# The EVA Curve Model: An Analytical and Econometric Approach

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**Abstract**

This research aims to analytically develop the traditional EVA formula by investigating how EVA behaves in relation to a value driver represented by revenue. EVA and revenue do not invariably exhibit a direct proportional relationship given the impact of management decisions on operational, financial, and investment structures. The analytical development of the EVA formula reveals the interplay between these structures and the underlying value creation variables, resulting in a versatile model — the EVA Curve Model — which can be employed for planning and monitoring business decisions, as well as evaluating management performance.

An empirical analysis is then carried out. The EVA Curve Model's validity is demonstrated by applying an econometric approach to two Italian economic sectors: coffee roasting and construction. These sectors were chosen for two reasons: the former is characterised by stability and maturity, while the latter is strongly influenced by general economic trends, as well as specific government investment and fiscal policies. The findings of this empirical study confirm that, in some cases, there is an inverse relationship between total revenues and EVA. The proposed model helps managers take corrective action on the underlying variables to restore optimal conditions.

**Keywords:** EVA, EVA Curve Model, Zero EVA Point (ZEP), Performance Management, Managerial Policies, Professionalisation of Management Activities.

## 1. INTRODUCTION

The need to identify a performance indicator that can be used to quantify the value created or destroyed, and to guide managementdecisions, has led to the creation of the model known as Economic Value Added (EVA) (Bennett Steward III, 1991). The primary aim of this research is to develop the EVA model in an analytical manner, examining the behaviour of EVA in relation to a value driver, identified as revenue. Secondly, the proposed model is tested in two economic sectors with very different characteristics through an econometric analysis.

The rationale for focusing on the EVA model is twofold. Firstly, it is able to overcome the well-known limitations of traditional accounting-based indicators (Guatri, 2000; Melis et al., 2014). Secondly, it is straightforward to implement and provides timely insights that can inform management decisions. Moreover, the employment of EVA serves to mitigate the agency problem between shareholders and management (Jensen and Meckling, 1976; Hundal, 2015). Furthermore, it denotes a transition towards the implementation of a management system that is oriented around the maximisation of firm value, as opposed to the mere generation of profits (Ittner and Larcker, 2001; Stern and Willett, 2019).

The selection of revenue as the value driver of the model is substantiated by the accessibility of this figure in financial statements. The impact of this independent variable on EVA is not a foregone conclusion. Assuming a specific operating structure and predetermined investment and financing decisions, an increase in revenues does not invariably result in value creation, nor does it necessarily lead to profit growth. Even when a company generates a profit, this does not guarantee value creation.The operative, financial and investment structures, resulting from managerial decisions, exert a significant influence on value creation and growth. Consequently, for a given revenue, EVA can vary considerably between companies adopting divergent structures.

It became imperative for managers to develop a comprehensive understanding of the variables inherent in the operative, financial and investment structures. Moreover, managershave to recognise and manage the interconnections between these three structures, which are often regarded as distinct compartments rather than as a cohesive whole.

This research proposes a novel analytical approach to the traditional EVA formula that moves in the aforementioned direction.By explicating the variables underlying the three structures and the links between them, the EVA Curve Model demonstrates how a particular managerial decision influencesvalue creation. It is therefore essential for management to establish substantial connections between their strategy, these variables and value created or destroyed to enable effective decision making and performance management.

The structure of the paper is as follows.Paragraph 2 presents a review of the literature on performance measurement and value creation,highlighting the gap that this study aims to fill.Paragraph 3 proposes the analytical EVA Curve Model, underlining the links among variables and the benefits in terms of performance measurement and management.Paragraph 4 deals with the application of the proposed model to the construction and coffee roasting sectors in order to verify its statistical significance and demonstrate that the relationship between revenue and EVA is sometimes inverse.Paragraph 5 concludesemphasising the employment of the proposed model as a planning, control and learning tool, enabling the direction and coordination of activities in a manner that serves the interests of the company and its shareholders.

## 2. LITERATURE REVIEW

The field of performance management has seen a proliferation of performance indicators over time. These include Cash Flow Return on Investment (CFROI) by HOLT Value Associates, Shareholder Value Added (SVA) by LEK-Alcar Consulting Group, Economic Profit approach by McKinsey, Economic Earnings by AT Kearney, and Economic Value Added (EVA) by Stern Stewart & Co. The commonality between these metrics is that they are all predicated on the premise that reported earnings are subject to accounting distortions and fail to account for the total cost of capital.

Among these indicators, Economic Value Added (EVA®) has received considerable attention. Bennett Stewart (1991, 1994) asserts that it is superior to other metrics in its ability to accurately measure a company's true economic profit, in its capacity to facilitate investment opportunities for investors, and in its role in incentivising managers to make decisions that add value to the business. Tully (1994) describes EVA as the most recent and exciting innovation in the field of measuring corporate success, while Young and O’Byrne (2003) regard it as the pivotal element in the implementation process of a strategy.



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The aim of EVA® is to focus financial and strategic planning on value creation (Grant, 2005; Guermat*et al.*, 2019). It is utilised as an indicator to evaluate and incentivise management performance, with the objective of mitigating the well-documented divergences between the objectives of shareholders and management itself (agency theory, Hundal, 2015; Jensen and Meckling, 1976; Pellicelli, 2007).

The author's approach asserts that EVA is equivalent to the net operating profit after tax (NOPAT), from which the cost of capital employed (CC) must be deducted. The cost of capital employed is the product of the weighted average cost of capital (WACC, $i_A$) and the net invested capital (NIC):

$$\mathrm{EVA} = \mathrm{NOPAT} - \mathrm{CC} = \mathrm{NOPAT} - (i_A \cdot \mathrm{NIC}) \qquad [2.1]$$

The value creation is contingent upon the existence of a spread between a positive NOPAT and the cost of capital (NOPAT > CC $\Rightarrow$ ROIC[1]> WACC).

A substantial corpus of research has been dedicated to the subject of EVA, which can be broadly categorised as follows:

- theoretical and empirical studies that evaluate the superiority of EVA over other metrics in measuring shareholder value;
- theoretical and empirical studies that evaluate the relevance and significance of the accounting adjustments involved in calculating EVA;
- theoretical and empirical studies that evaluate the extent to which EVA-linked performance measurement systems enhance value, aid strategic planning and decision-making, andmotivate managers and employees to perform better, in line with shareholders' interests.

It is a well-established doctrine that accounting measures are inadequate for reliable assessment of value creation or destruction (Bacidore et al., 1997; Chen and Dodd, 2001, 1997; Ehrbar, 1999; Ferguson and Leistikow, 1998; Gupta and Sikarwar, 2016; Rappaport, 1999; Sharma and Kumar, 2010; Shil, 2009; Tripathi et al., 2023). Theyconstitute a valid support and the essential starting point for preparing an accurate analysis of company performance (Guatri, 2000). However, it is imperative to highlight the limitations of accounting measures from a value creation perspective, limitations that can be attributed to: the absence of a reliable assessment of the cost of equity; the strong tendency to ignore risk and the financial value of time; and the absence of references to the market values of balance sheet items.These values are replaced by the concept of historical cost, which is traceable to prudential principles (Melis et al., 2014). Since these measures are derived from accounting data, they are subject to the same construction constraints. This applies to a wide range of profitability measures, including Return on Investment (ROI), Return on Equity (ROE), Return on Sales (ROS), Earnings per Share (EPS) and numerous others.

The primary distinctions between EVA and traditional accounting-based measures can be attributed to two factors. Firstly, the cost of capital, which is deducted from NOPAT, encompasses both the cost of debt and the opportunity cost of equity capital. Consequently, an organisation is deemed to be generating value solely when it returns more than the expected returns to its shareholders. Secondly, the adjustments made to NOPAT and invested capital to overcome accounting distortions serve to differentiate EVA from other measures. A comprehensive list of over 160 adjustments has been proposed by the proponents of EVA (Bennett Stewart III, 1994, 2013), and various studies have been conducted to ascertain the extent to which these accounting adjustments contribute to the value of EVA and the number of adjustments required to enhance the relevance of EVA to value (O'Byrne, 1996; Weaver, 2001; Young, 1999).

[1] $\mathrm{ROIC} = \frac{\mathrm{NOPAT}}{\mathrm{NIC}}$



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A substantial body of research hasdocumented the success of companies that have adopted EVA and EVA-based performance management systems (Bennett Stewart III, 1994; Biddle et al., 1997; Ehrbar, 1999; Guermat et al., 2019; Klieman, 1999; Riceman et al., 2002). In particular, the implementation of EVA has been shown to result in significant enhancements to EBITDA and operating margins, accelerated asset turnover, and augmented cash flow generation. These factors, in turn, have been identified as crucial catalysts for superior stock market performance. This subject has led to the development of a management approach known as Value-Based Management (VBM) (Donna, 1999; Knight, 1998; Ittner and Larcker, 2001; Morin and Jarrel, 2001; Stern and Willett, 2019; Wobst et al., 2025), with the objective of maximising company value rather than merely generating profits (Hundal, 2015; Knight, 1998; Manelli and Pace, 2009). According to Morin and Jarrel (2001) “[VBM] is both a philosophy and a methodology for managing companies. As a philosophy, it focuses on the overriding objective of creating as much value as possible for the shareholders. […] As a methodology, VBM provides an integrated framework for making strategic and operating decisions”.

Conversely, the review of the extant literature reveals a paucity of studies on the relationships between the managerial policies and the different variables determining the value creation. The present research aims to fill this gap, by undertaking an analytical refinement of the conventional EVA formula.As early as the 1980s, emphasis was placed on the necessity to address management policies in a more systematic and scientific manner (Chittoor and Das, 2007; Grey, 1997; Reed and Anthony, 1992; Zanda, 1984). In addition to the intuition, experience and foresight of individual managers, it was argued that the governance of modern companies increasingly required the adoption of sophisticated technical tools for calculating, processing and transmitting information. Indeed, there were calls for the “scientification” and “professionalisation” of management activities.The integration of artificial intelligence into the day-to-day operations is a direct consequence of this paradigm shift.The EVA Curve Model is a relevant framework in this context, as it provides a tool for the systematic and rigorous evaluation of the effects that management policies have on value creation.Furthermore, the identification of the variables that influence EVA facilitates the dissemination and specification of objective and verifiable quantitative targets across different hierarchical levels. These targets are useful for the aforementioned process of staff assessment and incentivisation. They serve to constrain the autonomy of decision-making at the individual level, thereby initiating processes of self-control and learning. Moreover, they facilitate the coordination and direction of collective conduct in a manner that is aligned with the interests of the company and its shareholders.

The following research questions are addressedduring the development of the EVA Curve Model:

1. Is there always a direct proportional relationship between revenues and EVA, or can management policies lead to inverse proportionality?
2. Are there total revenue thresholds that delimit the areas of value creation and value destruction?
3. How can management policies influence these thresholds and the extent of the areas of value creation and destruction?
4. Can this relationship be empirically studied according to the assumptions of the statistical regression model?

## 3. EVA CURVE MODEL

The aim of this paragraph is to analytically developthe traditional EVA formula, thereby defining a versatile model that can be readily employed forunderstanding the dynamics underlying value creation, for planning and monitoring business decisions, and evaluating and incentivisingmanagement performance.

This model attempts to analyse the behaviour of EVA by describing its evolution through a curve, starting from the total cost ($C_T$) and total revenue ($R_T$) functions. These are conventionally



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depicted geometrically as two curves (Figure 1.A), thereby signifying a non-linear trend as a function of the quantities produced and sold. The vertical difference between these curves enables the construction of the operating profit curve (OP) (Figure 1.B), which represents the known maximum point at the maximum distance between the total cost curve and the total revenue curve (point at which marginal revenue equals marginal cost). The application of a tax rate at each point on the operating revenue curve results in a reduction of the operating profit function, thereby enabling the determination of the NOPAT curve (Figure 1.B).

For the sake of illustration, the cost of capital (CC) isrepresented by a straight line, which is also correlated with the level of quantities produced and sold (Figure 1.B). It could also be represented by a non-linear function quite similar to that of total costs. The graphical construction of the EVA curve is obtained as the vertical difference between the NOPAT curve and the cost of capital curve (Figure 1.C).

The result obtained enables the identification of the area of value production, defined by the points of intersection between the EVA curve and the x-axis, where the ROIC will exceed the WACC.It will be demonstrated that these points, termed Zero EVA Point (ZEP), are of considerable importance. Furthermore, it is possible to identify areas of value destruction, where the ROIC is lower than the WACC. Finally, it should be noted that this graphical representation of the EVA trend facilitates the identification of anoptimum point, in terms of volumes produced and sold (Q*), corresponding to a maximum level of EVA ($EVA_{MAX}$).As demonstrated in Figure 1, this approach provides an intuitive answer to the primary and secondary research questions.

In our analytical approach to the EVA Curve Model, we have opted for linear functions on the basis that, within a specified range of relevance of managerial choices, they provide a satisfactory approximation to the non-linear behaviour of the aforementioned functions.

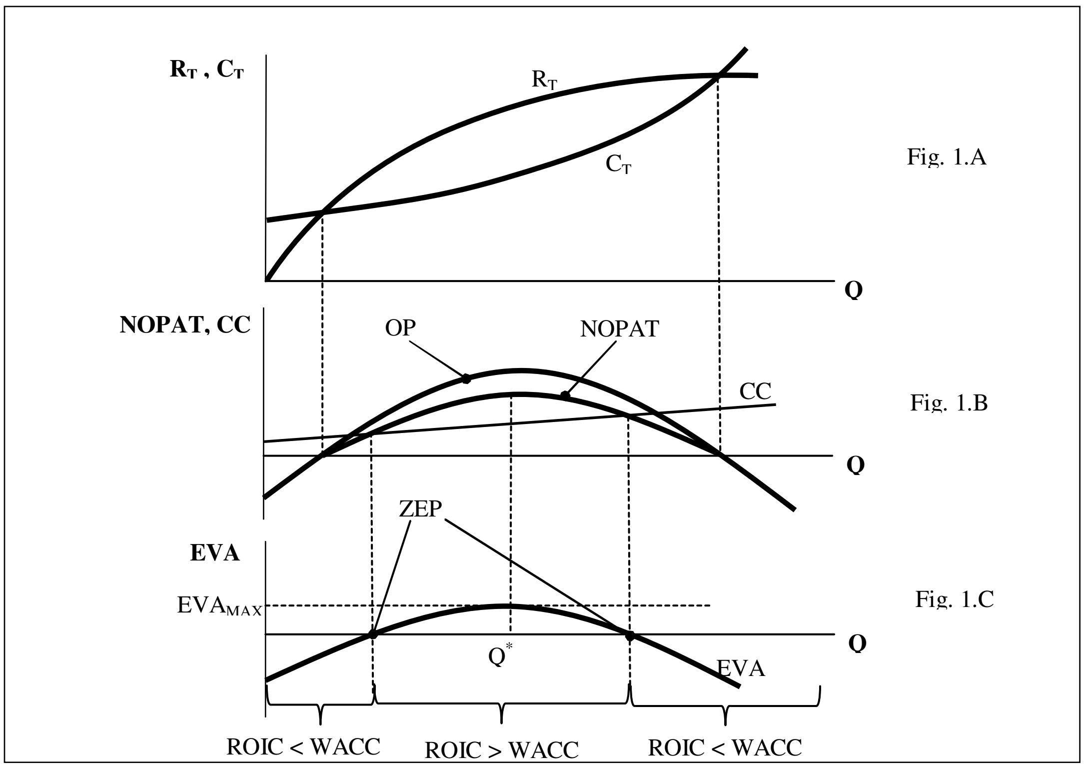


**FIGURE 1:** The EVA curve model. The non-linear approach.



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### 3.1 Hypotheses

The model is predicated on the following assumptions: 1) a company may be defined as either single or multi-product. In the context of multi-product companies, the total cost and revenue curves are associated with the equivalent product. That is to say, the curves relate to a hypothetical product, the costs and revenues of which are equivalent to the weighted average value of the products constituting the production and sales mix; 2) the curves of total costs, total revenues (exclusively attributable to the operating area) and, consequently, of NOPAT are approximated, within a relevant range, by linear equations; 3) the cost of capital curve is approximated, within the same range of significance, by a linear equation; 4) the model is uniperiodal; 5) the model has a single driver (or independent variable) that can be attributed to the level of revenue; 6) the WACC is an appropriate measure of the weighted average cost of capital; 7) taxation is characterised by a single, non-progressive marginal tax rate.

### 3.2 NOPAT Curve

As previously stated, NOPAT is defined as operating profit (OP) after tax, which can be estimated using the following formula:

$$\mathrm{NOPAT} = \mathrm{OP} \cdot (1 - t) \qquad [3.1]$$

The estimation of the operating profit can be derived by decomposing this variable into its two determinants, total revenues and total costs. The straight lines of total revenues and total costs facilitate the identification of their quantitative level with respect to the chosen reference driver, initially identified as the volume of sales, and subsequently enable the construction of alinear equation relating the operating income to the level of revenues (the main driver associated with the model). This can be expressed as follows:

$$\mathrm{OP_O} = -\mathrm{K} + \left(1 - \frac{v}{p}\right) \cdot \mathrm{R_T} \qquad [3.2]$$

In this equation, p denotes the unit price, v denotes the variable unit cost, K denotes the fixed unit cost and $R_T$ denotes the total revenue.

Replacing [3.2] in [3.1] gives the following equation:

$$\mathrm{NOPAT} = -[(1 - t) \cdot \mathrm{K}] + \left[(1 - t) \cdot \left(1 - \frac{v}{p}\right)\right] \cdot \mathrm{R_T} \qquad [3.3]$$

For the sake of simplicity, let us consider the following relations:

$$\mathrm{N_F} = (1 - t) \cdot \mathrm{K} \qquad [3.4]$$

$$\mathrm{N_V} = (1 - t) \cdot \left(1 - \frac{v}{p}\right) \qquad [3.5]$$

Substituting these relations in [3.3] yields [3.6]:

$$\mathrm{NOPAT} = -\mathrm{N_F} + \mathrm{N_V} \cdot \mathrm{R_T} \qquad [3.6]$$

### 3.3 Cost of Capital Curve

The cost of capital (CC) from equation 2.1 is expressed as the product of the level of net invested capital (NIC) and the weighted average cost of capital (WACC, $i_A$). In order to incorporate this relationship into the model, it is necessary to correlate the cost of capital with the level of total



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income. To this end, it is advantageous to consider the representation of NIC as a straight line, with the fixed component of net invested capital ($NIC_F$) serving as the vertical intercept and the variable component of $NIC_V$ as the angle coefficient.

The cost of capital curve can thus be expressed in terms of sources as follows:

$$CC = i_A \cdot NIC = i_A \cdot (NIC_F + NIC_V \cdot R_T) \quad [3.7]$$

$$CC = [i_A \cdot NIC_F] + [i_A \cdot NIC_V] \cdot R_T [3.8]$$

**3.4 EVA Curve**
In order to obtain an equation that can analytically represent the evolution of the level of EVA in relation to the level of revenue achieved, it is necessary to replace equations [3.6] and [3.8] in [2.1]. The resulting equation is as follows:

$$EVA = [-N_F + N_V \cdot R_T] - \big[[i_A \cdot NIC_F] + [i_A \cdot NIC_V] \cdot R_T\big] \quad [3.9]$$

The equation for the EVA curve is obtained by simplification and rearrangement:

$$EVA = -[N_F + (i_A \cdot NIC_F)] + [N_V - (i_A \cdot NIC_V)] \cdot R_T \quad [3.10]$$

**3.5 Zero Eva Point (ZEP)**
Once the equation for the EVA curve has been established, the subsequent step involves the identification of the revenue level at which EVA reaches zero (ZEP) and the level at which value creation occurs. If the revenue level falls below this threshold, negative EVA and value destruction will ensue. This point can be obtained by setting equation [3.10] equal to zero, thereby obtaining the ZEP in terms of sources:

$$ZEP = \frac{[N_F + (i_A \cdot NIC_F)]}{[N_V - (i_A \cdot NIC_V)]} \quad [3.11]$$

The NOPAT curve and the cost of capital curve are shown in Figure 2.A, and the vertical difference between these curves gives the EVA curve shown in Figure 2.B.

The answers to the first two research questions, which were previously based on intuitive reasoning, have now been developed and confirmed analytically and graphically.

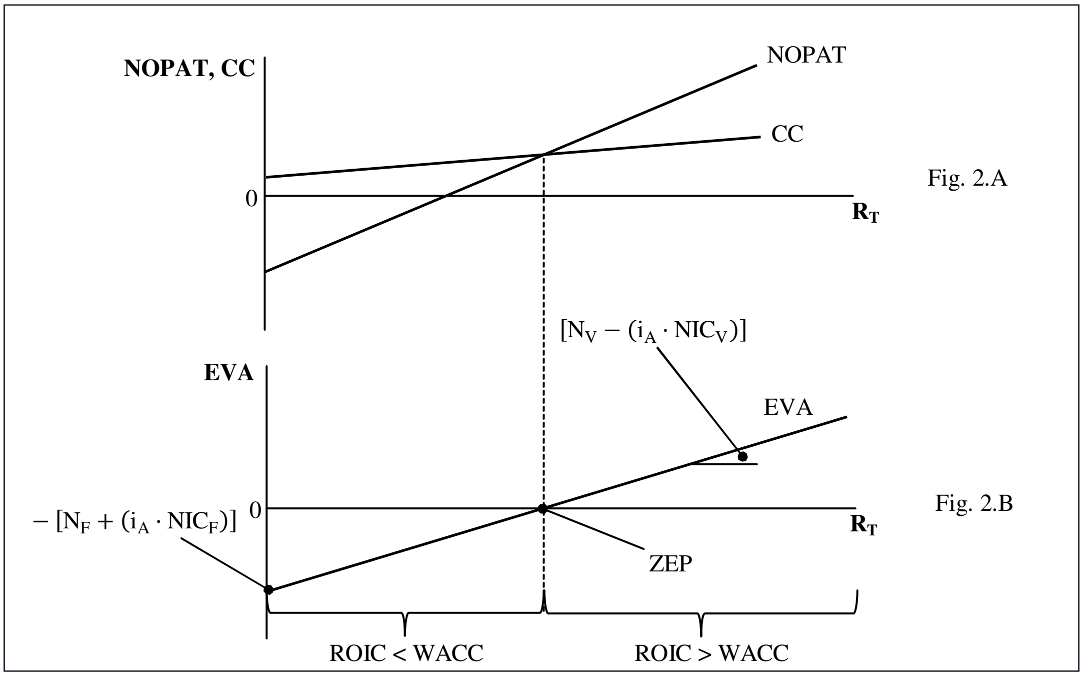


**FIGURE 2:** The EVA curve model. The linear approach.

### 3.6 Performance Management and Value Creation

The aim of this paragraph is to explain how managerial policies can influence the level of the ZEP and the extent of the areas of value creation and destruction, thereby providing a response to the third research question.

The NOPAT curve is influenced by management policies that impact the cost/revenue structure. Interventions that modify the balance between fixed and variable costs, as well as marketing policies that influence the prices of products/services on the market, considered singly or in combination, affect the NOPAT curve, both in terms of the vertical intercept with the y-axis and in terms of the growth and decline of the curve. These parameters vary according to the level of total revenue. From a comparative static perspective, changes in management policy affecting the cost/revenue structure will lead to a different shape and/or positioning of the NOPAT curve, all other variables being equal.

Furthermore, the cost of capital is influenced by financing and investment policies. In consideration of the equilibrium relationship (3.12), the fixed component of the NIC ($NIC_F$) can be expressed as the sum of the fixed capital (FC) and the fixed component of the net working capital ($NWC_F$), while the variable component of the NIC ($NIC_V$) can be represented by the variable component of the net working capital ($NWC_V$).

The equilibrium relationship (3.12) can thus be expressed as follows:

$$\underbrace{[i_A \cdot (FC + NWC_F)] + [i_A \cdot NWC_V] \cdot R_T}_{\text{Investments}} = \underbrace{[i_A \cdot NIC_F] + [i_A \cdot NIC_V] \cdot R_T}_{\text{Sources}} \quad [3.12]$$

$$CC = [i_A \cdot NIC_F] + [i_A \cdot NIC_V] \cdot R_T \; [3.13]$$

$$CC = [i_A \cdot (FC + NWC_F)] + [i_A \cdot NWC_V] \cdot R_T \; [3.14]$$



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In such a scenario, financing policies have the capacity to influence the WACC by modifying both the slope and the vertical intercept of a straight line. It is also important to note that the same financing policies could change the level of the NIC on the source side. This phenomenon can be attributed tothe fact that self-financing policies (which are also contingent on the level of revenues) of investments, through the formation or enlargement of reserves, serve to increase one of the two components of the NIC, i.e. equity capital. Conversely, recourse to financial debts serves to increase the sensitivity of the NIC to changes in revenues, as well as to increase the level of financial charges, which in turn affects the WACC.

Investments in fixed assets and in the fixed component of the NWC (typically the fixed component of inventory, trade receivables and payables due to deferrals of collection and payment) influence the vertical intercept of the CC curve. Whit regards to the angular coefficient of the same curve and the relationship it has with investment policies, the sensitivity of the NWC to changes in the level of total revenues, represented by the variable component of the NWC, is relevant. The management policies of the NWC that demonstrate a particular sensitivity to changes in the level of total revenues result in a higher angular coefficient. This sensitivity can be identified in a heightened reactivity of the inventory level to fluctuations in sales, which may be attributable to seasonal peaks. Further analogous scenarios can be identified by examining the policies surrounding the deferral of receivables and payables collection from the operating area.As the sensitivity of the NWC decreases, the CC curve approaches a flatter and flatter shape, and given other factors remain constant, the area of value creation widens.

It is imperative to acknowledge the multiplicative impact of investment and financing policies, as reflected in the WACC and NIC, on the slope of the CC curve. The outcome of this multiplicative effect, in instances where it surpasses the variable component of the NOPAT, results in the inversion of the EVA curve, which exhibits a gradual decline in values as total revenues increase.This phenomenon is indicative of a downward slope in the EVA curve.

As demonstrated in Figures 3.A and 3.B, an increase in WACC and/or $NIC_V$ (or $NWC_V$) leads, in the absence of other influencing factors, to a counterclockwise rotation of the CC curve, which consequently impacts the EVA curve. In this scenario, the EVA curve moves from the top right to the bottom left, resulting in a reduction of the area of value creation until reaching a state where no value is created.

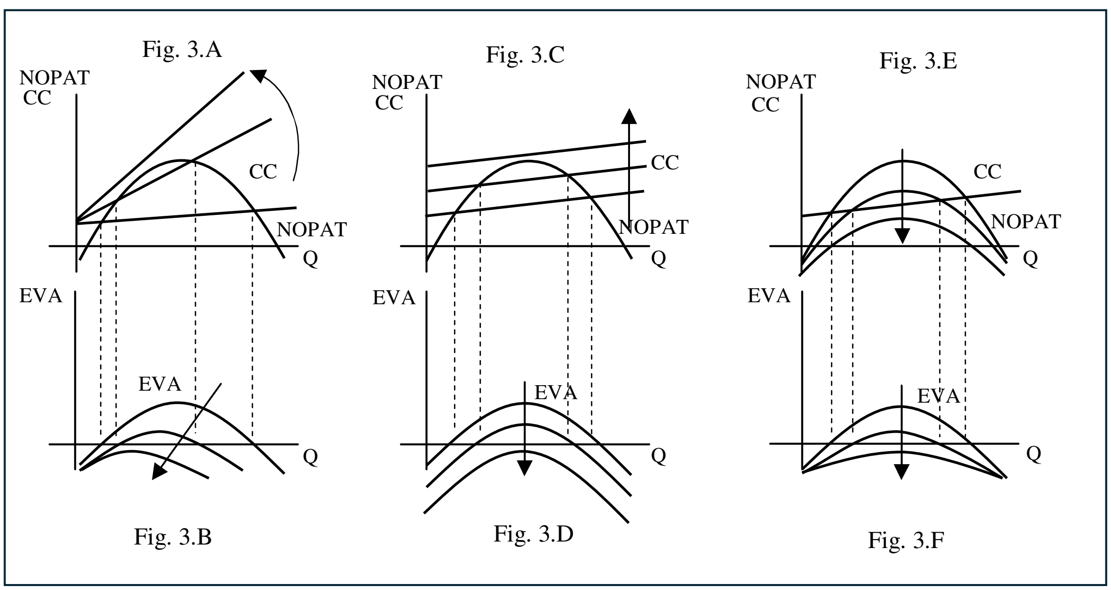


**FIGURE 3:** Shifts and translations of the EVA curve. The non-linear approach.

Figures 3.C and 3.D illustrate how an increase in WACC and/or NICF (or FC or NWCF) results, under similar conditions, in an upward shift of the CC curve, affecting the EVA curve. This shift in the EVA curve leads to a reduction in the area of value creation to the extent that it may no longer be able to occur.

Finally, Figures 3.E and 3.F demonstrate how a downward shift in the NOPAT curve, for example due to a reduced unit contribution margin, all other factors being equal, also shifts the EVA curve downwards, thereby contracting the area of value creation to the extent that this may not occur.

It is important to note that the effects analysed using comparative statics can exhibit an opposite manifestation when the conditions of analysis are reversed. Specifically, a clockwise rotation of the CC curve, a downward shift of the same curve, or an expansion of the NOPAT curve can lead to the opposite effects.

Table 1 demonstrates that managerial policies exert an influence on the EVA curve through translations and rotations. Management interventions lead to changes in the variables that influence the vertical intercept and the angular coefficient of the curve (interpreted as a straight line), thereby affecting its course and position.The consequence of this is an EVA curve that demonstrates how, for a given total revenue, markedly disparate EVA values can be obtained. The area of value production, situated below the EVA curve and delineated by the ZEP, exhibits potential for expansion or contraction.ZEP, which is defined as the total revenue level at which the EVA curve intersects the X-axis, can be situated at low levels of total revenue, thereby facilitating its attainment, or at higher levels, thus hindering its achievement.

| | | |
|---|---|---|
| **Translation if the EVA curve** | **Upward translation** (*) | **Downward translation**(**) |
| | $\Delta K < 0$;$\Delta FC < 0$<br>$\Delta NWC_F < 0$; $\Delta NIC_F < 0$<br>$\Delta i_A < 0$ | $\Delta K > 0$; $\Delta FC > 0$<br>$\Delta NWC_F > 0$; $\Delta NIC_F > 0$<br>$\Delta i_A > 0$ |
| **Rotations of the EVA curve** | **Counterclockwise rotation**(*) | **Clockwise rotation** (**) |
| | $\Delta p > 0$; $\Delta v < 0$<br>$\Delta NWC_V < 0$; $\Delta NIC_V < 0$<br>$\Delta i_A < 0$ | $\Delta p < 0$; $\Delta v > 0$<br>$\Delta NWC_V > 0$;$\Delta NIC_V > 0$<br>$\Delta i_A > 0$ |
| (*) ZEP shifts to the left (decreasing ZEP level)<br>(**) ZEP shifts to the right (increasing ZEP level) | | |

**TABLE 1:** The impact of the variables on the EVA curve

It is therefore management intervention that exerts influence on the efficiency conditions for the value generation as measured by EVA. In essence, the relationship between EVA and total revenues is significantly influenced by management policies that impact the shape and positioning of the EVA curve. It is important to note that value generation does not necessarily coincide with sales volume growth. Further analysis reveals instances of decreasing EVA despite simultaneous growth in NOPAT, and in extreme cases, a complete absence of value production.

Consequently, the following conclusions can be deduced:

- Acting on the variables that modify the vertical intercept (Figure 4.A) will result in a downward shift (DT) of the curve, from $ZEP_1$ to $ZEP_2$, or an upward translation (UT), from $ZEP_1$ to $ZEP_3$.
- On the other hand, acting on the variables that modify the angular coefficient (Figure 4.B), willresult in a clockwise rotation of the curve (CWR), from $ZEP_1$ to $ZEP_2$, or a counterclockwise rotation (CCR), from $ZEP_1$ to $ZEP_3$.

Table 2 delineates the conditions that occur when the EVA curve exhibits a positive or negative slope. In the first case, there is a favourable condition; conversely, the EVA curve exhibits a downward slope, indicating an unfavourable condition. It is important to note that the spread



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$N_V - (i_A \cdot NIC_V)$, which is the differential between the variable component of the NOPAT and the product of the WACC and the variable component of the NIC, is the determining factor for the change of slope. High values of the WACC and/or the $NIC_V$ can lead to a reversal of the trend, $N_V$ being equal.

This reversal occurs when the product of the WACC and the variable component of the $NIC_V$ exceeds the variable component of the NOPAT, resulting in an anomalous scenario. While the NOPAT continues to trend upwards as total revenue increases, the EVA declines. This is attributable to the fact that the variable component of the cost of capital (represented by the product $i_A \cdot NIC_V$) exceeds the variable component of the NOPAT. Consequently, the cost of capital exhibits a higher growth rate than NOPAT. A similar scenario can arise when the variable component of the NOPAT declines substantially, $i_A \cdot NIC_V$ being constant. This occurs when the unit contribution margin diminishes to the extent of becoming negative (selling at below cost prices).

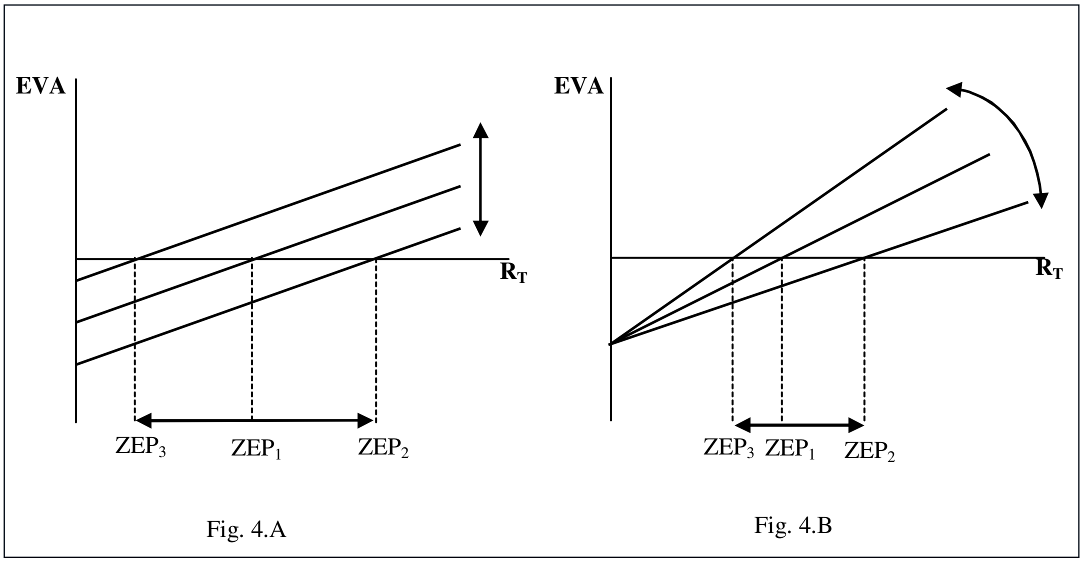


**FIGURE 4:** Shifts and translations of the EVA curve. The linear approach

Consequently, companies may encounter circumstances in which value creation is either suboptimal or, in less favourable cases, absent entirely. This phenomenon can be attributed to inadequate managerial oversight with respect to the cost-revenue structure, the financial structure, and the investment structure.The proposed model immediately highlights the issue, thereby prompting management to take corrective action.

| | **Figure A** | **Figure B** |
|---|---|---|
| **Vertical intercept** | $N_F > -[i_A \cdot NIC_F]$ | $N_F > -[i_A \cdot NIC_F]$ |
| **Angle coefficient** | $N_V > [i_A \cdot NIC_V]$ | $N_V < [i_A \cdot NIC_V]$ |
| | **Figure C** | **Figure D** |
| **Vertical intercept** | $N_F < -[i_A \cdot NIC_F]$ | $N_F < -[i_A \cdot NIC_F]$ |
| **Angle coefficient** | $N_V > [i_A \cdot NIC_V]$ | $N_V < [i_A \cdot NIC_V]$ |

**TABLE 2:** Positioning of the EVA curve. Analytical conditions.

The aforementioned circumstances and conditions result in the scenarios depicted geometrically in Figure 5, from 5.A to 5.D.



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Management policies have a positive impact on the evolution of the EVA curve when involve not only a reduction in the level of ZEP, which facilitates its achievement, but also an expansion in the area of value creation, which is clearly beneficial. Conversely, management policies have a negative impact when involve an increase in the ZEP, leading to a reduction in the area of value creation as the equilibrium point becomes more difficult to reach. These considerations illustrate how the proposed model enhances the existing advantages of the EVA indicator. The ability to predict behaviour would signify a distinct advantage for both managers, committed to the pursuit of optimal EVA values, and for shareholders, who would be able to better assess the impact of management policies on the value creation, as expressed directly by the EVA Curve Model.

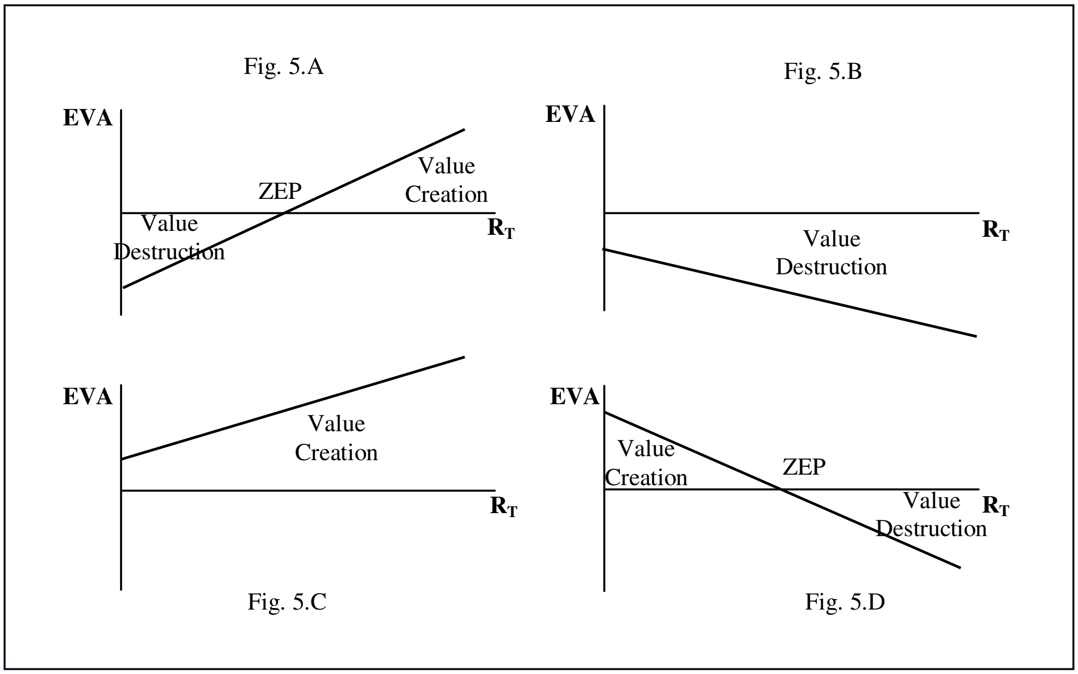


**FIGURE 5:** Theoretical positioning of the EVA curve. Geometric approach.

## 4. APPLICATION OF THE EVA CURVE MODEL

The aim of this paragraph is to address the fourth research question, which pertains to the statistical validity of the proposed EVA Curve Model. For this purpose, a general linear regression equation is utilised. In particular, the EVA curve equation[3.10]:

$$\text{EVA} = -[\text{N}_\text{F} + (\text{i}_\text{A} \cdot \text{NIC}_\text{F})] + [\text{N}_\text{V} - (\text{i}_\text{A} \cdot \text{NIC}_\text{V})] \cdot \text{R}_\text{T} \qquad [3.10]$$

can be presented in the following way:

$$\text{EVA}_\text{i} = \hat{\text{a}} + \hat{\text{b}} \cdot \text{R}_{\text{Ti}} + \varepsilon_\text{i} \qquad [4.1]$$

Specifically, the parameters of the generic linear regression equation (vertical intercept and angular coefficient) estimate the corresponding parameters of the EVA curve equation, as follows:

$\text{EVA}_\text{i}$ = dependent variable (or response variable) for the *i-th* observation
$\hat{\text{a}}$ = vertical intercept of the regression line = $-[\text{N}_\text{F} + (\text{i}_\text{A} \cdot \text{NIC}_\text{F})]$
$\hat{\text{b}}$ = angular coefficient of the regression line = $[\text{N}_\text{V} - (\text{i}_\text{A} \cdot \text{NIC}_\text{V})]$



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$R_{Ti}$ = independent variable (or explanatory variable) for the *i-th* observation
$\varepsilon_i$ = regression error (or residual) for the *i-th* observation
Accordingly, the ZEP equation is:

$$\text{ZEP} = \frac{-\hat{a}}{\hat{b}} \, [4.2]$$

This approach allows for the identification of a relationship between the level of EVA and the evolution of revenues, under the assumptions of the statistical regression model. The same linear equation facilitates the verification of the ability of the companies under scrutiny to engender value, in conjunction with the estimation, at a satisfactory level of statistical approximation, of the amount of ZEP for each of them.This provides an empirical response to the first two research questions formulated in paragraph 2. In particular, it is expected that the investigation will yield instances wherein the relationship between revenue and EVA is inversely proportional, resulting in a negative angular coefficient.

The Italian construction sector and coffee roasting sector are selected as cases studies. The characteristics and motivations for this choice are defined in the following subsections.

**4.1 Construction Sector and Sample Selection**
All over the world, the construction sector is widely regarded as a key driver of national economic growth (Giand and Pheng, 2011). At the same time, it is subject to significant external influences, most notably in the form of government investment and fiscal policies.

In particular, during the initial years under examination, the Italian construction sector experienced a prolonged recessionary period as a consequence of the global financial crisis (Horta et al., 2013). The European Commission (2012) recommended that investment in sustainable buildings and vital infrastructure should be regarded as a strategic contributor to future economic growth and job creation, rather than as a mere form of public spending. Nevertheless, public investment in the Italian construction sector declined due to EU-wide austerity measures designed to stimulate economic growth by reducing expenditure. Indeed, Federcostruzioni (2015) estimated that output would return to the same level as half a century earlier.

In the subsequent years, 2020 and 2021, many construction companies were shaped by the global Covid-19 pandemic crisis, which resulted in significant shifts in the economic and financial performance.

In recent years, specifically in 2022 and 2023, the construction sector has undergone a robust recovery, largely attributable to a series of tax deductions for expenditures on both the renovation of residential buildings and the enhancement of their energy efficiency (Associazione Nazionale Costruttori Edili, 2024, 2022, 2021; MEF-Dipartimento delle Finanze-Agenzia delle Entrate, 2024, 2023, 2021).

Given this volatile trend, the construction industry may encounter difficulties in testing the EVA Curve Model. However, a favourable outcome would serve to substantiate its reliability.

The survey was conducted on a sample of 88 medium-sized and large unlisted enterprises in the NACE Rev. 2 41 – construction of buildings sector. In aligning with the roasting coffee sector, the size thresholds employed to extract the data from the AIDA database (for the entire ten-year period) are in accordance with the last EU Directive 2023/2775, issued by the European Commission on 17 October 2023. The application of these thresholds was conducted retrospectively, encompassing the entire decade under scrutiny, with the objective of ensuring the homogeneity and consistency of the sample. The inclusion criteria were as follows: firstly, the



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average number of employees was required to be a minimum of 50; secondly, the revenue from sales and services was required to be a minimum of €10 million; and thirdly, the total assets on the balance sheet were required to be a minimum of €5 million.

As with the roasting coffee sector, the additional industry-specific data, including beta, the debt-to-equity ratio, the equity risk premium, and risk-free rates, which are useful for calculating betas and WACCs, were derived from the Damodaran's surveys.

### 4.2 Coffee Roasting Sector and Sample Selection

Coffee is an integral part of many people's daily lives, ranking as the second most popular beverage in the world after tea and the second most traded commodity in terms of economic value, behind only petroleum products (Daviron and Ponte, 2005; Samoggia and Riedel, 2018).

The Italian coffee market is currently in a mature and stable phase, with demand having reached its market potential and no significant room for growth in consumption due to the organoleptic characteristics of the product (the presence of caffeine). The population consumes an average of 1.5 cups of coffee per day, a figure that is notably high and which has led to the coffee industry occupying a significant segment of the Italian market.

Exports have emerged as the primary driver of growth for the Italian coffee industry, as domestic consumption, at its current rate, shows limited potential for expansion. Espresso coffee, a hot beverage synonymous with Italian food culture and lifestyle, represents the Made in Italy concept (Morris, 2013). This culture also encompasses the mechanical products used for espresso preparation, such as coffee espresso machines (Cavicchi et al., 2016). However, it is important to note that Italy's roasting industry consumes 98% of the green coffee imports, with only the remaining 2% being re-exported. Consequently, throughout the entire period under analysis, the sector has remained relatively stable, even during the global pandemic caused by the SARS-CoV-2 virus. In light of these characteristics, the coffee roasting sector is considered a suitable candidate for the testing of the EVA curve model.

The survey was conducted on a sample of 12 medium-sized and large unlisted enterprises in the NACE Rev. 2 1083 – tea and coffee processing sector. The size thresholds employed to extract the data from the AIDA database (for the entire ten-year period) are in accordance with the last EU Directive 2023/2775, issued by the European Commission on 17 October 2023. The application of the thresholds was conducted retrospectively, encompassing the entire decade under scrutiny, with the objective of ensuring the homogeneity and consistency of the sample.

Specifically, the criteria for inclusion were as follows: firstly, the average number of employees was required to be a minimum of 50; secondly, the revenue from sales and services was required to be a minimum of € 10 million; and thirdly, the total assets on the balance sheet were required to be a minimum of € 5 million.

The additional industry-specific data, including beta, the debt-to-equity ratio, the equity risk premium, and risk-free rates, which are useful for calculating betas and WACCs, were derived from the Damodaran's surveys.

### 4.3 Findings

The investigation revealed an average level of $R^2$ of 59.68% for the construction sector sample and 65.75% for the roasting sector sample. When considering only the regressions that present p-value levels of less than 5% for both the intercept and the angular coefficient, these percentages rise to 74.78% and 77.72%, respectively (i.e. in 61.36% of the cases for the construction sector and 58.33% of the cases for the roasting sector). This finding suggests that the proposed model demonstrates a satisfactory degree of applicability. The $R^2$ average level indicates that the explanatory or independent variable of the model is the only driver in the coffee roasting and construction sector. The explanatory or independent variable, represented by the level of total revenues, has the capacity to elucidate a significant portion of the variations in the level of EVA (the response or dependent variable).

The frequency distribution of $R^2$ is graphically evident in Figures6 and 7, which illustrate its application to the construction and roasting sectors, respectively. The graphs demonstrate a clear correlation betweenhigher $R^2$ values and higher frequencies, as indicated by the right-hand side histograms, in contrast to lower $R^2$ levels, which are represented by the left-hand side histograms.

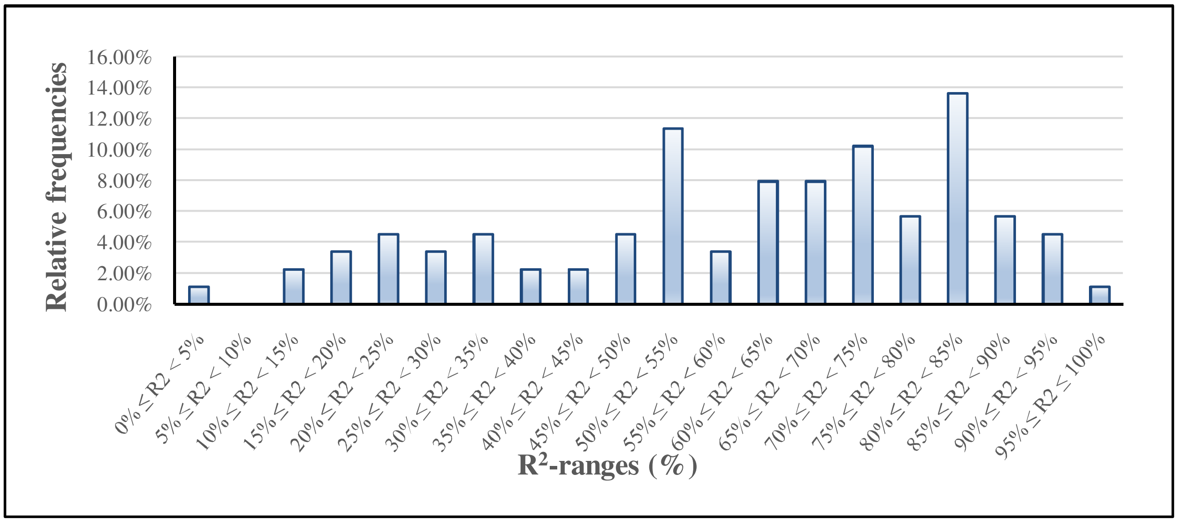


**FIGURE6:** Frequency distribution of $R^2$, construction sector (2014-2023).

At the 95% confidence level, the p-values for the regression parameters indicate that the model finds statistical significance in the vertical intercept (p-value < 5%) in 62.5% of cases in the construction sector and 58.33% of cases in the roasting sector. A noteworthy finding is the statistical significance of the angular coefficient (p-value < 5%) in 71.59% of the construction sector cases and 75% of the roasting sector cases.

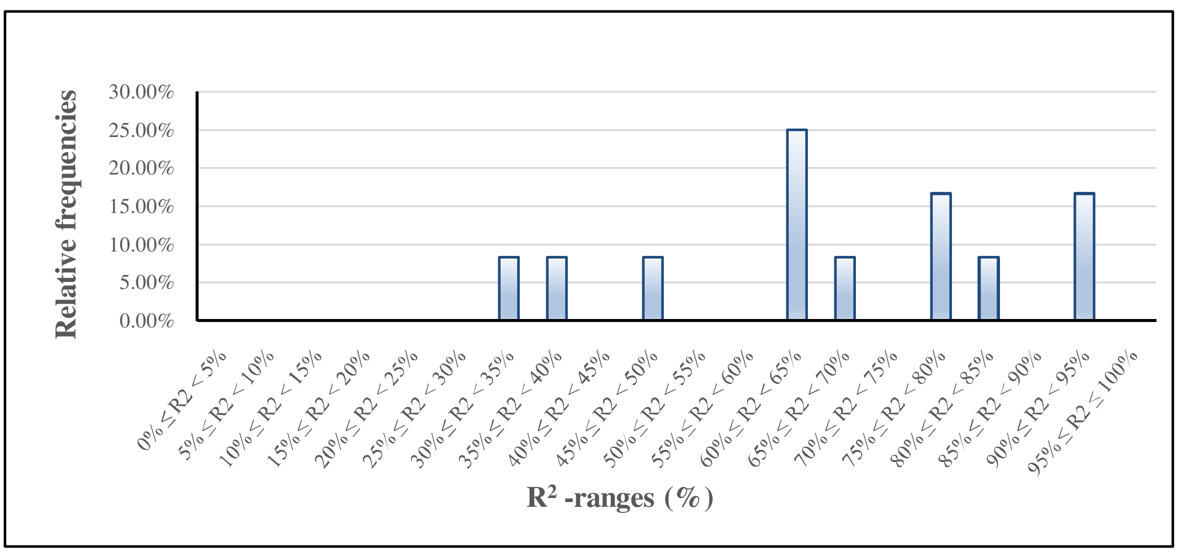


**FIGURE 7:** Frequency distribution of $R^2$, roasting sector (2014-2023).

In order to achieve a comprehensive understanding of the outcomes of this analysis in terms of $R^2$ and p-value, the reader is referred to Table 3 and Table 4 in the appendix. The former details the construction sector results and the latter the roasting sector results. The initial two columns present the progressive identification number of the company and the respective level of the calculated ZEP, followed by the results of the coefficients (vertical intercept and angular coefficient) with the respective p-values. The final column of the Tables displays the $R^2$ values.

In addition to the ZEP, the intercept, the angular coefficient, their respective p-values, and the $R^2$, Tables 3 and 4 in the appendix are arranged, from left to right, with the evaluation of the assumptions underlying the linear regression model presented. The assumptions evaluated are linearity (L), homoscedasticity (H), exogeneity (E), normality (N) and independence (I).

The regression analysis results indicate the presence of cases where the regression line slope is negative (cases highlighted in grey). These cases are found in 15 out of 88 companies in the construction sector (17.04%) and 3 out of 12 companies in the coffee roasting sector (25%). These findings are consistent with the theoretical framework outlined above, thereby substantiating the empirical validation of the primary research question. This indicates that the trend of the EVA curve is not universally upward, but rather that certain corporate policies may exert a downward force on EVA.

The regression analysis reveals an inverse relationship between total revenues and EVA for some companies. When the angular coefficient is negative, these companies enter the value destruction area, extending beyond the ZEP. Consequently, management should implement corrective interventions on the variables within the model to invert the trend of the EVA curve. The interventions to be implemented should concern the spread $\mathrm{N_V} - (\mathrm{i_A} \cdot \mathrm{NIC_V})$,with the objective of widening the area of value production and moving the ZEP as far away as possible, thus restoring optimal conditions.

The results demonstrate that the most prevalent scenario can be traced back to the trend of the EVA curve (see Figure 5.A). Furthermore, Tables 3 reveal the presence of certain exceptional cases. Companies 9 and 47 of the construction sector exhibit negative values for the angular coefficient, the intercept, and the ZEP, thereby validating the observations depicted in Figure 5.B. Conversely, company number 40 of the same sector demonstrates positive angular coefficient and intercept values, while the ZEP is negative. This finding is graphically represented in Figure 5.C, which illustrates an EVA trend that remains consistently positive, devoid of any areas of value destruction.

The results of the research indicate that the proposed version of the model is statistically significant in the majority ofcases and can be discretely applied to the sectors studied, despite their divergent characteristics.

### 4.4 Empirical examples of performance management and value creation

This paragraph employs an empirical approach to explore further the four representative cases (A, B, C and D) of the various EVA curve configurations that are theoretically delineated in Figure 5[2]. The identification of concrete cases for each of these theoretical situations serves to confirm the validity of the analysis and the proposed EVA Curve Model, thereby reinforcing the practical relevance of the study.

The following observation pertains to each of the cases presented: the regression line approximates a section of the theoretical EVA curve. Consequently, the line is only valid in a limited area surrounding the observations and does not apply to extreme values of the line.

[2]The extraction was performed from the sample of construction companies with a larger sample size. This allows for a greater variety of scenarios, parameters and operating conditions to be covered.



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Figure 9.A illustrates the Case 5.A, defined as the standard. Itrefers to the company marked with the number 10 which is characterised by a situation in which the regression line exhibits a positive slope and a negative intercept. This finding suggests a direct relationship between the variables, thereby indicating a positive effect of the independent variable on the dependent variable. During the period under consideration, the company number 10 created value in only 3 of the 10 years analysed. In such cases, it is possible to improve the situation through management policies aimed at:

- raising the regression line with a consequent shift of the ZEP to the left. As demonstrated in Table 1, this objective can be accomplished through a reduction in the following elements: fixed costs (K), fixed capital (FC), fixed component of net working capital ($NWC_F$), fixed component of NIC ($NIC_F$) and cost of capital ($i_A$);
- rotating the line counterclockwise, resulting in a shift of the ZEP to the left. As demonstrated in Table 1, this objective can be accomplished through an increase in the selling price (p) or a reduction in the variable component of the net working capital ($NWC_V$), the variable component of the NIC ($NIC_V$), and the cost of capital ($i_A$).

Both actions engender the conditions for management to improve the company's performance while maintaining the same revenue.

Figure 8.B illustrates theCase 5.B. It refers to the company marked with the number 9 which is characterised by a situation in whichthe regression line has a negative slope and vertical intercept. This scenario demonstrates an inverse relationship between the variables, whereby an increase in the independent variable is associated with a decrease in the dependent variable. Case B represents the worst-case scenario and is also the least common, as it involves an initial negative value and a continuous decrease in the value created.

In such circumstances, the implementation of management policies should be directed towards the reversal of the prevailing negative trend. Again, the most efficacious approach is to elevate the regression line and implement a counterclockwise rotation strategy, a method that ought to be adopted much more pervasively. The aim of rotating the regression line counterclockwise is to transform the slope from negative to positive, thereby moving from Case B to Case A. By raising the regression line until it attains a positive vertical intercept, Case B is consequently reverted to Case D, analysed below. Both actions aim to improve performance by shifting the ZEP and expanding the area of value production, leveraging the favourable conditions present in Case A or Case D.

Figure 8.C illustrates the Case 5.C.It refers to the company marked with the number 40 which is characterised by a situation in which the regression line has both a positive slope and vertical intercept. This indicates the presence of a direct relationship between the variables, whereby an increase in the independent variable is concomitant with an increase in the dependent variable.

Case C, as opposed to Case B, can almost always be interpreted in positive terms, as it indicates an upward trend and a positive starting value. Nevertheless, although the latter is undoubtedly a desirable outcome, Case C remains an anomalous situation and is less frequent than Case A.

In this scenario, the management policies adopted are deemed to be appropriate and management intervention should be aimed at maintaining this favourable situation.

Figure 9.D illustrates the Case 5.D. It refers to the company marked with the number 52 which is characterised by a situation in whichthe regression line has a negative slope and a positive vertical intercept. This demonstrates an inverse relationship between the variables, whereby an increase in the independent variable is associated with a decrease in the dependent variable.



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This configuration is less prevalent than Case A, yet it may be more prevalent than Cases B and C.

In this particular scenario, the aim of management policies is to promote a shift in the ZEP towards the right. This objective can be realised through the elevation or rotation of the regression line in a counterclockwise direction. Both actions result in the expansion of the value creation area, which, in this case, is situated to the left of the ZEP.

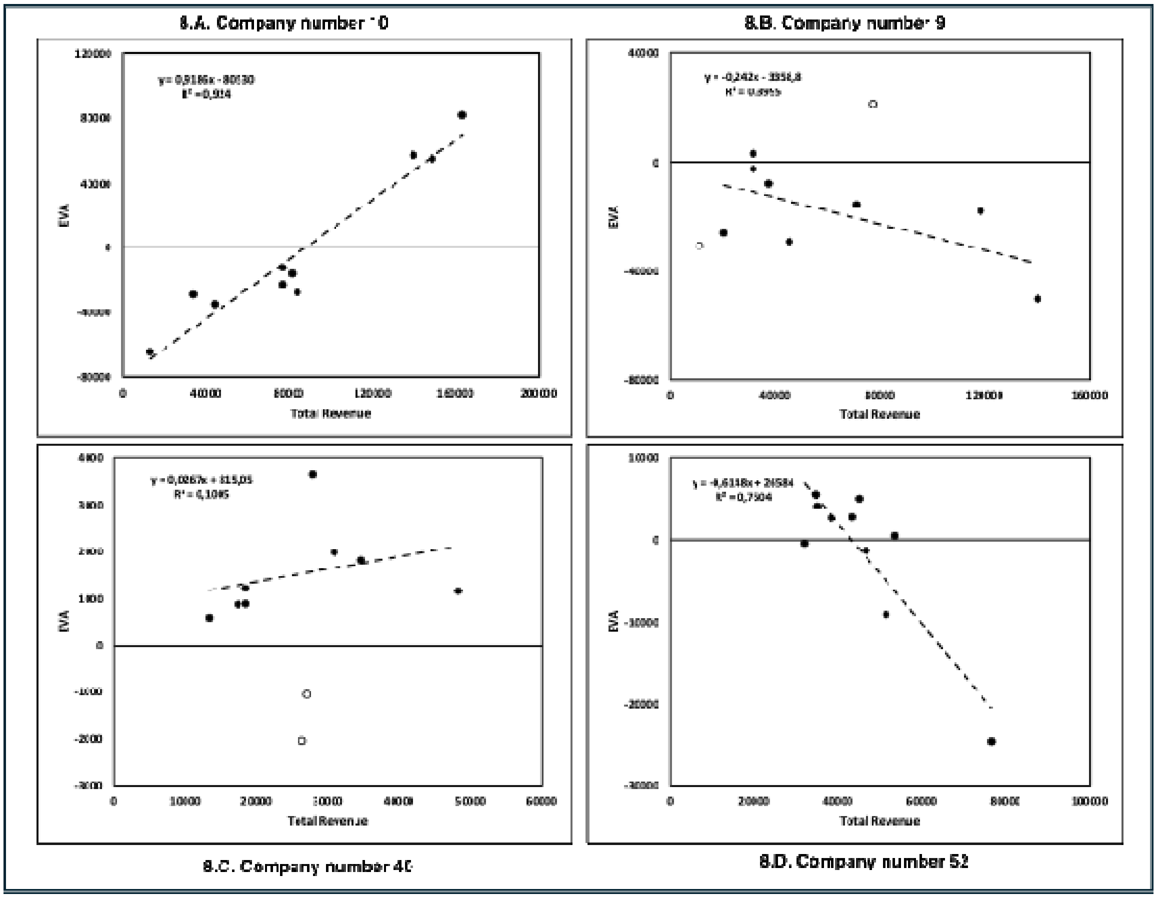


**FIGURE 8:** Empirical positioning of the EVA curve. Geometric approach.

## 5. CONCLUSIONS

The aim of this research is to formulate an approach grounded in EVA that facilitates performance management, thereby enhancing comprehension of the impact of managerial policies onthe determinants of value creation.

This research addresses the gap and enriches the extant literature on the variables and their interrelations determining value creation. As is commonly posited, contemporary enterprises increasingly require the application of sophisticated tools, which are derived from the integration of various fields, including business administration, mathematics, statistics, psychology and sociology. In this context, EVA can be regarded as a tool that enables the extension of the boundaries of rationality, thereby promoting the “scientification” and “professionalization” of management activities. This, in turn, leads to an enhancement in objectivity, reliability, and the level of communication and acceptance of managerial policies and their associated actions and targets. Consequently, EVA emerges as asystematic metric of self-direction, self-control and selfassessment for managers and personnel. This counteracts the limitations imposed by a myopic perspective and organisational entropy, encouraging convergence and complementarity between the objectives pursued by managers and staff and those of the company and its shareholders. In essence, the aspirations of both parties are unified and interconnected thanks to EVAand the target values of the internal variables.

The study was initiated with a theoretical foundation, leading to the formulation of the EVA Curve Model.At an empirical level, the validity of this model was demonstrated through an econometric analysis in two Italian economic sectors with very different characteristics: the construction sector and the coffee roasting sector.

The analytical development of the model and its empirical application have enabled the verification of the following hypothesis:

1. The relationship existing between total revenues and EVA is not always direct.The EVA curve can also exhibit a downward trend, and at a certain level of sales, the area of value destruction is entered. This phenomenon can be attributed to the fact that management policies exert influence not only on the more intuitive operational structure, but also on the financial and capital structure. It is imperative for a value-oriented manager to adopt a specific policy only after a thorough assessment of its effects on all three structures that impact on EVA.
2. There exist threshold levels of total revenues that delimit the areas of value creation and destruction. It is imperative for a value-oriented manager to take these thresholds and their risk into consideration when evaluating the alternative management policies.
3. Management policies influence the EVA curve through translations and rotations. It is imperative for a value-oriented manager to be aware that modifying the variables that affect the vertical intercept will result in a downward or an upward translation of the EVA curve. Similarly, modifying the variables that affect the angular coefficient will result in a clockwise or a counterclockwise rotation of the EVA curve.
4. The sectors analysed encounter cases in which value creation is suboptimal or absent. These cases are not isolatedwithin the current market. The EVA Curve Model is a valuable tool with which these companies can assess alternatives and implement corrective actions, thereby enhancing their decision-making processes.

Further research can investigate how external factors andenvironmental events, such as economic recessions, pandemics or regulatory changes, influence the EVA curve. This would include a specific emphasis on the impact of fiscal and monetary policies on the WACC and beta. As is the case with other uniperiodal models, the EVA Curve Model does not incorporate the concept of time. This is a limitation of the proposed model. The temporal dimension exerts a substantial influence on the success of investment projects. This is attributable to the temporal discrepancy between the decision-making process and the realisation of investment outcomes. That is to say, investment results are characterised by a time lag. Furthermore, the impact of investments extends beyond the temporal boundaries incorporated within the model.



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## APPENDIX

| Code | ZEP (€) | Intercept (€) | p-value | Coefficient | p-value | $R^2$ | L* | H* | E* | N* | I* |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 59.494.652,09 | 16.366.394,71 | 2,66% | -0,27509 | 2,26% | **60,75%** | ✓ | ✓ | ✓ | ✓ | ✓ |
| 2 | 526.326.950,85 | -466.023.551,68 | 0,00% | 0,88543 | 0,00% | **93,15%** | ✓ | ✓ | ✓ | ○ | ✓ |
| 3 | 138.737.091,69 | 17.165.193,11 | 7,63% | -0,12372 | 3,68% | **54,37%** | ✓ | ✓ | ✓ | ✓ | ✓ |
| 4 | 187.981.490,55 | -144.331.279,08 | 0,45% | 0,76780 | 0,27% | **69,46%** | ✓ | ✓ | ✓ | ✓ | ✓ |
| 5 | 173.783.490,98 | -195.281.130,96 | 5,12% | 1,12370 | 4,58% | **51,27%** | ✓ | ✓ | ✓ | ○ | ✓ |
| 6 | 95.713.280,29 | -17.372.451,25 | 1,44% | 0,18151 | 0,67% | **62,18%** | ✓ | ✓ | ✓ | ✓ | ✓ |
| 7 | 84.533.545,56 | -13.621.869,69 | 0,19% | 0,16114 | 0,24% | **80,81%** | ✓ | ✓ | ✓ | ○ | ✓ |
| 8 | 88.070.353,99 | -14.616.169,16 | 0,28% | 0,16596 | 0,33% | **78,62%** | ✓ | ✓ | ✓ | ✓ | ✓ |
| 9 | -13.882.305,54 | -3.358.837,37 | 72,31% | -0,24195 | 9,27% | **39,95%** | ✓ | ✓ | ✓ | ○ | ✓ |
| 10 | 87.669.220,39 | -80.530.451,81 | 0,00% | 0,91857 | 0,00% | **92,40%** | ✓ | ✓ | ✓ | ✓ | ✓ |
| 11 | 39.045.621,78 | 10.099.187,29 | 14,80% | -0,25865 | 2,78% | **58,13%** | ✓ | ✓ | ✓ | ✓ | ✓ |
| 12 | 39.554.948,41 | 7.343.765,81 | 4,23% | -0,18566 | 0,55% | **69,06%** | ✓ | ✓ | ✓ | ○ | ✓ |
| 13 | 52.870.262,08 | -34.177.530,07 | 0,17% | 0,64644 | 0,05% | **84,00%** | ✓ | ✓ | ✓ | ✓ | ○ |
| 14 | 144.381.502,24 | -8.616.723,64 | 5,50% | 0,05968 | 15,22% | **30,94%** | ✓ | ✓ | ✓ | ✓ | ✓ |
| 15 | 49.024.936,76 | -8.297.448,41 | 1,51% | 0,16925 | 0,69% | **73,06%** | ✓ | ✓ | ✓ | ✓ | ○ |
| 16 | 41.923.127,35 | -8.531.501,18 | 2,86% | 0,20350 | 1,62% | **58,63%** | ✓ | ✓ | ✓ | ✓ | ✓ |
| 17 | 30.134.983,14 | -7.964.024,77 | 31,83% | 0,26428 | 21,51% | **24,25%** | ✓ | ✓ | ✓ | ✓ | ✓ |
| 18 | 12.875.830,20 | -3.535.359,51 | 0,01% | 0,27457 | 0,00% | **98,58%** | ✓ | ✓ | ✓ | ✓ | ✓ |
| 19 | 85.126.318,79 | -45.497.652,42 | 0,11% | 0,53447 | 0,19% | **71,88%** | ○ | ✓ | ✓ | ✓ | ✓ |
| 20 | 19.520.138,56 | -1.463.032,78 | 39,30% | 0,07495 | 2,48% | **53,66%** | ✓ | ✓ | ✓ | ✓ | ✓ |
| 21 | 48.229.098,89 | -27.400.794,23 | 1,12% | 0,56814 | 0,62% | **68,08%** | ✓ | ✓ | ✓ | ✓ | ✓ |
| 22 | 22.491.545,00 | -1.946.757,56 | 25,92% | 0,08656 | 3,55% | **54,87%** | ✓ | ✓ | ✓ | ✓ | ✓ |
| 23 | 17.808.069,81 | -11.996.680,95 | 0,35% | 0,67367 | 0,17% | **82,83%** | ✓ | ✓ | ✓ | ○ | ✓ |
| 24 | 37.428.175,14 | 12.322.987,68 | 56,51% | -0,32924 | 34,16% | **15,09%** | ✓ | ✓ | ✓ | ✓ | ✓ |
| 25 | 22.518.566,49 | -3.142.917,88 | 51,40% | 0,13957 | 15,55% | **30,54%** | ✓ | ✓ | ✓ | ✓ | ✓ |
| 26 | 40.764.572,97 | 12.760.696,98 | 16,47% | -0,31303 | 6,52% | **45,81%** | ✓ | ✓ | ✓ | ✓ | ✓ |
| 27 | 29.012.642,36 | -26.931.247,13 | 0,04% | 0,92826 | 0,01% | **88,12%** | ✓ | ✓ | ✓ | ✓ | ✓ |
| 28 | 74.987.275,24 | -78.827.757,19 | 0,04% | 1,05122 | 0,03% | **85,99%** | ✓ | ✓ | ✓ | ✓ | ✓ |
| 29 | 49.801.115,78 | -25.885.462,24 | 16,31% | 0,51978 | 15,99% | **30,00%** | ✓ | ✓ | ✓ | ✓ | ✓ |
| 30 | 68.363.976,96 | -7.785.771,16 | 18,22% | 0,11389 | 20,30% | **25,39%** | ✓ | ✓ | ✓ | ✓ | ✓ |
| 31 | 61.421.387,06 | -47.778.140,8 | 6,91% | 0,77787 | 6,45% | **46,01%** | ✓ | ✓ | ✓ | ✓ | ✓ |
| 32 | 43.033.618,51 | -10.064.042,16 | 0,19% | 0,23386 | 0,19% | **82,24%** | ✓ | ✓ | ✓ | ✓ | ✓ |
| 33 | 36.765.569,36 | -15.087.376,62 | 12,72% | 0,41037 | 14,79% | **31,48%** | ✓ | ✓ | ✓ | ✓ | ✓ |
| 34 | 9.672.604,05 | -390.657,50 | 73,93% | 0,04039 | 22,61% | **23,26%** | ✓ | ✓ | ✓ | ○ | ✓ |
| 35 | 38.962.006,40 | -6.029.832,12 | 27,23% | 0,15476 | 30,68% | **17,21%** | ✓ | ✓ | ✓ | ○ | ✓ |
| 36 | 18.061.829,19 | -2.255.579,37 | 45,87% | 0,12488 | 16,60% | **29,29%** | ✓ | ✓ | ✓ | ✓ | ✓ |
| 37 | 35.470.416,01 | -14.961.064,41 | 0,63% | 0,42179 | 1,11% | **68,63%** | ✓ | ✓ | ✓ | ✓ | ✓ |
| 38 | 74.768.140,50 | -22.681.127,49 | 0,69% | 0,30335 | 0,50% | **75,72%** | ✓ | ✓ | ✓ | ✓ | ✓ |
| 39 | 31.023.223,95 | 7.032.738,67 | 9,89% | -0,22669 | 8,90% | **40,65%** | ✓ | ✓ | ✓ | ✓ | ✓ |
| 40 | -30.481.715,39 | 815.047,53 | 41,22% | 0,02674 | 44,41% | **10,05%** | ✓ | ✓ | ✓ | ✓ | ○ |
| 41 | 26.898.614,43 | -12.276.400,69 | 2,70% | 0,45640 | 3,78% | **54,02%** | ✓ | ✓ | ✓ | ✓ | ✓ |
| 42 | 22.184.301,31 | -17.037.731,88 | 0,06% | 0,76801 | 0,13% | **74,27%** | ✓ | ✓ | ✓ | ✓ | ✓ |
| 43 | 18.450.380,16 | -11.991.495,64 | 0,72% | 0,64993 | 0,47% | **70,39%** | ✓ | ✓ | ✓ | ✓ | ✓ |
| 44 | 28.999.961,31 | -19.869.739,90 | 1,48% | 0,68516 | 1,87% | **62,96%** | ✓ | ✓ | ✓ | ✓ | ✓ |

* hypothesis verified, ✓; hypothesis not verified, ○

**TABLE 3.A:** Results on construction sector.



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| Code | ZEP (€) | Intercept (€) | p-value | Coefficient | p-value | $R^2$ | L* | H* | E* | N* | I* |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 45 | 20.873.184,75 | -5.137.890,90 | 0,43% | 0,24615 | 0,46% | **70,62%** | ✓ | ✓ | ✓ | ✓ | ✓ |
| 46 | 31.315.705,32 | -6.827.617,08 | 1,09% | 0,21803 | 0,95% | **64,18%** | ✓ | ✓ | ✓ | ✓ | ✓ |
| 47 | -61.809.737,89 | -24.008.030,74 | 7,05% | -0,38842 | 32,83% | **15,87%** | ✓ | ✓ | ✓ | ✓ | ✓ |
| 48 | 13.974.119,09 | -3.725.412,49 | 0,55% | 0,26659 | 0,09% | **81,49%** | ✓ | ✓ | ✓ | ✓ | ✓ |
| 49 | 22.318.644,22 | -12.552.089,80 | 13,83% | 0,56240 | 16,70% | **29,17%** | ✓ | ✓ | ✓ | ✓ | ✓ |
| 50 | 30.920.851,92 | -25.290.261,33 | 0,98% | 0,81790 | 1,18% | **61,94%** | ✓ | ✓ | ✓ | ✓ | ✓ |
| 51 | 25.849.890,02 | -10.470.377,16 | 6,95% | 0,40505 | 9,06% | **40,34%** | ✓ | ✓ | ✓ | ○ | ✓ |
| 52 | 43.241.978,62 | 26.583.687,84 | 0,18% | -0,61477 | 0,10% | **76,04%** | ✓ | ✓ | ✓ | ✓ | ✓ |
| 53 | 22.913.959,01 | -6.579.898,49 | 0,46% | 0,28716 | 0,43% | **71,10%** | ✓ | ✓ | ✓ | ✓ | ✓ |
| 54 | 28.281.859,47 | 5.439.548,71 | 15,16% | -0,19233 | 3,36% | **55,63%** | ✓ | ✓ | ✓ | ○ | ○ |
| 55 | 17.185.113,70 | -4.665.884,93 | 3,45% | 0,27151 | 0,95% | **70,13%** | ✓ | ✓ | ✓ | ✓ | ✓ |
| 56 | 22.478.738,85 | -2.437.680,08 | 0,56% | 0,10844 | 1,20% | **67,81%** | ✓ | ✓ | ✓ | ✓ | ○ |
| 57 | 20.958.272,82 | -5.092.572,64 | 2,38% | 0,24299 | 2,24% | **54,90%** | ✓ | ✓ | ✓ | ✓ | ✓ |
| 58 | 19.068.762,44 | -10.526.198,58 | 22,16% | 0,55201 | 25,18% | **21,13%** | ✓ | ✓ | ✓ | ✓ | ✓ |
| 59 | 24.470.891,41 | -14.017.393,15 | 1,67% | 0,57282 | 4,49% | **51,56%** | ✓ | ✓ | ✓ | ✓ | ✓ |
| 60 | 16.524.868,65 | -3.697.063,78 | 2,26% | 0,22373 | 0,96% | **69,99%** | ✓ | ✓ | ✓ | ✓ | ○ |
| 61 | 9.845.840,10 | 3.317.615,38 | 41,42% | -0,33696 | 22,08% | **23,74%** | ✓ | ✓ | ✓ | ○ | ✓ |
| 62 | 22.634.962,44 | -12.872.837,17 | 0,10% | 0,56871 | 0,10% | **80,50%** | ✓ | ✓ | ✓ | ○ | ✓ |
| 63 | 16.869.741,76 | -9.053.657,35 | 1,35% | 0,53668 | 1,37% | **60,41%** | ✓ | ✓ | ✓ | ✓ | ✓ |
| 64 | 14.321.468,56 | -1.946.995,07 | 0,37% | 0,13595 | 0,19% | **76,99%** | ✓ | ✓ | ✓ | ✓ | ✓ |
| 65 | 8.226.642,77 | 71.809.029,11 | 33,54% | -8,72884 | 4,35% | **52,01%** | ✓ | ✓ | ✓ | ✓ | ✓ |
| 66 | 11.729.758,05 | -3.118.147,47 | 8,28% | 0,26583 | 4,96% | **50,06%** | ✓ | ✓ | ✓ | ✓ | ✓ |
| 67 | 38.480.005,28 | -17.934.660,97 | 0,17% | 0,46608 | 0,11% | **80,18%** | ✓ | ✓ | ✓ | ✓ | ✓ |
| 68 | 21.526.788,97 | -12.917.835,13 | 0,15% | 0,60008 | 0,25% | **80,55%** | ✓ | ✓ | ✓ | ✓ | ✓ |
| 69 | 17.567.281,69 | -8.286.118,52 | 3,09% | 0,47168 | 4,32% | **52,12%** | ✓ | ✓ | ✓ | ✓ | ✓ |
| 70 | 12.679.351,26 | -2.690.705,16 | 0,06% | 0,21221 | 0,04% | **89,34%** | ✓ | ✓ | ✓ | ✓ | ✓ |
| 71 | 13.624.008,29 | -8.401.282,47 | 5,28% | 0,61665 | 5,72% | **47,90%** | ✓ | ✓ | ✓ | ✓ | ✓ |
| 72 | 15.613.922,07 | -5.446.284,06 | 0,01% | 0,34881 | 0,01% | **90,28%** | ✓ | ✓ | ✓ | ✓ | ✓ |
| 73 | 17.714.762,75 | -20.944.895,85 | 0,00% | 1,18234 | 0,00% | **92,73%** | ✓ | ✓ | ✓ | ✓ | ✓ |
| 74 | 15.544.784,38 | -927.495,33 | 35,91% | 0,05967 | 42,26% | **10,99%** | ✓ | ✓ | ✓ | ✓ | ✓ |
| 75 | 17.369.205,51 | -24.958.585,52 | 0,69% | 1,43694 | 6,70% | **45,39%** | ✓ | ✓ | ✓ | ✓ | ✓ |
| 76 | 14.179.760,36 | 4.711.996,78 | 1,15% | -0,33230 | 1,06% | **69,06%** | ✓ | ✓ | ✓ | ✓ | ✓ |
| 77 | 12.595.450,96 | -10.381.528,92 | 0,01% | 0,82423 | 0,00% | **88,64%** | ✓ | ✓ | ✓ | ✓ | ✓ |
| 78 | 13.727.944,97 | -1.464.068,64 | 14,60% | 0,10665 | 10,76% | **37,33%** | ✓ | ✓ | ✓ | ✓ | ✓ |
| 79 | 11.434.213,70 | -9.353.385,72 | 2,98% | 0,81802 | 1,79% | **63,52%** | ✓ | ✓ | ✓ | ○ | ✓ |
| 80 | 18.315.642,86 | -35.322.686,93 | 0,02% | 1,92855 | 0,11% | **80,33%** | ✓ | ✓ | ✓ | ✓ | ✓ |
| 81 | 18.005.559,38 | -18.300.046,18 | 0,02% | 1,01636 | 0,02% | **83,76%** | ✓ | ✓ | ✓ | ✓ | ✓ |
| 82 | 10.232.905,93 | -1.444.275,29 | 6,93% | 0,14114 | 0,78% | **71,93%** | ✓ | ✓ | ✓ | ✓ | ✓ |
| 83 | 15.286.359,65 | -2.808.088,52 | 2,56% | 0,18370 | 0,68% | **73,09%** | ✓ | ✓ | ✓ | ✓ | ✓ |
| 84 | 7.396.384,96 | -565.291,08 | 0,65% | 0,07643 | 0,19% | **82,16%** | ✓ | ✓ | ✓ | ○ | ✓ |
| 85 | 15.414.906,47 | 165.402,14 | 90,20% | -0,01073 | 90,95% | **0,17%** | ✓ | ✓ | ✓ | ○ | ✓ |
| 86 | 9.365.208,72 | -3.758.310,72 | 0,26% | 0,40131 | 0,19% | **82,14%** | ✓ | ✓ | ✓ | ✓ | ✓ |
| 87 | 8.679.467,39 | -8.630.432,36 | 0,02% | 0,99435 | 0,01% | **88,75%** | ✓ | ✓ | ✓ | ✓ | ✓ |
| 88 | 3.479.121,13 | -10.312.406,07 | 0,16% | 2,96408 | 0,16% | **77,82%** | ✓ | ✓ | ✓ | ○ | ○ |

* hypothesis verified, **✓;** hypothesis not verified, ○

**TABLE 3.B:** Results on construction sector.

| Code | ZEP (€) | Intercept (€) | p-value | Coefficient | p-value | $R^2$ | L* | H* | E* | N* | I* |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 901.129.560,00 | 83.683.000,00 | 21,66% | -0,09286 | 5,49% | **48,52%** | ✓ | ✓ | ✓ | ✓ | ○ |
| 2 | 134.005.860,62 | -43.382.380,19 | 0,64% | 0,32373 | 0,44% | **76,58%** | ✓ | ✓ | ✓ | ✓ | ✓ |
| 3 | 156.391.881,16 | -92.114.493,50 | 3,55% | 0,58900 | 3,18% | **63,53%** | ✓ | ✓ | ✓ | ✓ | ✓ |
| 4 | 52.015.071,70 | -12.734.940,43 | 3,89% | 0,24483 | 0,80% | **78,38%** | ✓ | ✓ | ✓ | ✓ | ○ |
| 5 | 69.092.973,87 | 30.226.766,12 | 0,02% | -0,43748 | 0,01% | **92,51%** | ✓ | ✓ | ✓ | ✓ | ✓ |
| 6 | 85.973.163,75 | -23.252.594,82 | 0,36% | 0,27046 | 0,25% | **80,50%** | ✓ | ✓ | ✓ | ✓ | ✓ |
| 7 | 44.620.232,34 | -17.004.035,02 | 0,50% | 0,38108 | 0,03% | **90,03%** | ✓ | ✓ | ✓ | ✓ | ✓ |
| 8 | 50.025.544,64 | -18.299.970,78 | 5,08% | 0,36581 | 1,62% | **64,58%** | ✓ | ✓ | ✓ | ✓ | ✓ |
| 9 | 38.035.892,16 | -4.205.537,97 | 26,20% | 0,11057 | 20,26% | **30,06%** | ✓ | ✓ | ✓ | ✓ | ○ |
| 10 | 24.819.850,08 | -5.395.571,17 | 5,09% | 0,21739 | 1,41% | **66,13%** | ✓ | ✓ | ✓ | ✓ | ✓ |
| 11 | 29.538.604,04 | 5.621.851,73 | 18,74% | -0,19032 | 15,66% | **35,69%** | ✓ | ✓ | ✓ | ✓ | ✓ |
| 12 | 25.310.076,11 | -138.863.280,11 | 3,55% | 5,48648 | 3,44% | **62,48%** | ○ | ✓ | ✓ | ✓ | ✓ |

* hypothesis verified, ✓; hypothesis not verified, ○

**TABLE 4:** Results on coffee roasting sector.



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