Miras Technologies International

Whitepaper

Dynamic price optimization in retail

The potentials of automated pricing methods

The right price at the right time – automatically

Miras Teams | Autumn 2017

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Abstract

Online shops, Airlines, car transportation and travel business are demonstrating how: They are increasingly implementing dynamic pricing strategies. The method used boast a completely new quality compared to conventional pricing strategies thanks to the interplay between continuous environmental analysis (competitive prices, Inventory, season etc.) and price response. This white paper provides information about how Miras dynamic pricing works and promising retail use cases. The use of pricing intelligence has enormous potential, both for e-commerce business.

Why dynamic pricing

In the past, a price was mainly found, set or fixed by applying the so-called cost-plus method. Thereby the profit to be gained is added to the full cost of the product to determine the selling price. With this cost-driven pricing approach, monitoring competitors' prices and the gut feeling of the category manager played significant roles. It was largely a manual process. Nowadays the pricing system in many retail companies has been refined and operates with system support using software that is also in a position to map pricing rules. Various product types can thus be classified according to their price focus and their competitive relevance. Prices in the stores can be controlled by way of regional price zones.

Nevertheless, it is still mostly a manual process not in keeping with market dynamics.

Figure 1 cost-plus pricing method

In the age of big data, digitalization and a highly dynamic market, it is no longer possible for humans to adequately control the variety of influencing factors on the price. This is where
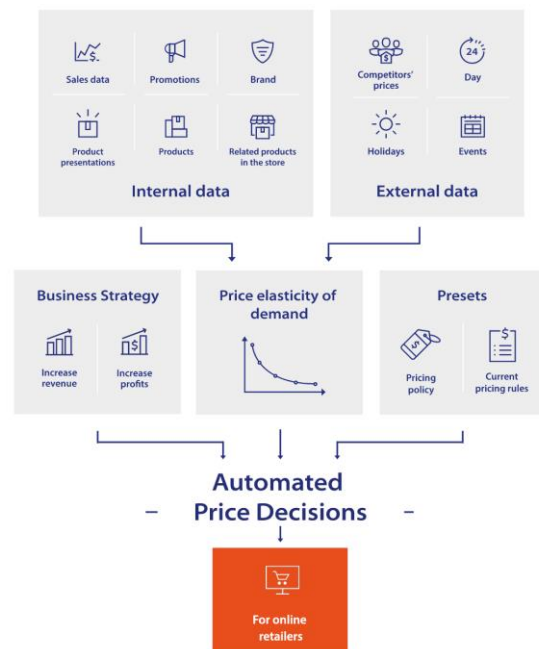

Figure 2 Automated pricing diagram

self-learning algorithms come into play. At any time and at all touch points they can completely

automatically calculate the optimal price for each item based on price elasticity. Consumer price acceptance is crucial for this type of pricing. The reasons for using fully automatic pricing methods operating in real time are easy to comprehend:

Increased efficiency through process automation

It is impossible to consistently gather, analyses and evaluate all of the price influencing factors for product ranges with several thousand products without an intelligent automation solution. Prices can be calculated using an algorithm and then automatically implemented in online businesses. Dynamic pricing makes it possible to automate data analytics and price response processes across the entire retail business in the medium and long-term.

Optimising sales, turnover, and earnings through value-added pricing

A dynamic pricing system can be configured for different objectives. Depending on the product range and competitive relevance, the system can be set to optimise gross profit, turnover or sales volume. The artificial intelligence behind it has been proven to increase gross profit in the online environment. Product prices are optimised according to the target function defined by the retailer and knowledge of customer price acceptance thresholds. This will lead to:

- Improved Revenues
- Improved profits
- Stock levels reduction

Building a positive price image through strategic pricing

Every retailer is naturally interested in the pricing of its competitors. Unfortunately, rigid, mechanical pricing rules often are getting nowhere. Dynamic pricing methods recognize, anticipate and prevent ruinous price spirals, offering a considerable added value to end customers: Serious price development instead of confusing price distortions. Dynamic pricing includes competitor prices, not as a concrete adjustment rule but weighted according to the brand strength of the retailer and taking into account many other pricing factors. The expertise of the respective retailer thus has more of an impact. If the competitor lowers the price of an item, the response is both automatic and dynamic. However, the price is not always lowered to the competitor's level but rather only to the price acceptance threshold relative to the company's own brand strength. Sometimes customers buy an item even if it costs more than the competitor's item. There can be several reasons for this, easily illustrated using the example of a full-range supplier. Many customers will accept a higher price if the level of service is particularly high if items are always in stock if they can find everything they need in the one place or simply because the store is convenient in the mentioned terms for them. Strategic pricing strengthens the price image, achieving a fair market price for the entire assortment. Focusing the system on the
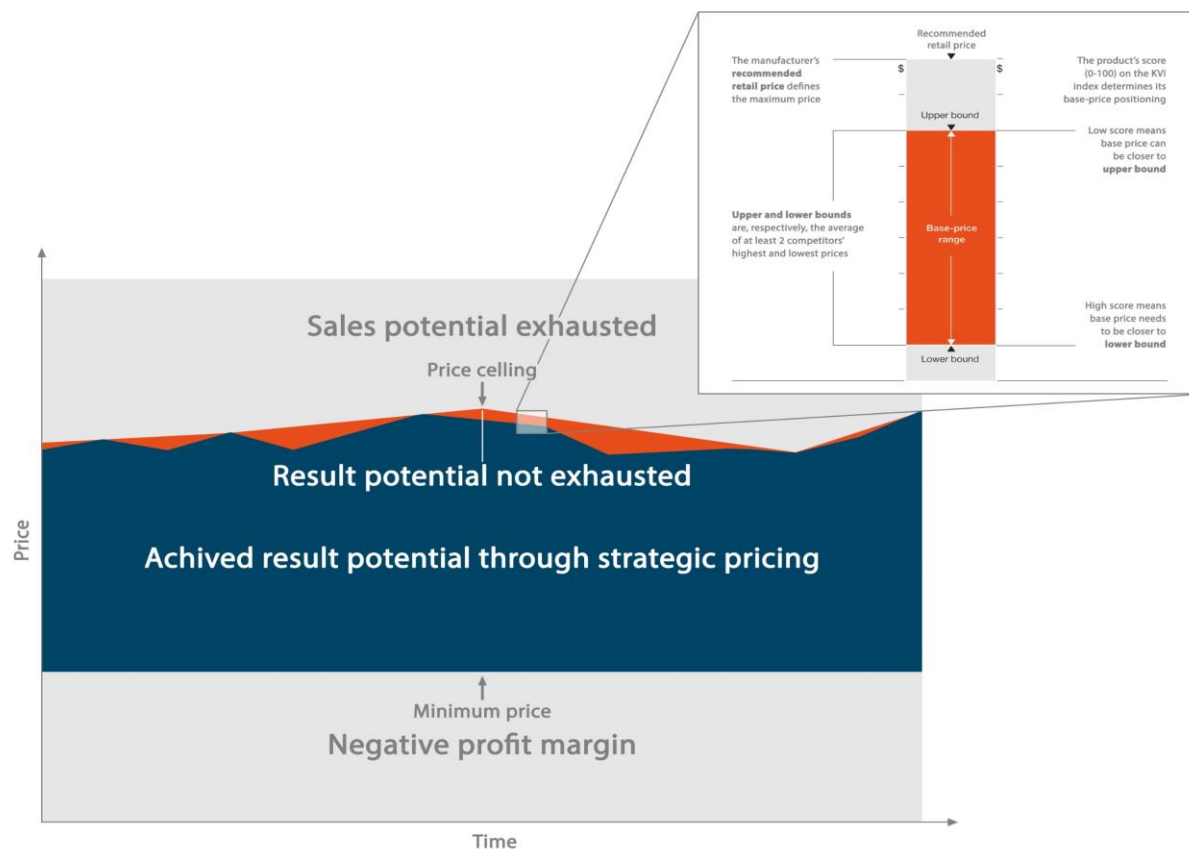
Figure 3 Value Added Pricing

optimisation of turnover or frequency allows market shares to be consistently expanded.

## *Automatic consideration of complex interdependencies*

Pricing intelligence considers the price factor, not in isolation from other parameters and environmental factors. The optimisation tasks to be solved are clearly more complex. A number of targets (customer loyalty, turnover etc.), as well as constantly changing environmental conditions (availabilities, events etc.), must be incorporated. This complexity can only be handled using intelligent dynamic pricing methods. In a constantly changing market environment, the fair

market price can only be determined using dynamic pricing methods that take into account these changes adaptively and in real time.

Simulation of new pricing strategies

Intelligent, IT-supported dynamic pricing and the human capacity to make decisions are not mutually exclusive concepts. On the contrary: Data-driven price optimisation and strategic control complement one another. Consistent data analysis and data preparation enable insight into the cause-effect relationships essential to strategic decision-making. That means it ultimately provides the opportunity to pro-actively design a wide variety of pricing policies, simulate the

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Figure 4 A sample of simulated pricing scenarios
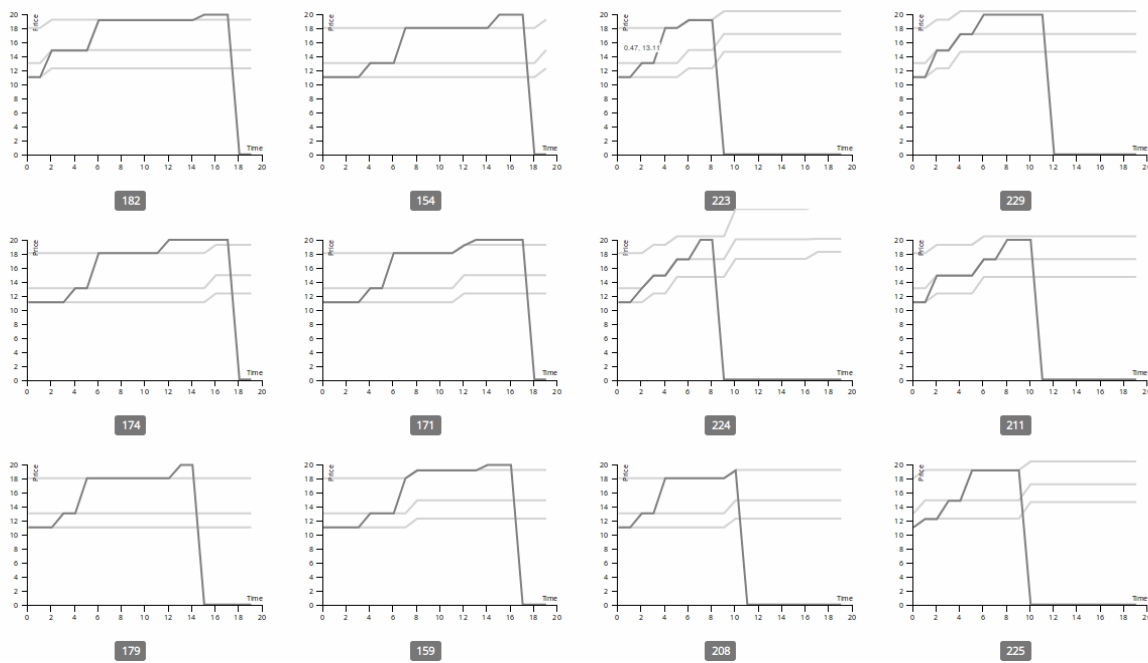
effects of various strategies and predict their success. This system ultimately provide a scientific optimisation based on machine learning instead of a rule-based system. Our scientific price optimisation is based on machine learning instead of pre-set rules or hypotheses, making it more accurate and able to rapidly adapt to market changes. Price optimisation covers thousands of products at SKU/store level on a daily basis Serving a customisable pricing strategy and strategic KPIs such as revenue or profit.

Base Pricing for Online Retailers

Challenge

Retailers currently face fierce competition, with rising online players taking over a big chunk of the market. In order to stop declining sales and falling profits, retailers must carefully look at their base pricing strategy.

- Increased competition, mostly from online retailers

- Deciding which prices should follow competition trends

Solution

- Optimised pricing, which accurately calculates how external factors such as competition affect the price elasticity per product

- A strategic price optimisation, depending on the desired business strategy, e.g. focus on revenue and/or profits

Features

- Increased revenue and margin
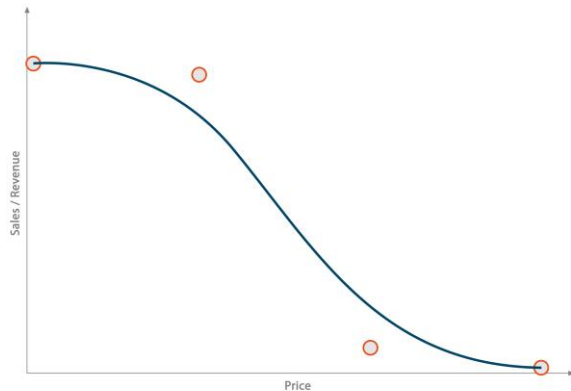
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- Reduced stock level

Figure 5 Price elasticity

- Reduction in return rates due to more competitive pricing

- Constant price updates based on the latest information – prices follow market trends

- Price optimisation for both normal seasonal sales and markdown sales

- Low maintenance after initial setup – considerably reduces time spent on price management

Price elasticity determination

Miras Price Optimisation systematically tests different price points for a given product to calculate the resulting changes in demand. It then determines the price elasticity of demand for each product based on a collection of price, quantity pairs and session data of online store. Even for slow-selling goods, the price elasticity can be accurately determined by using cluster and aggregation algorithms and evaluating their describing features.

Once the price elasticity is known, the price for a product can be optimised according to the customer's chosen pricing strategy. After a short learning period, it sets the optimal price for each product, ensuring that the company's price implementation matches its overall strategy.

Revenue-maximising pricing strategy

As the name suggests, this strategy sets the price so that the overall revenue for the product is maximised. It automatically detects the point where the effect of decreasing price offsets the effect of growing sales to calculate and revenue is no longer increased.

This strategy achieves rapid sales, but the revenue-optimising price may be unprofitable for the company. It works best for growth companies and new product introductions where capturing market share is the primary goal.

Profit-maximising pricing strategy

Profit-maximising sets the price so that the overall profit margin for the product is maximized, taking into account the cost of merchandise and individual product return rates, not just the revenue that can be achieved.

This strategy optimises for maximum profit – which could also include price increases or significant changes compared to competitive prices. It is most beneficial to established companies and existing assortments. It brings the fastest return on investment.

Stock-based pricing strategy

The stock-based pricing strategy can be used for products at the end of the product lifecycle. It considers available stocks, price elasticity, and

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forecasted demand until the end of the season or product lifecycle. Using this information, Price Optimisation sets the optimal price so that prices-price reductions happen as slowly as possible, while still ensuring that no leftover stocks remain at the end of the season.

This strategy performs profit-oriented markdown management and works best for highly seasonal products that go out of fashion or products that become obsolete due to technology life cycles.

Price strategy mix

The price strategy mix strikes a balance between revenue and profit optimisation. Depending on their individual goals, customers can define the percentage by which revenue should be optimised over profit.

It is possible to set a mix that accurately reflects the company strategy. If the customer focus is growth, setting the target to revenue will yield optimum results. If profit maximisation is required, setting the goal to profit optimisation is the ideal approach. But even in growth-oriented companies, the cost of capital can be a concern, so that mixing strategies may prove to be most useful.
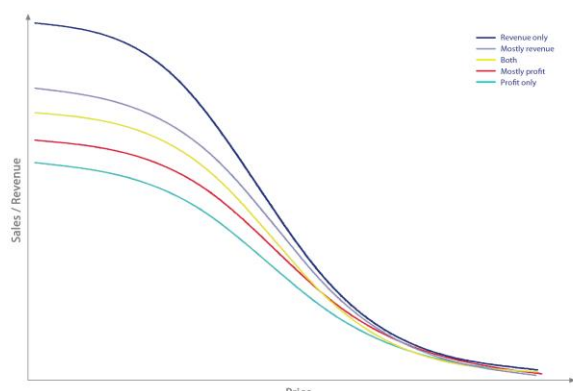

Figure 6 Different pricing strategy

Pricing rules

Miras Price Optimisation allows pricing rules to be set. All product prices within these rule sets are optimised according to their underlying constraints. Pricing rules allow constraints to be set on an individual product, between products (for instance, the smaller size of a product should always cost less than the larger size) and even across entire product groups (for instance, to enforce an average price). The optimisation is performed within the boundary parameters set by pricing rules.

Pricing rules such as minimum prices, maximum prices be implemented to ensure consistency. However, it is important to note that enforcing too many predefined pricing rules can constrain the optimisation and lead to reduced revenue or profit gains.

Marketplace monitoring

An important aspect to consider when setting prices is the price structure of the overall marketplace. Price Optimisation takes into account competitive prices (provided by the customer), as well as substitution and cannibalization effects between products to determine at what price customers decide to switch to a slightly different product, or even to a competitor.

This 360-degree view of the market ecosystem means that retailers automatically end up with a price strategy that is competitive, but still profitable and avoids the price wars and races to the bottom often caused by repricing tools. By monitoring the entire assortment for substitution and cannibalization effects, it also ensures that the

success of one item is not at the expense of another.

Cost of re-pricing

Every price change takes time to implement and more importantly have negative effect on customers most of the time. Even though Price Optimisation can optimise prices for tens of thousands of products across thousands of categories, it pools price changes to reduce their frequency so that they are only applied if they are profitable.

The cost of price changes can be submitted using our API, so that variations between product categories can be understood, leading to fewer price changes in cases where these changes are costly.

Supply & Demand REST API

The API allows the delivery of master data and sales data to Miras Price Optimisation using a simple and secure combination of XML and HTTPS. All uploads are checked for validity and consistency prior to booking.

Data can be delivered from any ERP or e-commerce system, database or technology platform, even homegrown solutions.

The optimal price – what retailer isn't looking for it? But how do we find the optimal price that is up-to-date, satisfies the customer's actual willingness to pay and also considers a wealth of environmental factors?

The basis of an intelligent pricing solution is the automated determination and preparation of all
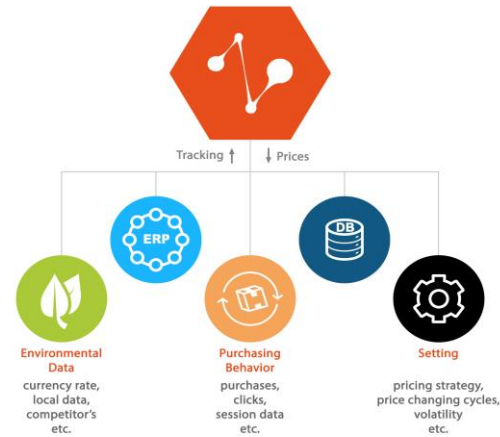

Figure 7 Miras Dynamic Pricing Engine

demand indicators at every customer interaction point. That includes, for example, every purchase, every click, every acceptance of *a newsletter, the geolocation of an interested customer and many other price-relevant environmental factors*. When adorned with an exact time stamp all this information can be useful to build the basis for the modeling of high-dimensional profit functions. However, the wealth of price-relevant information also implicates a challenge when it comes to consistently preparing, analyzing and using this information. Automating data analysis and price response processes is a real-time process in order to minimise resulting administrative costs.

Figure 7 depicts the real-time data analytics processes and interfaces as made available in the field of dynamic pricing by the Miras dynamic pricing Engine (DPE). The real-time framework illustrated provides the opportunity to completely automate data analysis and price response processes across all customer interaction channels.

The Miras DPE is a self-learning artificial intelligence that analyses the interplay between price action and customer response. Real-time capability allows for immediate feedback on the effectiveness of the pricing. Three rules apply in this case:

1. The larger the available data set, the better the analysis results.

2. Learning by direct interaction (online learning) is more important than analyzing historical data (of online learning).

3. Offline and online learning complement each other organically.

It can be compared to learning how to play chess: The player can learn the game by reading a book on the theory and rules of the game. However, that player will learn the most by playing against an actual opponent. The optimal solution is a combination of the two – the book and the real chess partner.

To exaggerate, real-time capability in the context of pricing means that the algorithm is playing a real-time game with the customer, consisting of real-time analysis, action, and response. The algorithm's goal is that the "customer purchases at the best price in accordance with the objective", whereas the customer's goal is to "buy at a price I can appreciate".

A/B testing

If required, Miras can perform a randomised A/B test for a customer. This involves controlling prices for only a subset of the inventory, allowing a comparison between optimised and non-optimised pricing strategies. However, this A/B test requires additional consulting and reduces the overall positive effect of Price Optimisation for the duration of the trial.

How we do it?

Miras Price Optimisation is the right choice for e-commerce retailers looking to achieve their strategic goals, such as revenue growth, profit increase, end-of-season markdown management or a combination of all three, by implementing a dynamic, market-driven pricing reflecting real customer demand.

As a software as a service, Price Optimisation can be easily and securely integrated into existing e-commerce systems. To achieve optimal results, some key customer data is required.

Implementation & Integration

Miras Price Optimisation include an implementation project conducted by Miras's team of data scientists. This implementation project typically includes:

- Qualification

- Pre-analysis based on historical sales data

- Concept development, including integration architecture

- Implementation and integration

- A/B testing (if required)

- Model tuning

- Rollout

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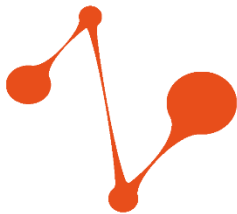
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