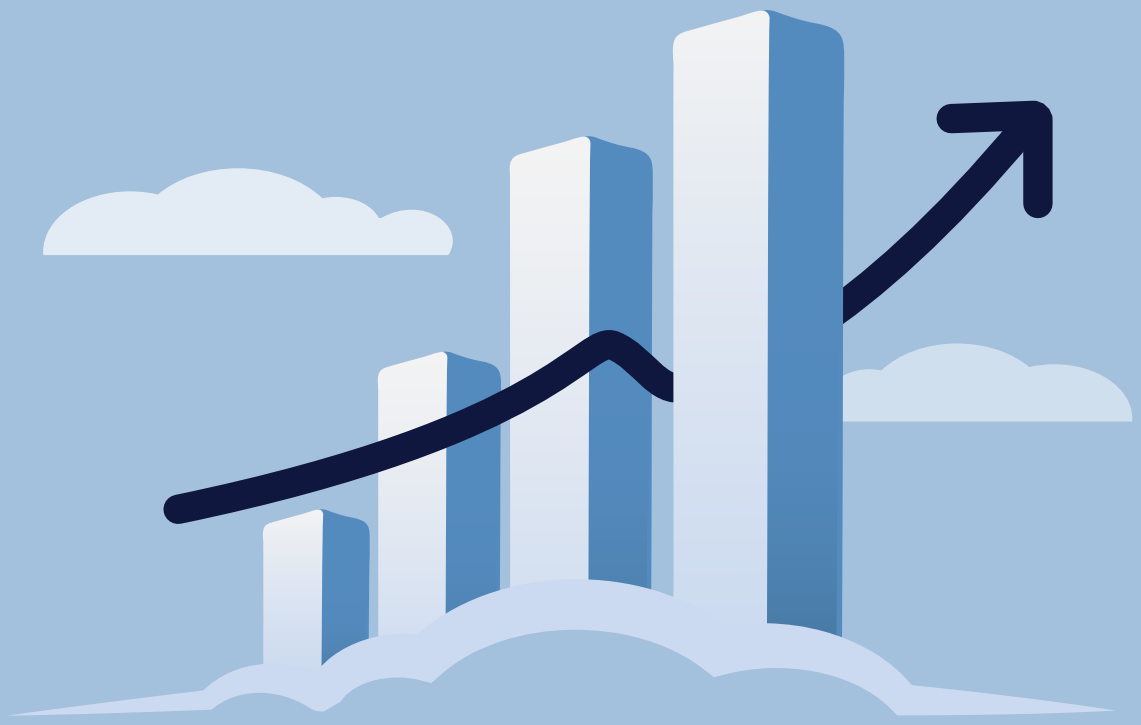

Price Elasticity & the Challenges in Retail

QUICKLIZARD

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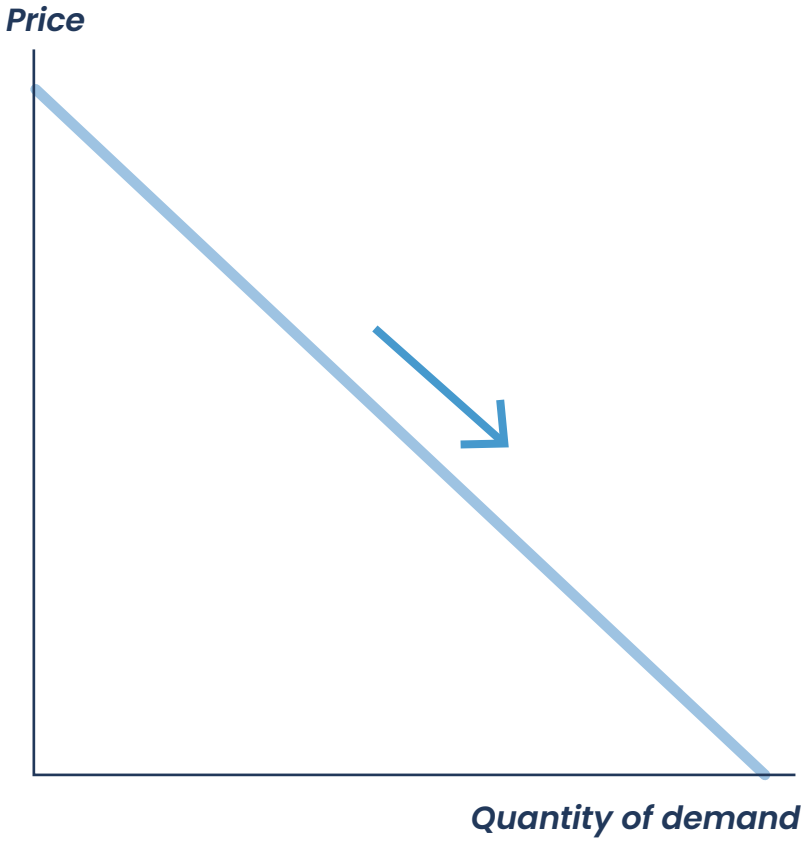
What is Price Elasticity

Pricing Elasticity is at the core of pricing science. A goods price elasticity measures the change in quantity demanded for a given change in price.



An elasticity of -1.25 means that for every 1% increase in price, the quantity demanded decreases by 1.25%. Elasticity is generally negative, the higher the price the lower the quantity demanded. Therefore, it is usually spoken of in absolute terms.

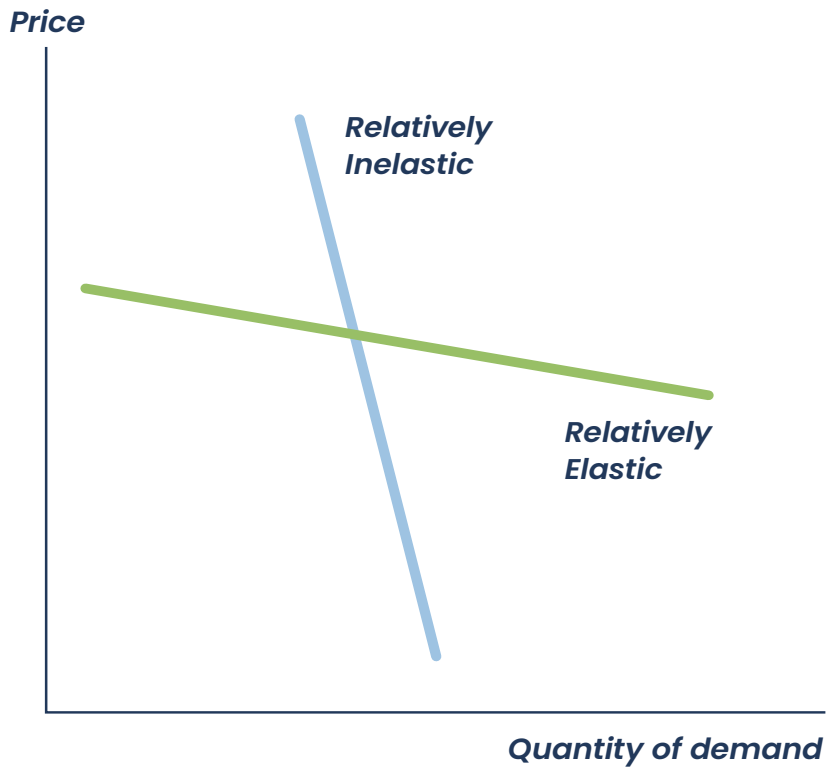
Every point on this demand curve represents a group of people (segment) that are willing to pay that price. Near the top is the segment only shop direct and won't shop around. They go directly to www.samsung.com and buy from there. Further down the curve, there are more segments to capture but they're more sensitive to price and have a lower willingness to pay.

Definition

A good that has an elasticity greater than 1 is said to be elastic. A good that has an elasticity of 1 is unitary elastic, and a good with elasticity below one is said to be inelastic. Elasticity is a spectrum so the greater the absolute elasticity the more elastic a good is. Higher elasticity means that a price change will have a higher proportional impact on quantity demanded

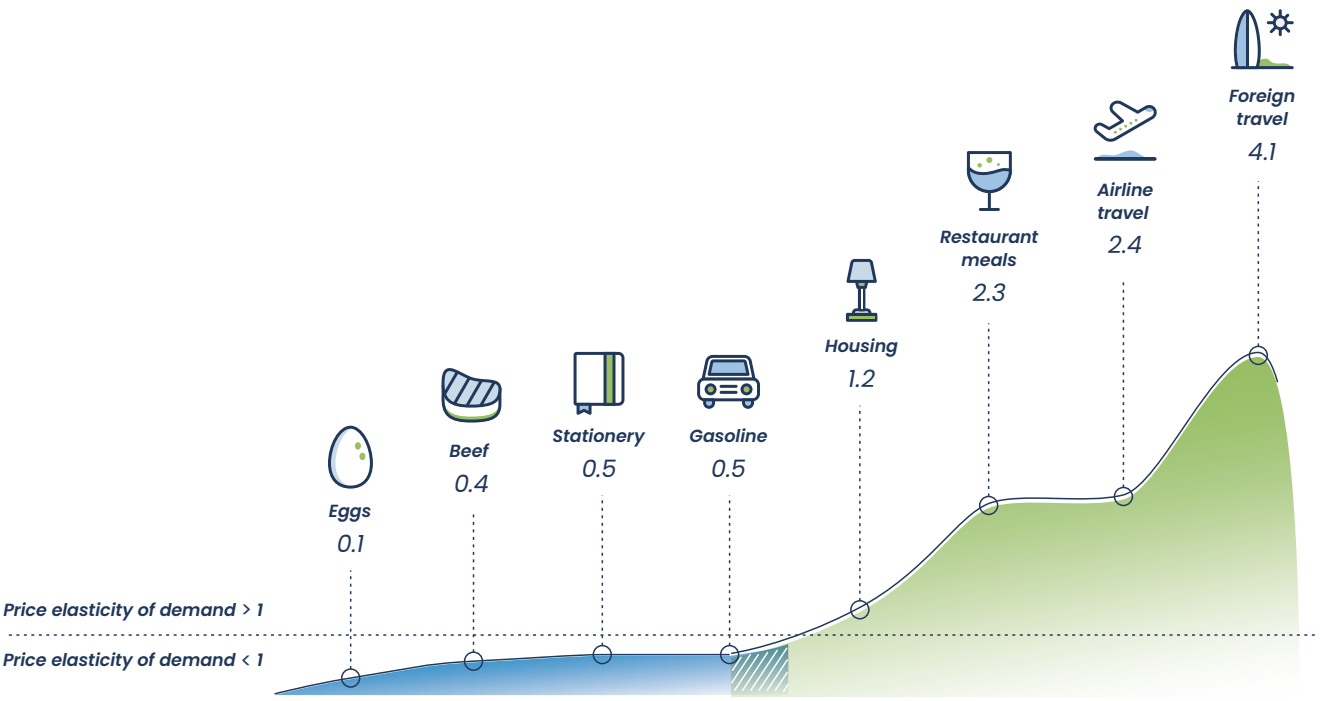
Elastic	**> 1**	**1% increase in price leads to a greater than 1% decrease in quantity demanded**
Unitary elastic	**= 1**	**1% increase in price leads to an equal decrease in quantity demanded**
Inelastic	**< 1**	**1% increase in price leads to a lower than 1% decrease in quantity demanded**

Elastic and inelastic products can be found within the same categories. For consumer electronics, a Playstation is relatively price inelastic, while a standard Dell laptop is relatively elastic. A Playstation is a branded product, sold by one company, with limited alternatives (XboX), and desired by kids. All these factors make it less elastic so a 15% change in price won't shift demand significantly. However, a personal Dell laptop has a lot of similar alternatives (HP, Acer, Asos, Lenovo etc.) that customers can substitute into. A 15% change will shift demand more significantly.



This elasticity difference can be noted within the same product range as well. The premium mobile phone industry has a small group of superior series inelastic products with a long tail of elastic ones. The latest iPhone pricing is less elastic than an older version. There are customers all along the demand curve for all these phones. The customer that wants the latest iPhone has a higher willingness to pay than one looking for a temporary replacement for their recently lost Nokia.

In the grocery industry, essential products with limited substitutes like eggs are relatively inelastic while Non essential products such as liquor are relatively elastic.



Point Versus Arc Elasticity

There are two main ways to calculate elasticity. Point elasticity measures the quantity change demanded for a change in price at a specific point on the demand curve. It depends heavily on which two points on the curve are chosen as starting and end points of the calculation. Point elasticity is most accurate for small price changes and changes all along the demand curve.

Conversely, arc elasticity, also known as the mid-point method, is calculated by taking the average of the starting and ending points of prices and quantities. It gives the average elasticity of a section of the curve between two points.

How it's Calculated

Point Elasticity

Point elasticity is calculated by dividing the change in quantity demanded by the change in price between two points on a curve

Step 1:	***Step 2:***	***Step 3:***
% change in Quantity (Q) = (Q2-Q1)/Q1	% change in Price (P) = (P2-P1)/P1	% change in Q / % change in P

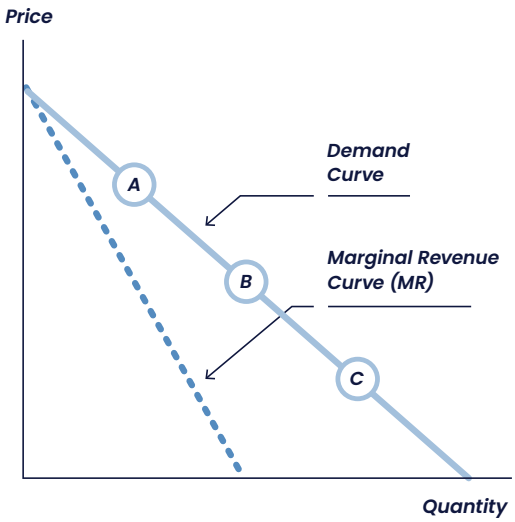
Arc Elasticity

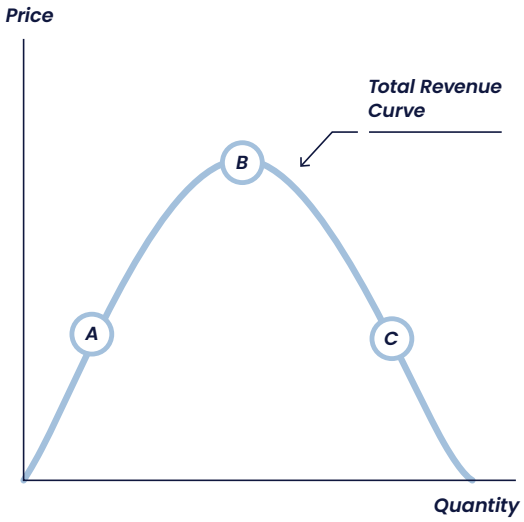
Arc elasticity is calculated by measuring the elasticity at the midpoint between two points on the curve.

Step 1	***Step 2***	***Step 3***
Midpoint Quantity (Q) = (Q1+Q2)/2	Midpoint Price (P) = (P1+P2)/2	[(Q2-Q1)/Midpoint Q] / [(P2-P1)/Midpoint P]

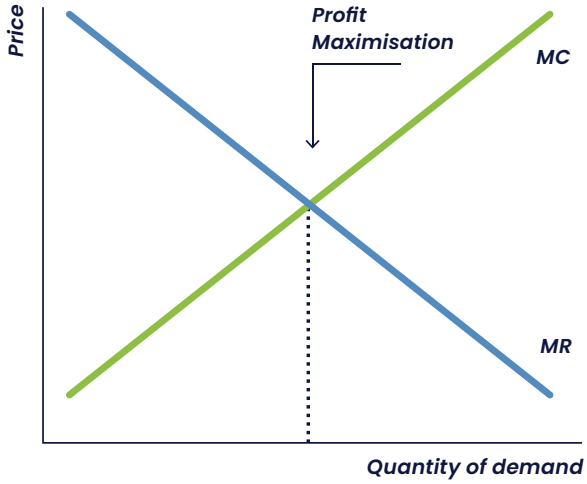
Elasticity Related Pricing Strategies

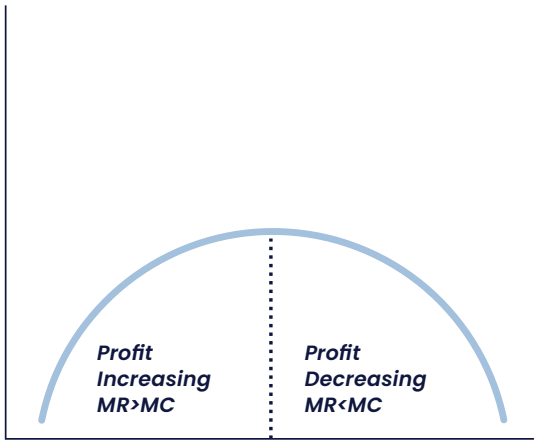
The goal of an elasticity related pricing strategy is to find the maximizing curve. There are three curves to consider. The already familiar price to quantity curve needs to be combined with a view of price to revenue and price to profit.





The marginal revenue curve (MR) shows the increase in revenue from selling one additional unit. In this example, the demand curve is linear and revenue is maximized at point B. However, neither of these two curves take cost into account. Like marginal revenue, marginal cost (MC) shows the cost impact of selling one additional unit. Therefore, profit is maximized when MC = MR.





The price to quantity is a decreasing curve. Price to revenue is an increasing curve or semi-circle. In retail, there is a low range of pricing where units are sold. Price to profit is a semi-circle. The goal is to find the top of the profit curve.

At either end of the pricing extreme, pricing at zero or at infinity, profit is null. When priced at zero, no matter how many units are sold, profit will be zero. At a very high price, the per unit profit will be very high, but there is unlikely to be enough units sold to make a profit.

In Practice

There are two implementation approaches for elasticity related pricing strategies. One is an optimization approach where prices are changed by X% to a potential profit maximizing point and then re-calculated and re-tested based on the real quantity impact.

Another way, used when a complete elasticity curve is not available, is to change price based on the elasticity of individual products. This approach is often used by supermarkets. To increase revenue, decrease the price of very elastic goods such as pots and pans. To increase profit, increase the price of inelastic goods like bread.

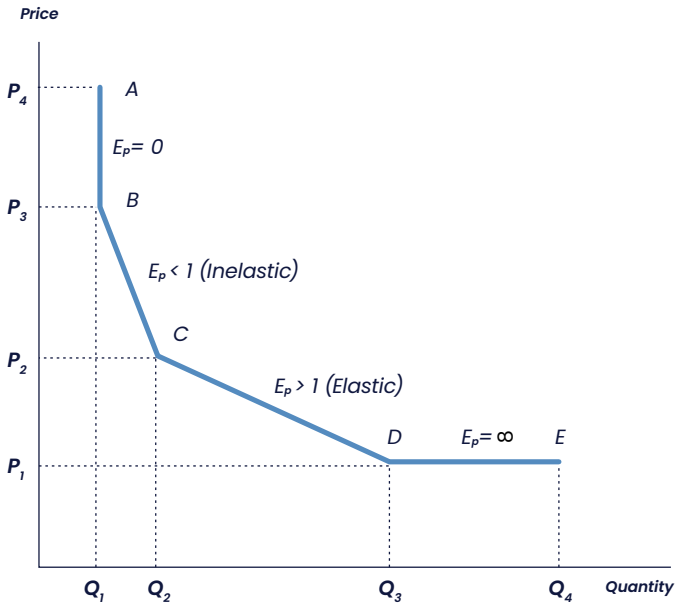
Overall, the goal is to maximize profit, not to calculate the elasticity number. While these strategies are useful, they are not everything.

Challenges in Retail

The Curve is not Linear

In most retail cases the demand curve isn't linear so one elasticity number is just an estimate.

With different curves, a single number cannot be used to say anything about elasticity Even arc elasticity assumes that arc is linear so more points along the curve are needed. Additionally, some points on the curve are not relevant due to inventory and replenishment constraints.



Sparse Data

Very often, pricing data at a product level is sparse. In this case and when there are many products, elasticity can be calculated by clustering similar products into groups. This means that not every product needs to have pricing history to calculate elasticity.

Recalculating Elasticity

Elasticity is not a static measure. It needs to be recalculated regularly. The price elasticity of the latest iPhone now is going to be different than in two years. Competition changes constantly influence the demand curve.

Elasticity in the Online World

Selling online presents additional challenges for calculating elasticity. While the quantity measure is straightforward for physical businesses, online businesses can always buy more traffic or users, thereby influencing the quantity measure.

More money can be spent on marketing to get a higher quantity instead of decreasing the price. This undue influence on quantity means that the price elasticity theory is broken in the online world.

Coefficients

It is important to distinguish between movements in the elasticity demand curve due to consumer behaviour, from movements of the entire curve due to external changes.

These external changes are also known as coefficients and are used to correct the demand curve to make it more accurate.

Seasonality

The demand for certain items has seasonal trends that need to be incorporated into the elasticity calculation. For seasonal products, demand becomes more elastic when demand levels peak. Price decreases that accompany a demand peak can have a bigger effect on revenue and profit than in times of lower demand.

Seasonality is not just holiday and sale seasons – in retail, days of the week are also an example of seasonality influencing the demand curve. Even times of day – in the grocery industry, busy people buy in the evening and afternoons, less busy people buy during the day.

Cross Elasticity

Price elasticity is also influenced by price changes of related products. Cross elasticity of demand measures the change in quantity demanded for a product to the change in price of another product. It can shift the entire demand curve.

A negative cross elasticity denotes two products that are complements. An increase in price of product A leads to a decrease in quantity demanded for product B. If the price of A decreases, the demand curve for product B shifts to the right, signalling an increase in demand for B.

eBooks and eBook readers are examples of complementary products. If the price of an eBook reader decreases, the consumption of eBooks will increase because more customers can afford the reader. Products can be close complements or weak complements.

A positive cross price elasticity denotes that products are substitutes. An increase in price of product A will increase the demand for product B because customers can easily replace product A with product B. Two competing airlines are examples of substitute products. If airline A increases flight prices even marginally versus Airline B, consumers will likely notice and substitute into Airline B. Like with complements, there are close and weak substitutes.

Unrelated products have a cross price elasticity of zero.

Complements	**< 1**	**Products that are consumed together where the demand for one directly affects the consumption of the other.**
Substitutes	**> 1**	**Products that are closely related to one another and compete for the same customers.**
Unrelated	**0**	**Products with no relation to one another have a cross price elasticity of zero.**

Competitor Price Sensitivity

Where pricing sits compared to the rest of the market also influences the quantity response to a price change. When the cheapest competitor in the market reduces price, it might not matter at all. But if one of the mid-range players decreases price, a minor change can make a big difference.

Omni-Channel

A (omni-channel) multi-brand strategy tries to capture different audiences on the same demand curve. Taking advantage of this strategy means selling on Amazon for one price, own dot com for a second price, and an outlet site at an even lower price - all from the same assortment. This works because consumers are not the same, some will leave the city to go to an outlet to buy jeans while others will just order online. The best way to price is to give each person on the demand curve the price that matches their willingness to pay exactly. This is known as price discrimination.

Case Study - Consumer Electronics

The first iPhone launched in 2007 for a starting price of $499. By 2021, the starting price of the latest model had risen to $799, with the Pro version at $999. That is a 60% increase for the flagship model in 14 years.

The iPhone is notoriously known as a price inelastic good. The brand power of Apple and amount of loyalty displayed but its customers seemed to have no bounds. It seemed like customers would pay any price. However, Apple did reach the point with their price increases where their elasticity curve broke. The curve is not linear and Apple found that out the hard way.

In 2018, Apple released the iPhone XS, XS Max, and XR starting at $999, $1,099, and $749. The XS Max pricing went up to $1,449 for the version with the most memory. This was the most expensive phone ever released by Apple. The previous years' flagship model (iPhone X) had also debuted at $999, like its replacement (XS), but the replacement (XS) was now the mid-range offer, not the top. This was the tipping point.

While the iPhone X made up 20.1% of its inaugural years' sales, the iPhone XS made up just 8.5% by the same time the following year. That year, the cheaper XR model ($749) dominated with 39.5% of sales.

By 2021, the flagship model was back down to a starting price of $799 and the Pro version at $999 - both below the 2018 levels. The change in starting prices indicates that Apple reached a part of the curve where elasticity gave way. The assumption that the price would remain inelastic forever was broken once the $1000 threshold was crossed.

Case Study - Grocery

Cottage cheese is a popular commodity in Israel and the Tnuva cooperative controlled up to 70% of the dairy market in the country. Due to this monopoly, until 2008, prices were regulated by the Israel Anti-Trust Authority.

In 2008, these price controls were removed. Research was carried out that showed that cottage cheese is an inelastic good and that the price could be increased with seemingly no bounds. Within 3 years, the price of Tnuva cottage cheese increased by 66%, from 4.82 to 8 NIS.

While Tnuva cottage cheese obeys the logic of inelastic products – essential product, low competition, no close substitutes, and constitutes a small proportion of income, this increase was where this inelasticity argument broke. Widespread protests and boycotts broke out in Israel over the unaffordability of food. The government got involved and re-imposed price controls and lowered tariffs on competing foreign dairy products. Tnuva lowered the price to 5.90 NIS.

The results of the cottage cheese boycott were widespread. Demand for cottage cheese dropped by 30% during the boycotts, brand loyalty diminished, customers substituted between brands, and post-boycott prices were below the profit maximizing levels. Inelasticity has its bounds. There was a blind trust that the product would always live on the inelastic part of the curve. Reality differed. Elasticity isn't everything.

How QuickLizard Can Help

Price elasticity is a multi-faceted topic. Using historical data and one elasticity metric is not enough. QuickLizard can help.

The Quicklizard elasticity module uses data science to calculate how a price change affects demand, while accounting for factors like seasonality, cannibalization, clustering, and competitor price changes.

The proprietary algorithm and full suite of pricing optimization and enrichment modules advances pricing excellence, at scale. It enables retailers to automate pricing and move to a fully digitalised pricing infrastructure that is tailored to business goals. Powered by science, designed for success.

To learn how QuickLizard can help you achieve pricing excellence,
speak to one of our pricing experts today.

Find out more >

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