames(HypoPT)
colnames(GentilePT)
colnames(HypoIT)
colnames(GentileIT)
# Function to convert selected columns to numeric data type
# This is necessary because certain columns may have been imported as non-numeric, which would interfere with model fitting
convert_to_numeric <- function(data, columns) {</pre>
  for (col in columns) {
    # Converting each specified column to numeric
    data[[col]] <- as.numeric(data[[col]])</pre>
  }
  return(data)
3
# Specifying the columns that need to be converted to numeric for each dataset
# This ensures the ARIMAX model can process these variables correctly
columns_to_convert_HypoPT <- c("Variabile Indipendente Neoblanc Hypo Vs PL (X1)"</pre>
                                "Variabile Indipendente Neoblanc Hypo vs AO (X2)",
                                "Variabile Indipendente Volatilità (X3)_Diff",
                                "Variabile Indipendente Inflazione (X4)_Diff",
                                "Variabile Indipendente Media (X5)_Diff")
columns_to_convert_GentilePT <- c("Variabile Indipendente Volatilità (X3)_Diff",
                                   "Variabile Indipendente Inflazione (X4)_Diff",
                                   "Variabile Indipendente Media (X5)_Diff")
columns_to_convert_HypoIT <- c("Variabile Indipendente ACE Hypo vs PL (X1)",</pre>
                                "Variabile Indipendente ACE Hypo vs AO (X2)"
                                "Variabile Indipendente Volatilità (X3)_Diff"
                                "Variabile Indipendente Inflazione (X4)_Diff",
                                "Variabile Indipendente Media (X5)_Diff")
columns_to_convert_GentileIT <- c("Variabile Indipendente ACE Gentile vs PL (X1)",
                                   "Variabile Indipendente ACE Gentile vs AO (X2)",
                                   "Variabile Indipendente Volatilità (X3)_Diff",
                                   "Variabile Indipendente Inflazione (X4)_Diff",
                                   "Variabile Indipendente Media (X5)_Diff")
# Converting the specified columns to numeric for each dataset
HypoPT <- convert_to_numeric(HypoPT, columns_to_convert_HypoPT)</pre>
GentilePT <- convert_to_numeric(GentilePT, columns_to_convert_GentilePT)</pre>
HypoIT <- convert_to_numeric(HypoIT, columns_to_convert_HypoIT)</pre>
GentileIT <- convert_to_numeric(GentileIT, columns_to_convert_GentileIT)</pre>
```

ARIMAX modeling is performed for each dataset. This model accounts for the internal structure of the time series (ARIMA) # and the impact of external independent variables, allowing for a more nuanced understanding of market share dynamics.

```
# Applying ARIMAX to the HypoPT dataset
arimax_HypoPT <- auto.arima(</pre>
  HypoPT$`Variabile Dipendente Market Share (Y)`,
  xreg = as.matrix(HypoPT[, c("Variabile Indipendente Neoblanc Hypo Vs PL (X1)",
                               "Variabile Indipendente Neoblanc Hypo vs AO (X2)",
                               "Variabile Indipendente Volatilità (X3)_Diff",
                               "Variabile Indipendente Inflazione (X4)_Diff",
                               "Variabile Indipendente Media (X5)_Diff")])
)
# Applying ARIMAX to the GentilePT dataset
arimax_GentilePT <- auto.arima(</pre>
  GentilePT$`Variabile Dipendente Market Share (Y)`,
  xreg = as.matrix(GentilePT[, c("Variabile Indipendente Volatilità (X3)_Diff",
                                  "Variabile Indipendente Inflazione (X4)_Diff",
                                  "Variabile Indipendente Media (X5)_Diff")])
)
# Applying ARIMAX to the HypoIT dataset
arimax_HypoIT <- auto.arima(</pre>
  HypoIT$`Variabile Dipendente Market Share (Y)`,
  xreg = as.matrix(HypoIT[, c("Variabile Indipendente ACE Hypo vs PL (X1)",
                               "Variabile Indipendente ACE Hypo vs AO (X2)'
                               "Variabile Indipendente Volatilità (X3)_Diff"
                               "Variabile Indipendente Inflazione (X4)_Diff",
                               "Variabile Indipendente Media (X5)_Diff")])
)
# Applying ARIMAX to the GentileIT dataset
arimax_GentileIT <- auto.arima(</pre>
  GentileIT$`Variabile Dipendente Market Share (Y)`,
  xreg = as.matrix(GentileIT[, c("Variabile Indipendente ACE Gentile vs PL (X1)",
                                   "Variabile Indipendente ACE Gentile vs AO (X2)",
                                  "Variabile Indipendente Volatilità (X3)_Diff",
                                  "Variabile Indipendente Inflazione (X4)_Diff",
                                   "Variabile Indipendente Media (X5)_Diff")])
)
# The ARIMAX models are evaluated using two main criteria: the <u>Akaike</u> Information Criterion (AIC) and the Bayesian
# Information Criterion (BIC). These metrics help us understand the model's goodness of fit while penalizing for complexity.
aic_HypoPT <- AIC(arimax_HypoPT)</pre>
bic_HypoPT <- BIC(arimax_HypoPT)</pre>
aic_GentilePT <- AIC(arimax_GentilePT)</pre>
bic_GentilePT <- BIC(arimax_GentilePT)</pre>
aic_HypoIT <- AIC(arimax_HypoIT)</pre>
bic_HypoIT <- BIC(arimax_HypoIT)</pre>
aic_GentileIT <- AIC(arimax_GentileIT)</pre>
bic_GentileIT <- BIC(arimax_GentileIT)</pre>
# Displaying the AIC and BIC values helps us compare model performance across datasets,
# guiding us towards the model that balances accuracy and simplicity.
cat("\nAIC and BIC for HypoPT model:", aic_HypoPT, bic_HypoPT)
cat("\nAIC and BIC for GentilePT model:", aic_GentilePT, bic_GentilePT)
cat("\nAIC and BIC for HypoIT model:", aic_HypoIT, bic_HypoIT)
cat("\nAIC and BIC for GentileIT model:", aic_GentileIT, bic_GentileIT)
# Summarizing the ARIMAX models provides insights into how each independent variable influences market share,
# taking into account the temporal structure of the data.
summary(arimax_HypoPT)
summary(arimax_GentilePT)
summary(arimax_HypoIT)
summary(arimax_GentileIT)
```

```
# Next, we extract and display p-values for each ARIMAX model's coefficients to assess their statistical significance.
# This step helps identify which factors have a meaningful impact on market share within each dataset.
get_pvalues_arimax <- function(model) {</pre>
  coeftest_results <- coeftest(model) # Conducting a coefficient test</pre>
  p_values <- coeftest_results[, 4]</pre>
                                       # Extracting p-values from the results
  return(p_values)
3
# Displaying the p-values for each model provides a clearer picture of the significance of each predictor.
cat("\nP-values for HypoPT ARIMAX model:\n")
pvalues_HypoPT <- get_pvalues_arimax(arimax_HypoPT)</pre>
print(pvalues_HypoPT)
cat("\nP-values for GentilePT ARIMAX model:\n")
pvalues_GentilePT <- get_pvalues_arimax(arimax_GentilePT)</pre>
print(pvalues_GentilePT)
cat("\nP-values for HypoIT ARIMAX model:\n")
pvalues_HypoIT <- get_pvalues_arimax(arimax_HypoIT)</pre>
print(pvalues_HypoIT)
cat("\nP-values for GentileIT ARIMAX model:\n")
pvalues_GentileIT <- get_pvalues_arimax(arimax_GentileIT)</pre>
print(pvalues_GentileIT)
# Finally, we summarize the results using tables to clearly communicate our findings,
# providing an easily interpretable format for each ARIMAX model's coefficients, p-values,
# and model evaluation metrics (AIC, BIC).
# This table includes p-values, AIC (Akaike Information Criterion), and BIC (Bayesian Information Criterion)
create_summary_table <- function(model, dataset_name) {</pre>
 pvalues <- get_pvalues_arimax(model) # Getting p-values for the model</pre>
  aic <- AIC(model) # Calculating the AIC for model fit evaluation</pre>
 bic <- BIC(model) # Calculating the BIC for model fit evaluation</pre>
  # Constructing a summary table with relevant statistics
  summary_table <- data.frame(</pre>
    "Variable" = names(pvalues),
    "P-value" = pvalues,
    "AIC" = aic,
    "BIC" = bic,
    "Model" = dataset_name,
   stringsAsFactors = FALSE
 )
 return(summary_table)
3
# Creating summary tables for all ARIMAX models
table_HypoPT <- create_summary_table(arimax_HypoPT, "HypoPT")</pre>
table_GentilePT <- create_summary_table(arimax_GentilePT, "GentilePT")</pre>
table_HypoIT <- create_summary_table(arimax_HypoIT, "HypoIT")</pre>
table_GentileIT <- create_summary_table(arimax_GentileIT, "GentileIT")</pre>
# Displaying the summary tables using kable for a structured view of the ARIMAX model outcomes
kable(table_HypoPT, caption = "Summary of ARIMAX Model Results for HypoPT", digits = 3)
kable(table_GentilePT, caption = "Summary of ARIMAX Model Results for GentilePT", digits = 3)
kable(table_HypoIT, caption = "Summary of ARIMAX Model Results for HypoIT", digits = 3)
kable(table_GentileIT, caption = "Summary of ARIMAX Model Results for GentileIT", digits = 3)
# Function to plot coefficients for each ARIMAX model
# This function excludes "intercept" and unwanted variables to provide a cleaner visualization
plot_coefficients <- function(coeff, title) {</pre>
```

```
coeff_without_intercept <- coeff[!names(coeff) %in% c("intercept", "ar1")]</pre>
```

```
# Creating a bar plot to visualize the coefficients
  barplot(coeff_without_intercept,
          main = title,
          horiz = TRUE,
          las = 1,
          xlab = "Coefficient Value",
          col = "#d22a48",
          xlim = range(c(0, max(coeff_without_intercept))))
}
# Applying the plot function to each ARIMAX model's coefficients
plot_coefficients(coef(arimax_HypoPT), "Regression Coefficients - HypoPT")
plot_coefficients(coef(arimax_GentilePT), "Regression Coefficients - GentilePT")
plot_coefficients(coef(arimax_HypoIT), "Regression Coefficients - HypoIT")
plot_coefficients(coef(arimax_GentileIT), "Regression Coefficients - GentileIT")
# This completes the ARIMAX modeling process. The results provide valuable insights into how price competitiveness
# and other factors influence brand performance over time, allowing us to draw conclusions that could inform
# strategic marketing decisions and competitive positioning.
##### DIAGNOSTIC TESTS AND RESIDUAL ANALYSIS #####
# After fitting the ARIMAX models, it's essential to validate the assumptions and ensure that our models are appropriate.
# This step involves a thorough residual analysis to check for issues such as non-normality, autocorrelation,
# and heteroscedasticity, which could undermine the reliability of our results.
# First, we extract the residuals from each ARIMAX model, as these residuals represent the differences
# between the observed and predicted values of the dependent variable (Market Share).
residuals_HypoPT <- residuals(arimax_HypoPT)
                                                 # Residuals for HypoPT model
residuals_GentilePT <- residuals(arimax_GentilePT) # Residuals for GentilePT model
residuals_HypoIT <- residuals(arimax_HypoIT)  # Residuals for HypoIT model</pre>
residuals_GentileIT <- residuals(arimax_GentileIT) # Residuals for GentileIT model
# Plotting residuals for each model to visually assess model fit
# A random scatter around zero indicates that the model captures the patterns well
plot(arimax_HypoPT$residuals, main = "Residuals - HypoPT", ylab = "Residuals", type = "o")
plot(arimax_GentilePT$residuals, main = "Residuals - GentilePT", ylab = "Residuals", type = "o")
plot(arimax_HypoIT$residuals, main = "Residuals - HypoIT", ylab = "Residuals", type = "o")
plot(arimax_GentileIT$residuals, main = "Residuals - GentileIT", ylab = "Residuals", type = "o")
# Creating residuals vs fitted values plots for each model to assess model assumptions
# These plots help evaluate whether the residuals show constant variance (homoscedasticity)
# and whether there is any pattern indicating model misspecification
# Function to create residuals vs fitted values plot using ggplot2 for enhanced visualization
plot_residuals_vs_fitted <- function(fitted_values, residuals, title) {</pre>
  data <- data.frame(Fitted = fitted_values, Residuals = residuals)</pre>
  ggplot(data, aes(x = Fitted, y = Residuals)) +
    geom_point(color = "#21346d", size = 2) + # Plotting residuals as points
geom_hline(yintercept = 0, color = "#d22a48", linetype = "dashed") + # Adding a reference line at 0
    labs(title = title, x = "Fitted Values", y = "Residuals") +
    theme_minimal() +
    theme(plot.title = element_text(hjust = 0.5, face = "bold"))
}
# Creating residuals vs fitted plots for each ARIMAX model
# For HypoPT
fitted_HypoPT <- fitted(arimax_HypoPT)</pre>
plot_residuals_vs_fitted(fitted_HypoPT, residuals_HypoPT, "Residuals vs Fitted - HypoPT")
# For GentilePT
fitted_GentilePT <- fitted(arimax_GentilePT)</pre>
plot_residuals_vs_fitted(fitted_GentilePT, residuals_GentilePT, "Residuals vs Fitted - GentilePT")
```

```
# For HypoIT
fitted_HypoIT <- fitted(arimax_HypoIT)</pre>
plot_residuals_vs_fitted(fitted_HypoIT, residuals_HypoIT, "Residuals vs Fitted - HypoIT")
# For GentileIT
fitted_GentileIT <- fitted(arimax_GentileIT)</pre>
plot_residuals_vs_fitted(fitted_GentileIT, residuals_GentileIT, "Residuals vs Fitted - GentileIT")
# To formally test whether the residuals are normally distributed, we apply the Shapiro-Wilk test.
# Normality of residuals is an important assumption in regression analysis, and violations could affect
# the validity of hypothesis testing results.
shapiro.test(residuals_HypoPT)
                                   # Shapiro-Wilk test for HypoPT residuals
shapiro.test(residuals_GentilePT) # Shapiro-Wilk test for GentilePT residuals
                                 # Shapiro-Wilk test for HypoIT residuals
shapiro.test(residuals_HypoIT)
shapiro.test(residuals_GentileIT) # Shapiro-Wilk test for GentileIT residuals
# Generating QQ (Quantile-Quantile) plots further aids in assessing residual normality.
# These plots compare the quantiles of the residuals to a theoretical normal distribution.
# Deviations from the 45-degree line suggest departures from normality.
qqnorm(residuals_HypoPT, main = "QQ-plot Residuals - HypoPT")
qqline(residuals_HypoPT)
qqnorm(residuals_GentilePT, main = "QQ-plot Residuals - GentilePT")
aqline(residuals_GentilePT)
qqnorm(residuals_HypoIT, main = "QQ-plot Residuals - HypoIT")
qqline(residuals_HypoIT)
gqnorm(residuals_GentileIT, main = "QQ-plot Residuals - GentileIT")
gqline(residuals_GentileIT)
# Next, we analyze the residuals for autocorrelation using ACF (Autocorrelation Function)
# and PACF (Partial Autocorrelation Function) plots. These plots reveal whether there is any
# remaining structure in the residuals that our model did not capture. Ideally, there should be no significant
# autocorrelation remaining, indicating that our model has adequately explained the data.
acf(residuals_HypoPT, main = "ACF of Residuals - HypoPT ARIMAX")
pacf(residuals_HypoPT, main = "PACF of Residuals - HypoPT ARIMAX")
acf(residuals_GentilePT, main = "ACF of Residuals - GentilePT ARIMAX")
pacf(residuals_GentilePT, main = "PACF of Residuals - GentilePT ARIMAX")
acf(residuals_HypoIT, main = "ACF of Residuals - HypoIT ARIMAX")
pacf(residuals_HypoIT, main = "PACF of Residuals - HypoIT ARIMAX")
acf(residuals_GentileIT, main = "ACF of Residuals - GentileIT ARIMAX")
pacf(residuals_GentileIT, main = "PACF of Residuals - GentileIT ARIMAX")
# To statistically confirm the presence or absence of autocorrelation in the residuals,
# we perform the Ljung-Box test. This test evaluates whether any significant autocorrelation
# remains at different lags in the residuals, providing a formal check of model adequacy.
residuals_HypoPT <- na.omit(residuals_HypoPT)</pre>
residuals_GentilePT <- na.omit(residuals_GentilePT)</pre>
residuals_HypoIT <- na.omit(residuals_HypoIT)</pre>
residuals_GentileIT <- na.omit(residuals_GentileIT)</pre>
cat("\nLjung-Box Test for Autocorrelation - HypoPT:\n")
lb_test_HypoPT <- Box.test(residuals_HypoPT, lag = 20, type = "Ljung-Box")</pre>
print(lb_test_HypoPT)
cat("\nLjung-Box Test for Autocorrelation - GentilePT:\n")
lb_test_GentilePT <- Box.test(residuals_GentilePT, lag = 20, type = "Ljung-Box")</pre>
print(lb_test_GentilePT)
```

```
cat("\nLjung-Box Test for Autocorrelation - HypoIT:\n")
lb_test_HypoIT <- Box.test(residuals_HypoIT, lag = 20, type = "Ljung-Box")</pre>
print(lb_test_HypoIT)
cat("\nLjung-Box Test for Autocorrelation - GentileIT:\n")
lb_test_GentileIT <- Box.test(residuals_GentileIT, lag = 20, type = "Ljung-Box")</pre>
print(lb_test_GentileIT)
# Another crucial diagnostic test is the Variance Inflation Factor (VIF),
# which measures multicollinearity among independent variables in our ARIMAX models.
# High VIF values suggest that some independent variables are highly correlated,
# potentially inflating standard errors and leading to unreliable coefficient estimates.
calculate_vif <- function(exog_data, dataset_name) {</pre>
  # A 'fake_response' variable is created for VIF calculation since VIF requires a dependent variable,
  # but we're only interested in the relationships among the independent variables.
  fake_response <- rnorm(nrow(exog_data)) # Creating a dummy dependent variable for linear model fitting</pre>
  lm_model <- lm(fake_response ~ ., data = exog_data) # Fitting a dummy linear model to calculate VIF</pre>
  vif_values <- vif(lm_model) # Calculating VIF values</pre>
  # Displaying VIF values for each independent variable provides insight into multicollinearity issues.
  cat("\nVIF for exogenous variables in", dataset_name, ":\n")
  print(vif_values)
}
# Preparing exogenous variables (independent variables) for each dataset
# Exogenous variables for HypoPT
exog_vars_HypoPT <- HypoPT[, c(</pre>
  "Variabile Indipendente Neoblanc Hypo Vs PL (X1)",
  "Variabile Indipendente Neoblanc Hypo vs AO (X2)",
  "Variabile Indipendente Volatilità (X3)_Diff",
  "Variabile Indipendente Inflazione (X4)_Diff",
  "Variabile Indipendente Media (X5)_Diff"
)]
# Exogenous variables for GentilePT
exog_vars_GentilePT <- GentilePT[, c(</pre>
  "Variabile Indipendente Volatilità (X3)_Diff",
  "Variabile Indipendente Inflazione (X4)_Diff",
  "Variabile Indipendente Media (X5)_Diff"
)]
# Exogenous variables for HypoIT
exog_vars_HypoIT <- HypoIT[, c(</pre>
  "Variabile Indipendente ACE Hypo vs PL (X1)",
  "Variabile Indipendente ACE Hypo vs AO (X2)"
  "Variabile Indipendente Volatilità (X3)_Diff"
  "Variabile Indipendente Inflazione (X4)_Diff",
  "Variabile Indipendente Media (X5)_Diff"
)1
# Exogenous variables for GentileIT
exog_vars_GentileIT <- GentileIT[, c(</pre>
  "Variabile Indipendente ACE Gentile vs PL (X1)",
  "Variabile Indipendente ACE Gentile vs AO (X2)",
  "Variabile Indipendente Volatilità (X3)_Diff",
  "Variabile Indipendente Inflazione (X4)_Diff",
  "Variabile Indipendente Media (X5)_Diff"
)]
```

```
# Calculating and displaying VIF values for each dataset to identify potential multicollinearity issues.
calculate_vif(exog_vars_HypoPT, "HypoPT")
calculate_vif(exog_vars_GentilePT, "GentilePT")
calculate_vif(exog_vars_HypoIT, "HypoIT")
calculate_vif(exog_vars_GentileIT, "GentileIT")
# The results from this comprehensive diagnostic analysis will inform us about the validity
# of our ARIMAX models, # highlighting any assumptions that might have been violated or
# aspects of the models that need adjustment.
##### MEDIA VARIABLE ANALYSIS WITH LAGS #####
# Having completed the initial ARIMAX models and diagnostics, we noticed that the
# independent variable GRPs (Gross Rating Points), was not consistently significant across all models.
# This lack of significance is unusual, as GRPs typically play a crucial role in influencing market share.
# To investigate this further, we need to examine potential lag effects.
# We create a function that runs the ARIMAX model across different lag intervals for GRPs,
# enabling us to capture any delayed effects on market share and determine if these
# effects are indeed significant.
# Function to replace zero values with a small non-zero value
# This step prevents issues with log transformation and helps avoid errors in the ARIMAX model
replace_zeros_with_small_value <- function(dataset, var_name, small_value = 0.1) {
  dataset[[var_name]] <- ifelse(dataset[[var_name]] == 0, small_value, dataset[[var_name]])</pre>
  return(dataset)
}
# Function to apply a logarithmic transformation to the variable (optional)
# Log transformation can help stabilize variance and normalize the distribution of the media variable
apply_log_transform <- function(dataset, var_name) {</pre>
  dataset[[paste0(var_name, "_log")]] <- log(dataset[[var_name]])</pre>
  return(dataset)
}
# Replacing zero values with a small non-zero value for the "Media (X5)" variable in each dataset
# This ensures that log transformation can be applied without encountering infinite or undefined values
HypoPT <- replace_zeros_with_small_value(HypoPT, "Variabile Indipendente Media (X5)")</pre>
GentilePT <- replace_zeros_with_small_value(GentilePT, "Variabile Indipendente Media (X5)")
HypoIT <- replace_zeros_with_small_value(HypoIT, "Variabile Indipendente Media (X5)")</pre>
GentileIT <- replace_zeros_with_small_value(GentileIT, "Variabile Indipendente Media (X5)")
# Applying a log transformation to the "Media (X5)" variable (optional)
# This transformation helps to handle skewness and makes the relationship with the dependent variable more linear
HypoPT <- apply_log_transform(HypoPT, "Variabile Indipendente Media (X5)")</pre>
GentilePT <- apply_log_transform(GentilePT, "Variabile Indipendente Media (X5)")
HypoIT <- apply_log_transform(HypoIT, "Variabile Indipendente Media (X5)")</pre>
GentileIT <- apply_log_transform(GentileIT, "Variabile Indipendente Media (X5)")
# Function to run an ARIMAX model with lags on the exogenous media variable (X5)
# The goal is to check whether adding lags makes the media variable significant in predicting market share
run_arimax_with_lags <- function(dataset, dep_var, indep_var, indep_log_var, lags, use_log = FALSE) {</pre>
  results <- list() # Initialize a list to store results for each lag
  for (lag in lags) {
    lagged_var <- ifelse(use_log, paste0(indep_log_var, "_Lag", lag), paste0(indep_var, "_Lag", lag))</pre>
    # Creating the lagged version of the media variable
    dataset[[lagged_var]] <- dplyr::lag(dataset[[ifelse(use_log, indep_log_var, indep_var)]], n = lag)</pre>
```

```
# Fitting an ARIMAX model with the lagged media variable as the exogenous regressor
    arimax_model <- auto.arima(dataset[[dep_var]], xreg = dataset[[lagged_var]], seasonal = TRUE)</pre>
    # Save the model and its summary in the results list
    results[[paste0("Lag_", lag)]] <- list(model = arimax_model, summary = summary(arimax_model))</pre>
  }
  return(results) # Return the list of models and summaries for each lag
}
# Defining the dependent and independent variables
# The dependent variable is Market Share (Y), and the independent variable is the media variable (X5)
dependent_var <- "Variabile Dipendente Market Share (Y)"</pre>
independent_var <- "Variabile Indipendente Media (X5)'</pre>
independent_log_var <- "Variabile Indipendente Media (X5)_log"
lags_to_apply <- c(1, 2, 3, 4, 5, 6) # List of lags to apply for testing the effect of different lag intervals
# Applying the lagged ARIMAX models to each dataset to assess whether the GRPs variable becomes significant
# over different time lags and to understand the full extent of its impact on market share.
# For HypoPT dataset
arimax_HypoPT_Lags <- run_arimax_with_lags(HypoPT, dependent_var, independent_var,
                                          independent_log_var, lags_to_apply, use_log = TRUE)
# For GentilePT dataset
arimax_GentilePT_Lags <- run_arimax_with_lags(GentilePT, dependent_var, independent_var,
                                              independent_log_var, lags_to_apply, use_log = TRUE)
# For HypoIT dataset
arimax_HypoIT_Lags <- run_arimax_with_lags(HypoIT, dependent_var, independent_var,</pre>
                                           independent_log_var, lags_to_apply, use_log = TRUE)
# For GentileIT dataset
arimax_GentileIT_Lags <- run_arimax_with_lags(GentileIT, dependent_var, independent_var,
                                              independent_log_var, lags_to_apply, use_log = TRUE)
# Displaying the results for each lagged ARIMAX model helps determine if the GRPs variable shows any delayed significance
# in its effect on market share, thereby providing more accurate insights into its role in brand performance.
print("ARIMAX Results with Lags for HypoPT:")
print(arimax_HypoPT_Lags)
print("ARIMAX Results with Lags for GentilePT:")
print(arimax_GentilePT_Lags)
print("ARIMAX Results with Lags for HypoIT:")
print(arimax_HypoIT_Lags)
print("ARIMAX Results with Lags for GentileIT:")
print(arimax_GentileIT_Lags)
###### BREAKPOINT ANALYSIS #####
##### SEGMENTED REGRESSION AND BREAKPOINT ANALYSIS #####
# An important part of our analysis is to determine if there is a specific price threshold (breakpoint)
# above which the market share of a brand is significantly impacted. This threshold can inform strategic pricing decisions.
# Segmented regression allows us to identify these breakpoints, where the relationship between price index
# and market share changes, indicating a significant shift in consumer behavior or market dynamics..
# Function to clean up column names by removing any leading/trailing whitespace and newline characters
# This step ensures that the column names are consistent and do not have any formatting issues
# that could cause errors during analysis
clean_colnames <- function(df) {</pre>
  colnames(df) <- gsub("^\\s+1\\s+$", "", gsub("\n", "", colnames(df))) # Removing unnecessary spaces and newlines
  return(df)
}
```

```
# Applying the cleanup function to each dataset to ensure consistency in column names
# Consistent column names are crucial for avoiding errors and ensuring smooth data analysis
HypoPT <- clean_colnames(HypoPT)</pre>
GentilePT <- clean_colnames(GentilePT)</pre>
HypoIT <- clean_colnames(HypoIT)</pre>
GentileIT <- clean_colnames(GentileIT)</pre>
# Segmented regression allows us to identify the breakpoints, where the relationship between price index
\# and market share changes, indicating a significant shift in consumer behavior or market dynamics..
perform_segmented_regression <- function(dataset, price_var_name, market_var_name, plot_title, plot_color) {
  # Extract the price index and market share variables from the dataset
  # This is crucial for understanding how changes in price index impact market share across different levels
  price_index_var <- dataset[[price_var_name]]</pre>
  market_share_var <- dataset[[market_var_name]]</pre>
  # Fit an initial linear model to establish a baseline relationship between price index and market share
  # The linear model provides a starting point to identify any potential breakpoints
  lin_model <- lm(market_share_var ~ price_index_var, data = dataset)</pre>
  # Perform segmented regression to identify breakpoints in the relationship
  # The segmented model detects points where the slope of the relationship between price index
  # and market share changes significantly
  segmented_model <- segmented(lin_model, seg.Z = ~price_index_var)</pre>
  # Displaying the summary of the segmented model
  # This summary provides insights into the location of the breakpoints
  # and how the relationship changes before and after these points
  print(summary(segmented_model))
  # Plotting the original data (Price Index vs Market Share) to visualize the relationship
  # Adding the segmented rearession line helps to clearly show where the breakpoints occur
  plot(price_index_var, market_share_var, main = plot_title,
       xlab = "Price Index", ylab = "Market Share", pch = 19, col = "gray")
  plot(segmented_model, add = TRUE, col = plot_color, lwd = 2)
}
# Performing segmented regression for each dataset using both "vs PL" (Private Label) and "vs AO" (All Other) price indices
# This process helps identify how market share is impacted by price index relative to private label and other competitors
# HypoPT: Performing segmented regression using "vs PL" price index
perform_segmented_regression(HypoPT,
                             price_var_name = "Variabile Indipendente Neoblanc Hypo Vs PL (X1)",
                             market_var_name = "Variabile Dipendente Market Share (Y)",
                             plot_title = "Segmented Regression for HypoPT vs PL",
                             plot_color = "#d22a48")
# HypoPT: Performing segmented regression using "vs A0" price index
perform_segmented_regression(HypoPT,
                             price_var_name = "Variabile Indipendente Neoblanc Hypo vs A0 (X2)",
                             market_var_name = "Variabile Dipendente Market Share (Y)",
                             plot_title = "Segmented Regression for HypoPT vs A0",
                             plot_color = "#d22a48")
# GentilePT: Performing segmented regression using "vs PL" price index
perform_segmented_regression(GentilePT,
                             price_var_name = "Variabile Indipendente Neoblanc Gentile vs PL (X1)",
                             market_var_name = "Variabile Dipendente Market Share (Y)",
                             plot_title = "Segmented Regression for GentilePT vs PL",
                             plot_color = "#d22a48")
# GentilePT: Performing segmented regression using "vs AO" price index
perform_segmented_regression(GentilePT,
                             price_var_name = "Variabile Indipendente Neoblanc Gentile vs A0 (X2)",
                             market_var_name = "Variabile Dipendente Market Share (Y)",
                             plot_title = "Segmented Regression for GentilePT vs AO",
plot_color = "#d22a48")
```

```
# HypoIT: Performing segmented regression using "vs PL" price index
perform_segmented_regression(HypoIT,
                             price_var_name = "Variabile Indipendente ACE Hypo vs PL (X1)",
                             market_var_name = "Variabile Dipendente Market Share (Y)",
                             plot_title = "Segmented Regression for HypoIT vs PL",
                             plot_color = "#d22a48")
# HypoIT: Performing segmented regression using "vs AO" price index
perform_segmented_regression(HypoIT,
                             price_var_name = "Variabile Indipendente ACE Hypo vs A0 (X2)",
                             market_var_name = "Variabile Dipendente Market Share (Y)",
                             plot_title = "Segmented Regression for HypoIT vs A0",
                             plot_color = "#d22a48")
# GentileIT: Performing segmented regression using "vs PL" price index
perform_segmented_regression(GentileIT,
                             price_var_name = "Variabile Indipendente ACE Gentile vs PL (X1)",
                             market_var_name = "Variabile Dipendente Market Share (Y)",
                             plot_title = "Segmented Regression for GentileIT vs PL",
                             plot_color = "#d22a48")
# GentileIT: Performing segmented regression using "vs AO" price index
perform_segmented_regression(GentileIT,
                             price_var_name = "Variabile Indipendente ACE Gentile vs A0 (X2)",
                             market_var_name = "Variabile Dipendente Market Share (Y)",
                             plot_title = "Segmented Regression for GentileIT vs A0",
```

plot_color = "#d22a48")

By performing these segmented regression analyses, we can pinpoint the exact price indices where a significant # change in market share occurs. These breakpoints are crucial for informing pricing strategies, allowing brands # to understand the price sensitivity of their customers and adjust their pricing tactics accordingly.