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The Importance of Self-Financing in the Capital Structure of U.S. Agro-Industrial Companies

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Master in Finance

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Iscte-Iul

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Resumo

Esta dissertação explora o papel da capacidade de autofinanciamento (SFC) na estrutura de capital de empresas americanas do setor agroindustrial listadas na NYSE de 2020 a 2023. Este estudo examina as principais teorias de estrutura de capital, os teoremas de Modigliani-Miller, a Teoria do Trade-Off e a Teoria da Ordem de Preferência, avaliando a sua relevância através de análises empíricas e teóricas. Ao adotar uma abordagem melhorada do modelo da Ordem de Preferência, a investigação demonstra que a SFC oferece uma melhor visibilidade para a definição de uma estrutura de capital e para a tomada de decisões de financiamento, permitindo uma antecipação estratégica em resposta a mudanças nas necessidades de capital de giro e compromissos de financiamento externo.

Através da análise de regressão múltipla de três modelos conceptuais, esta dissertação estabelece ligações entre a capacidade de autofinanciamento, as fontes de financiamento externo e a capitalização de mercado. Os resultados demonstram que a SFC é um indicador mais forte da capitalização de mercado, influenciando de forma significativa e positiva o valor de mercado. Adicionalmente, a relação negativa significativa entre a dívida e a SFC na capitalização de mercado desafia a Proposição II de Modigliani-Miller, indicando que a dívida, com os seus benefícios fiscais, não é um fator primário na criação de valor de mercado. Além disso, a relação dívida-capital próprio (D/E) apresenta uma relação positiva, mas não significativa. De modo geral, estes resultados rejeitam a Teoria do Trade-Off e apoiam a Proposição I de Modigliani-Miller, que defende que a estrutura de financiamento externo não afeta necessariamente o valor de mercado. Consequentemente, estes resultados sugerem que as estratégias de financiamento estão mais alinhadas com a Teoria da Ordem de Preferência do que com a Teoria do Trade-Off.

Em conclusão, embora a adaptação completa da Teoria da Hierarquia de Financiamento a este contexto seja limitada pela insignificância estatística de uma variável, a importância crítica da capacidade de autofinanciamento é claramente destacada, sublinhando a sua relevância crucial na avaliação da estrutura de capital neste setor.

Palavras-chave: Capacidade de autofinanciamento; Estrutura de capital; Teoremas de Modigliani-Miller; Teoria do Equilíbrio; Teoria da Ordem de Preferência; Capitalização de mercado; Setor agroindustrial; Análise de regressão múltipla.

Classificação JEL: C3, G3.

Abstract

This dissertation explores the role of Self-financing capacity (SFC) in the capital structure of American companies in the agro-industrial sector listed on the NYSE from 2020 to 2023. This study examines the main theories of capital structure, the Modigliani-Miller theorems, the Trade-Off Theory, and the Pecking Order Theory, and assesses their relevance through both empirical and theoretical analyses. By adopting an enhanced approach to the Pecking Order model, the research shows that SFC provides better visibility for establishing a capital structure and making financing decisions, allowing for strategic anticipation in response to changes in working capital needs and external financing commitments.

Using multiple regression analysis of three conceptual models, this thesis establishes links between Self-financing capacity, external financing sources, and market capitalization. The results demonstrate that SFC is a stronger indicator of market capitalization, significantly and positively influencing market value. Additionally, the significant negative relationship between debt and SFC to market capitalization challenges Modigliani-Miller Proposition II, indicating that debt, with its tax deductibility benefits, is not a primary driver of market value. Furthermore, the debt-to-equity ratio (D/E) shows a positive but non-significant relationship. Overall, these findings reject the Trade-Off Theory and support Modigliani-Miller Proposition I, which posits that external financing structure does not necessarily affect market value. Consequently, these results suggest that financing strategies align more closely with the Pecking Order Theory than with the Trade-Off Theory.

In conclusion, although the full adaptation of the Pecking Order Theory to this context is limited by the statistical insignificance of one variable, the critical importance of Self-financing capacity is clearly highlighted, underscoring its crucial relevance in evaluating capital structure within this sector.

Key words **:** Self-financing capacity; Capital structure; Modigliani-Miller Theorems; Trade-Off Theory; Pecking Order Theory; Market capitalization; Agro-industrial sector; Multiple regression analysis.

JEL Classification : C3, G3

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Chapter 1

Introduction

1.1. Presentation of the context

In today's economy, where borrowing poses significant repayment challenges, companies within the agro-industrial sector are increasingly exploring non-traditional financing options to maintain control over their capital structure while ensuring a substantial contribution to working capital. Although debt financing offers advantages that are widely embraced in both entrepreneurial and corporate circles, such as the ability to leverage tax benefits and optimize debt-to-asset ratios to enhance project maneuverability and reduce costs, there is a palpable risk.

As a matter of fact, taking a concrete example, companies today are led to finance their capital expenditures with resources as shown in Figure 1.1 in Annex A. Between 1990 and 2015, U.S. companies financed their growth by prioritizing their internal resources, followed by their debt, and finally capital dilution. Therefore, the choices made by companies are generally adapted to the available cash flows, which are seen as more profitable to use than debt. This indicates that companies tend to consider debt less and mitigate its impact.

Therefore, the current economic landscape is fraught with uncertainty, and sudden downturns can expose companies to substantial risk across all sizes and segments. In such scenarios, a rapid reduction in borrowing capacity can thrust a company into financial distress, potentially leading to bankruptcy. Therefore, navigating the complexities of financing in the food industry sector requires careful consideration of the balance between leveraging debt for strategic advantages and mitigating the risks inherent in economic volatility.

This leads to the fundamental question of this thesis: *Can companies in the agro-industrial sector rely on their Self-financing capabilities to reduce their dependence on external financing and optimize their capital structure?*

1.2. Motivation

The challenge is to understand how managers can promote their development, both by reducing the risk of borrowing and boosting growth through better management of their internal funds.

The incentive of this work is to make companies capable of avoiding excessive repercussions on their structure in the event of abnormalities in the financial system. Therefore, the idea stands for Self-financing capacity (SFC) and the role it serves within a corporation.

The concept of SFC emerged in France in 1984 and enables companies to identify their internal funds by considering non-cashable funds and provisions for fixed assets and impairment. In other words, this approach takes a different view of financial accounting analysis, offering a view of operating cash flows while also considering a company's future situation. SFC has been used extensively since that time as it enables the interests of the company to be aligned, both within the company's top management and through external financing and banking. Its attractiveness in showing how a company can dispose of resources enables the company to know its borrowing capacity and provides it with information on risk reduction with regard to external financing markets, its ability to repay, and thus, structure its capital. The ultimate interest that this research will seek to prove in relation to the research question is that maximizing Self-financing capacity is important for creating growth, which should be reflected in the value of the company's market capitalization.

Thus, the research question is formulated to ascertain whether: *Self-financing capacity is a reliable indicator of the ability to mitigate the risk of capital devaluation.*

1.3. Thesis goal

To address the central question of this research, the role of SFC in capital structure must be analyzed. This thesis aims to demonstrate the hierarchical importance of capital funding methods. Thus, to the context of the American capital market, it is crucial to determine the order between internal financing with SFC and external financing with debt and equity.

Therefore, to achieve this goal, it is appropriate to enumerate the questions inherent to the research that are relevant to building and delimiting the axes to be understood in this report. The literature research questions are oriented in two distinct parts: the first is determined to elucidate the theoretical workings, and the second is oriented on an empirical statistical approach. The research questions will be mainly composed of literature questions and will be completed with methodology desk research questions on quantitative statistical data mining.

1.4. Literature review questions

The first questions that are essential to start the work are based on scientific literature research that will help unravel the functioning of financial institutions and the global economy in which the entities are present.

Table 1.1: Literature review questions

1. How do agro-industrial companies constitute their capital structure in a global context and how does this structure affect their value?
• What are the fundamental theories of capital structure that apply to this sector?
2. What are the implications of Modigliani and Miller's theorems on the capital structure and value of firms in the agro-food industry?
• How does the tax shield provided by debt affect the valuation of agro-industrial companies?
3. How does the Trade-off Theory apply to the financing strategies of agro-industries?
• What are the benefits and costs associated with using debt versus equity in this industry? • How do firms balance the tax advantages of debt with the risk of financial distress?
4. How does the Pecking Order Theory influence the financing decisions of agro-industrial firms?
Do firms prefer internal to external financing? How do profitability and retained earnings affect capital structure decisions in the agro-industrial sector?
5. What role does Self-financing capacity (SFC) play in the capital structure and financial health of agro-food companies?
What are the advantages and limitations of using SFC as a primary source of funding?
6. What are the empirical findings related to the capital structure and firm value in the agro-food sector?
• What does the existing research say about the relationship between leverage, profitability, and firm value in this industry? • How do different variables, such as firm size, tangibility, and liquidity, impact the market value of industrial companies?

1.5. Data mining questions

Then, the methodological research is conducted on the awareness of the companies, the methods that are applied, and Self-financing constraints.

Table 1.2: Hypothesis and conceptual model research questions

1. **How does Self-financing capacity (SFC) influence the financial performance of agro-industrial companies?**
• What is the relationship between Self-financing capacity and market capitalization? • Does Self-financing capacity significantly improve the financial health and value of agro-food companies?
2. **What is the impact of debt on agro-industrial companies' financial performance?**
• To what extent does leveraging debt contribute to financial performance? • At what point does debt become detrimental to these companies' financial performance?
3. **What role does fund management play in enhancing the financial performance of agro-food companies?**
• How does the strategic allocation of Self-financing resources affect financial stability and growth?

1.6. Methodology

Regarding the first methodology, it is important to consider desk data mining. The research methods at hand are documentation and financial data analyses.

Therefore, the second methodology consists of analyzing the literature search, which is the keystone of various data and information. Therefore, this method will guide research on specific self-financing articles and review strategies. Subsequently, it will help to understand the chosen range of tools and relevant problems to reach the desired situation and the company's objectives. Finally, this methodology can be identified as a quantitative analytical method.

Table 1.3: Methodology research question

1. **What are the significant variables that influence the financial performance of agro-food companies in the context of their capital structure?**
• What are the significant variables that influence the financial performance of agro-food companies in the context of their capital structure?
2. **How does the choice of sample (23 leading agro-food companies in the S&P500) impact the generalizability of the study's findings?**
3. **What methods can be used to ensure the reliability and validity of the collected financial data?**
• How should financial data be sourced and verified to ensure accuracy? • What statistical methods will be employed to test the research hypotheses?
4. **How can regression models be used to test the relationships between capital structure variables and financial performance?**
• What specific regression models will be used, and how will they be interpreted? • How will the significance of models be tested and validated?
5. **What are the potential limitations of the research methodology, and how can they be addressed?**
• How might the sample size and study period impact the findings? • What external factors (e.g., government policies and economic changes) need to be considered? • Are the selected companies, representative of the broader agro-industrial sector?

1.7. Thesis structure

The remainder of this study is structured as follows. Initially, a contextual approach is presented, which leads to this line of investigation. As previously explained, the literature is separated into two frameworks: theoretical and empirical.

Building on this body of literature, the findings of desk analyses, and paper reviews, Chapter 3 presents the research hypotheses and contextual models to be tested. Then, thanks to Chapter 4, the methodology and steps that link Chapters 3 and 5, explaining how to detail hypothetical models are quantified using a real database. Finally, Chapter 5 presents the results

of both the theoretical and empirical frameworks from Chapter 2, offering contributions to the various existing theories and discussing their implications.

The final step draws conclusions and offers recommendations based on the findings of this study. Ideally, these conclusions provide a clear answer to the research question, demonstrating that Self-financing capacity plays a significant role in structuring a company's capital.

Chapter 2

Literature review

2.1. Introduction

This section addresses the various questions that arise in this subject. How do companies in the agro-industrial sector build their capital structures in a global context and how does this affect their value? Indeed, in the current context, company managers are constantly preoccupied with strategic financing choices through which they endorse capital equilibrium. Consequently, it is important to understand the range of financing options a company must satisfy to promote value creation.

This brings the focus of this study to determine how companies meet their financing needs through internal Self-financing. To this end, it will be useful to provide a theoretical version of the concepts and then present empirical research supported by the model results proposed by various specialists in the field of corporate finance.

The aim of this study was to develop a more concrete version of this research. Then, still in the interest of the current context, this literature will play a pivotal role in capturing the benefits and limits of the leverage effects provoked by external financing. Finally, it highlights the major challenges of Self-financing, which will help companies build a less risky or penalizing financing portfolio.

2.2. Theoretical Framework

As mentioned, the theoretical framework enables to understand the fundamentals of capital-intensive finance and the different financing opportunities that companies face. It is important to consider theories that apply to the context and size of the companies under study, that is, the 23 largest listed companies in the US agro-alimentary sector. In the first instance, the theories presented are those of Modigliani Miller I and II, the Irrelevance Theorem and the Capital Structure Theorem, that are considered the pioneers of the field. These theories have provided support for the Trade-Off Theory (Myers, 1984) and the Pecking Order Theory (Myers & Majluf, 1984). It is then necessary to contextualize these theories with the research question that is to bring a critical vision towards the beneficial elements that the methods of Self-financing present.

2.2.1. Modigliani & Miller (Proposition I & II)

Modigliani and Miller Proposition I (1958) started a "groundbreaking work on capital structure in the field of Corporate Finance" (Jahanzed et al., 2014). According to this theorem, leverage has no impact on firm value in perfect capital markets. Proposition I outlines that a "firm's value is not affected by debt-equity ratio" (Jahanzed et al., 2015). In other words, if a firm relies more heavily on equity or debt to finance its activities, its trade value should not be influenced. Furthermore, Mohammed Ibrahim Sultan Obeidat in "The Validity of Modigliani-Miller Theorem at the Commercial Banking Industry of Jordan", published in 2021, explains that company's value is defined by its asset structure and yield rather than how it structures its capital portfolio (Enow, 2010). The author defines the Modigliani-Miller theory as a "broadly accepted theory regarding the capital structure", which relies on perfect market assumptions, implying that firms operate in a risk-free environment. Thus, it highlights that a company's capital structure is uncorrelated with "its value when the market is perfect". Suggesting that informed decisions on how a company chose to finance its investment are difficult, calculating the optimal "proportions of debt and equity", remains a challenge (Obeidat, 2021).

Finally, this theorem allowed to understand the links that could exist between the composition of capital and the value of a company, which stipulates that corporate strategic decisions should focus more on their propensity to maximize financial results and reduce risk, rather than being monopolized by the optimization of capital structure. Furthermore, the authors argue that productivity and asset quality are the real determinants of a company's value. In other words, a company's value is independent of how it has been financed (Modigliani & Millier, 1958, as cited by Obeidat, 2021).

However, Modigliani-Miller Proposition II (1963), discussed the former findings adding the tax shield theory, presenting a significant advantage of debt over other external financing because of the tax exemption that companies benefit from. In fact, the tax shield is influenced by the corporate tax rate, the amount of debt, the interest rate on debt, firm profitability, and earnings stability. These factors collectively determine the extent to which a firm can benefit from the "tax deductibility of debt interest" (Modigliani & Miller, 1963).

$$VL = VU + PV \text{ of Interest tax shield} \tag{2.1}$$

In the book Corporate Finance, 4th edition, published in 2017 by Pearson with the collaboration of Johnatan Berk and Peter DeMarzo, a schema (Figure 2.1) outlines the

advantages of leverage theory. This shows that a company with a levered value (VL), indebted, has a higher value than a company without recourse to debt, an unlevered company (VU), because of the present value of the interest tax shield. In other words, the tax-deductible value of the interest paid on debt contributes to creating value by optimizing the use of pre-tax cash flows that are not distributed as taxes. It is important to understand that interest paid on debt represents the repayment of long-term financing for an investment made at the time of borrowing. Consequently, investments through debt tend to improve future cash flows, and their loss is mitigated by debt repayment (Refer Annex B, Figure 2.1).

The conclusion drawn in the Proposition I, which considers a company's value creation through its propensity to create profitability derived from its corporate choices and not from its capitalist strategy, proves to be counterbalanced. Indeed, outside a neutral environment, the observed advantage of the tax shield shows that a decision on the choice of financing can be intrinsically linked to cash flow generation. Therefore, this section contradicts the view that it is possible to create a trade-off between the interests generated by debt and the benefits generated by tax benefits/exemptions. This leaves room for a theory inspired by the debate on Proposition II to Proposition I, called the Trade-Off Theory.

2.2.2. The Trade-Off Theory

As Iqbal et al. (2012) points out, the Trade-Off Theory (Myers, 1984) gained importance after the debate on Modigliani-Miller proposition. The main principle of this theory is seeking an optimal capital structure that balances the costs and benefits of debt and equity.

Trade-Off Theory is based on the idea that companies must find an optimal balance between the fiscal benefits of debt and the costs of financial distress associated with excessive debt. Thus, the use of debt enables companies to generate value through to the deductibility of the interest paid, which reduces the company's tax burden (FasterCapital, n.d.).

However, it is important to consider that the costs of bankruptcy or financial distress represent a major disadvantage of excessive debt use (Jahanzeb et al., 2014). These costs can be direct, such as legal fees, or indirect, such as the loss of customers and employees who were creating value.

Furthermore, the interests of creditors and managers may diverge from those of shareholders, leading to agency conflict. Consequently, a company could end up with high agency costs if shareholders wish to set up control mechanisms (audit, board of directors, governance) or financial incentives to align managers' choices with their interests. Additionally,

shareholders may resort to practices such as over indebtedness or asset substitution, thereby taking excessive risk to the detriment of creditors.

Myers (1984) made an important contribution to the notion of leverage developed by Modigliani and Miller Proposition II, supporting the idea that debt increases return on equity if the cost of debt is lower than the company's return on assets. He also argues that an optimal level of debt is achieved by balancing the benefits of interest payments with the costs of issuing debt. This means that companies focus on a certain debt-to-equity ratio and exchange the advantages of debt to maximize their value. This point is reached when the benefits of issuing debt outweigh the increasing "present value of the costs associated with issuing more debt" (Myers, 2001).

Thus, when debt is no longer a viable option and the optimal leverage point is reached, the company must turn to an equity issue. However, this issue also has disadvantages, as it incurs administrative costs and can be perceived negatively by the market, which may indicate that the company considers its shares to be overvalued, that the company does not generate sufficient liquidity, that it has a loss of yield/profitability, or that it does not have sufficient cash flow growth compared to the increase in debt costs. Myers (1984) established that companies may issue shares if they believe they are mispriced in the market. However, investors may interpret a share issue as a sign that shares are overvalued, often leading to a negative reaction.

In summary, the Trade-Off Theory proposes a balance between "debt and equity to minimize the cost of capital and maximize the value of [a] company" (FasterCapital, n.d.). However, it is crucial to note that issuing shares can move a company away from its optimal financing point, which investors often perceive as bad news.

2.2.3. The Pecking Order Theory (POT)

From a complementary perspective, the following section examines the Pecking Order Theory (Myers & Majluf, 1984), which offers an alternative to the Trade-Off Theory developed by Myers (1984). In the article "Market power versus capital structure determinants: Do they impact leverage?", written by Agha Jahanzeb, Norkhairul Hafiz, Bajuri & Aisha Ghori, published in 2015, the latter highlights POT reasoning implying that companies generally "prefer to finance new investments, first with internally raised funds, i.e. retained earnings, then with debt, and issue equity as a final resort" (Jahanzeb et al., 2015).

The financing hierarchy theory provides a clear idea that managers prefer to finance their activities first with retained earnings. If additional funds are required, they choose to issue debt,

and only as a last resort when issuing new debt could lead to financial distress do they issue equity. This approach supports the idea that highly profitable companies are likely to finance their activities using retained earnings and tend to reduce their debt levels. Contrary to the Trade-Off Theory (Myers, 1984), the Pecking Order Theory (Myers & Majluf, 1984) rejects the idea of fixed financial targets and advocates a specific financing hierarchy.

The fundamental basis of POT is the way in which companies prioritize sources of financing, considering asymmetric information and transaction costs. This theory challenges the traditional notion of optimal capital structure and emphasizes the role of internal financing, particularly retained earnings, as the preferred source of financing. Indeed, managers perceive the latter as a low-cost source of funds, thus avoiding the negative signaling effects associated with issuing equity. Finally, by using retained earnings for investments, companies maintain financial flexibility and signal confidence in their prospects, thereby enhancing shareholder value.

However, Myers and Majluf (1984) argues that it is difficult to define an optimal capital structure, as equity lies at both the top and bottom of this hierarchy.

2.2.4. Self-Financing Capacities (SFC)

According to the major theories reviewed by Modigliani-Miller (1963), Myers (1984), and Myers and Majluf (1984), setting up a balanced financing portfolio presents major obstacles. Therefore, it is wise to orient the thread of the rest of this research around the limits of the Pecking Order Theory (Myers & Majluf, 1984) to show how the approach to proposed financing choices by Self-financing capacity contributes to improving managers' internal decision-making. In other words, it is crucial to consider the financial opportunities and advantages that SFC can offer, its limitations, and how to complement its approach.

2.2.4.1. Definition & calculation of SFC

Self-financing capacity (SFC) is a critical indicator of a company's yield from core business operations. This reflects how efficiently a company can fund its activities through operational cash flows, excluding the impact of non-operating items, while emphasizing the importance of effective working capital management. This helps managers to make informed decisions regarding capital allocation and investment priorities as it represents "an independent and relatively stable source of enterprise financing in certain adverse conjectural situations" (Radu & Bordeianu, 2017).

To understand this approach, it is essential to examine the methods used to calculate Self-financing capacity (SFC). According to Radu and Bordeianu (2017), from an operational perspective, SFC can be determined using two methods: the subtractive and additive. The subtractive method is calculated as follows:

$$\text{Subtractive method SFC} = \text{EBE} + \text{Vaex} - \text{Chaex} + \text{Vf} - \text{Chf} - \text{Imp} \quad (2.2)$$

where EBE represents the gross operating surplus (EBITDA), Vaex and Chaex are other operating revenues and expenses, Vf and Chf refer to financial income and expenses, and Imp stands for revenue tax. In contrast, the additive method is calculated as follows:

$$\text{Additive method SFC} = \text{Rn} + \text{Aj} \quad (2.3)$$

where Rn is the net result of the exercise, and Aj refers to value adjustments for fixed assets, current assets, and provisions (Refer to Annex C, Table 2.1) (Radu & Bordeianu, 2017).

Radu and Bordeianu (2017), using the subtractive method, conclude that the evaluation of SFC could be defined by its elements, stating that "EBE [EBITDA] is the key element of the CAF [SFC] at the level of 'exploitation'. EBE therefore appears as a sort of 'self-financing capacity'" (Radu & Bordeianu, 2017). In the following method, the authors consider the “accounting regulations” information contained in the income statement that is, the depreciated and amortized value of assets, representing short-term operational and financial adjustments, which are also considered to determine the SFC. Thus, the latter is an adjustment of the POT's vision of internal resources, that is, the accumulation of net income, by adding depreciation, amortization, provisions for liabilities and charges, subtracting non-cash income and non-cash expenses (reversal of provisions) as financing opportunities.

Finally, taking a closer look at the context, Wagner (2023) states that listed companies are required by law and IFRS standards to present their operating results in the form of cash flow. He adds that SFC is often compared and confused with operating cash flows. He then describes the difference between the latter as the variation in working capital requirements and exceptional expenses. He subsequently evokes the same two approaches (additive and subtractive) mentioned above as ways to calculate it.

2.2.4.2. Advantages and limitations, and the need to extend the analysis

The benefits of SFC can be analyzed in several ways. With a clear view of internal liquidity, managers can better allocate resources and reduce waste risks (Radu & Bordeianu, 2017). This favors operational asset management to promote an increase in shareholders' value.

As a first step, it is worth considering how to optimize the management of cash resources. Wagner (2023) points out that SFC is a potential cash flow that can be used to finance working capital requirements, as illustrated by the example of a growth phase and sharp increase in working capital requirements. The board of managers must ensure that working capital requirements are properly managed so that they do not monopolize the totality of the Self-financing capacities, preventing the generation of sufficient and immediate operating cash flow that can be used rapidly.

Moreover Selmer (2018), in "La Boîte à outils du Responsable financier" explores the concept of Self-financing Capacity referring that SFC highlights the capacity to invest in new assets (CAPEX investments), engage in mergers and acquisitions, repay financial debts, distribute dividends to shareholders, or fuel growth by increasing Working Capital Requirements. Thus, the author's insights underscore the significance of SFC as a pivotal benchmark for evaluating a firm's financial strength and capacity for Self-financing, thereby guiding strategic financial decision-making. Therefore, according to Lenglet (2022) and Radu and Bordeianu (2017), the advantage of SFC is that it reveals a company's financial independence, enabling it to manage its operations with a minor reliance on financial or lending institutions.

Moreover, SFC can be used to reduce the financial expenses and agency costs linked to financial dependence on institutions, which can improve a company's overall profitability (Radu & Bordeianu, 2017). Indeed, Wagner (2023) indicates that it heavily influences the bank's view of a company, as it compares the SFC indicator with the number of financial debts (financial debts/SFC) to estimate the time it will take a firm to repay its debts in years. Consequently, Self-financing improves a company's financial ratios and facilitates the assessment of its future cash availability to satisfy its immediate financial obligations, such as debt payments and operating expenses.

This raises another point that these authors made. By improving these ratios, a company reflects a positive image of the markets, attracts external capital, and facilitates financing in capital markets. In fact, SFC allows the measurement of return on equity, provides a clear vision of financial yield, and "provides the premises for attracting external capital and financing from capital markets" (Radu & Bordeianu, 2017). In other words, "Self-financing is the

mechanism/machine that allows the transformation of energy (money) into work (value)" (Radu & Bordeianu, 2017). This concept helps shareholders determine whether a company is generating or eroding value, through the return on reinvested equity.

As a result, these resources can be used to finance growth, investments, to pay off debts, and avoid the systematic use of debt, as excessive leverage can exacerbate agency problems (Jensen & Meckling, 1976). It also indicates resource availability that managers can freely allocate to financing positive net present value projects or to increasing capital by integrating the accumulated funds, inherently enhancing most of the company's financial ratios. Therefore, the degree of Self-financing capacities affects a company's performance. This indicates that potential shareholders can manage "entrusted capital efficiently" and sustain a suitable payout. Therefore, the "absolute and relative magnitude of Self-financing certifies creditors the level of redemption capacity and the level of default risk" (Radu & Bordeianu, 2017).

2.3. Empirical framework

The combination of debt and equity employed by a company to finance its assets, known as capital structure, is crucial in shaping its financial stability and overall value. Enow (2010) highlights this by associating capital structure with the proportion of assets funded by debt, emphasizing its importance in financing company properties. Effective management of capital structure is essential for optimizing firm value, as assets are a major component of a firm's value and result from strategic capital structure decisions.

2.3.1. Modigliani & Miller

Since Modigliani & Miller Proposition II (1963), a considerable body of research has examined the presence of debt in companies' capital portfolios. Most of this research has focused on variables that affect company value.

As evidenced by Obeidat (2021), Nguyen et al. (2020) study the relationship between capital structure and firm value using a multiple regression method. It undertakes a panel of "22 food and beverage firms in Vietnam over the period 2010-2018", that is oriented toward equity and leverage. Thus, this study concludes "that a positive relationship exists between capital structure and firm value. It also showed that firm quality, tangibility, firm growth, and GDP growth can improve firm value" (Obeidat, 2021). Furthermore, this analysis indicates that firm profitability exhibits a significant negative correlation with firm value, suggesting that higher

profitability may not always translate to higher firm value. This finding aligns with Modigliani and Miller's theoretical predictions regarding optimal capital structure and the importance of firm quality in enhancing firm value (Aggarwal & Padhan, 2017). Similarly, Obeidat (2021) examined Aggarwal and Padhan (2017), who investigated the impact of capital structure on a firm's market value. This research focuses on 22 listed hotel firms on the BSE between 2001 and 2015. Complementing the findings of Nguyen et al. (2020), this study analyzed various, factors such as firm quality, leverage, size, profitability, tangibility, growth, liquidity, and macroeconomic conditions. The results indicate a significant relationship between firm value and several variables including firm quality, leverage, liquidity, size, and economic growth.

Moreover, Feidakis and Rovolis (2007) found a significant positive relationship between tangibility (proportion of fixed assets) and firm value. This finding suggests that firms with a higher proportion of fixed assets tend to have higher market capitalization, possibly because of their better collateral value and investment opportunities. Similarly, Batten and Vo (2018) concluded that firm liquidity demonstrates a negative relationship with firm value, indicating that excess liquidity may not be utilized effectively and could reduce firm value. The authors find a negative relationship between liquidity and firm value, indicating that firms with higher liquidity ratios may not utilize their capital efficiently, leading to lower market capitalization.

After examining empirical support for Modigliani and Miller's theory regarding the quality of assets, Obeidat (2021) explored several studies that depict the relationship between firm value and capital structure decisions. Al-Slehat (2020) analyses the effects of financial leverage, firm size, and asset structure, concluding that all these factors influence firm market value. This study focused on 13 mining and extraction firms listed on the Amman Stock Exchange from 2010 to 2018. Using a simple linear regression model, the results indicated "no significant impact of financial leverage on firm market value but revealed that both size and asset structure have a significant impact on firm value" (Obeidat, 2021).

In contrast to these findings, Obeidat (2021) presents the work of Shanika Ishari and Madhushanka Abeyrathna (2016), which examined the effect of financial leverage on firm market value, comparing the performance of listed manufacturing firms in Sri Lanka. The study, conducted on a sample of 50 firms over the period 2011–2015, used the Pearson correlation analysis. The results showed a "negative relationship between the debt-to-equity ratio and return on assets, but the regression analysis demonstrated a significant effect of the debt-to-equity ratio on return on assets. As the debt-to-equity ratio increases or decreases, the return on assets also changes significantly. This indicates that the company's mix of debt and equity has a clear impact on its financial performance" (Obeidat, 2021).

2.3.2. The Trade-off Theory

To begin with, Jahanzeb et al. (2014) identified "a positive relationship between leverage and profitability, showing that highly profitable firms prioritize external financing to shield income from taxes through the use of leverage" (Jahanzeb et al., 2014). However, empirical findings from prior research on the Trade-Off Theory offer mixed results.

In their review, Jahanzeb et al. (2014) examined studies by Titman and Wessels (1988), Rajan and Zingales (1995), and Fama and French (2002), who concluded that highly profitable firms tend to rely less on debt. This contradicts fundamental theory, as these firms should have greater incentives to borrow to benefit from tax deductibility. In contrast, Graham (2000) conducted a study that estimated the costs and benefits of debt, concluding that "large and more profitable firms, with lower expectations of financial distress, tend to use debt conservatively" (Jahanzeb et al., 2014). Furthermore, Graham and Harvey (2001) show that firms tend to move slowly towards their target leverage, and many prefer maintaining low debt to minimize financial distress costs. This cautious approach is exemplified by Microsoft's zero-debt policy, despite its profitability. Moreover, Welch (2004) argues that firms "do not compensate the impacts of stock returns actively" on market leverage, suggesting a more passive approach to capital structure management (Jahanzeb et al., 2014).

However, on the other side, Marsh (1982) and Hovakimian et al. (2001) confirm the role of target leverage, showing that firms do aim for a specific debt level. Leary and Roberts (2005) and Hovakimian (2006) show that firms adjust their capital structures by buying back securities to move towards their target leverage.

2.3.3. The Pecking Order Theory (POT)

As mentioned in the previous framework, the foundations of the Pecking Order Theory (Myers and Majluf, 1984) are based on a preference to avoid costs and negative signals associated with external equity issuance. Empirical studies have provided mixed evidence for this theory. Jahanzeb et al. (2015) highlighted studies from Shyam-Sunder and Myers (1999), where they tested the change in debt explained by a variable, deficit to total asset as the financing gap, showing that firms prefer internal financing to avoid the costs and negative signals associated with external equity issuance. As shown in Annex A, Figure 1.1, retrieved from the book Corporate Finance (Pearson, 2017), US corporations tend to rely first on their net income, then debt, and then equity, to finance capital expenditures.

However, Frank and Goyal (2003) argue that while the POT is useful, it has limitations in accurately predicting financial decisions. From this standpoint, Fama and French (2005) posited that companies' choices often oppose the predictions of the POT hypothesis, suggesting other driving forces.

Overall, the POT contributes to the understanding of capital structure dynamics by highlighting the interplay between financing choices, information asymmetry, and market reactions. Thus, firms' reluctance to deviate from internal financing reflects a pragmatic approach to capital-structure management.

2.3.4. Self-Financing Capacity (SFC)

Self-financing capacity (SFC) measures a firm's ability to finance its operations using internal resources. SFC is crucial for managing liquidity and optimizing resource use, reducing reliance on external financing, and aligning with the POT's preference for internal funds. Radu and Bordeianu (2017) emphasize its role in optimizing resource allocation, such as financing investments, maintenance, and development of fixed assets, and present in their results that it has a positive effect on the company's growth and profitability by having an enhanced control of firm liquidity.

Lenglet (2022) referred to accounting specialist results presenting that "the minimum self-financing capacity of a business should represent 5% of its turnover if the company pays corporate tax; represent 15% of its turnover if the company pays income tax" (Lenglet, 2022). This leaves room for interpretation of their final argument that there is a positive correlation between Self-financing capacities/Turnover ratio and firm profitability, as it being indicative of good financial health.

2.4. Conclusion

The analysis of capital structure theories, including the Modigliani-Miller Theorems, the Trade-Off Theory, and the Pecking Order Theory, reveals the crucial importance of Self-financing in managerial decision-making and financial stability of companies. It is clearly established that, although external financing is a fundamental contributor, the emphasis on SFC enhances decision-making and stabilizes the external fundings of companies by reducing risks associated with debt and equity. This promotes sustainable growth and value creation by providing

increased visibility to strategically anticipate fluctuations in working capital needs and other financial obligations.

Chapter 3 is dedicated to developing conceptual models that integrate SFC into an enhanced approach to the POT. This direction was chosen to explore how SFC can be effectively used to manage capital structure and financing decisions, in contrast to the traditional use of retained earnings. The central question is whether SFC, as a financial management tool, can reduce reliance on external financing and optimize capital structure, thereby reflecting a deeper understanding of the financial dynamics within the agro-industrial sector listed on the NYSE.

This strategic choice highlights the importance of Self-financing capacity as the predominant decision-making tool for large companies in the agro-industrial sector. By examining the effectiveness of SFC in reducing dependence on external financing and enhancing financial autonomy, Chapter 3 establishes a crucial bridge between theoretical foundations and their practical application in the significance analysis of the multiple regression presented in Chapter 5.

Chapter 3

Conceptual Model and Research Hypothesis

This chapter presents research hypotheses formulated based on the literature review and existing theoretical models. It also suggests three conceptual models guided by the empirical framework. The conceptual models, and hypotheses help to examine how capital structure affects the financial performance of agro-industrial firms in the NYSE stock market. Therefore, in the first part of this chapter, the hypotheses are unfolded to follow the Pecking Order Theory and coincide with the interpretation in Chapter 2.

Thus, in the second part, the conceptual models are explained to emphasize the importance of capital structure considering all factors, from the internal resources to the external ways of structuring the financial capital of a firm and observing the interactions with market capitalization, which can be translated into financial performance.

3.1. Research hypothesis

Several research hypotheses can be formulated based on the literature review. These hypotheses explore the relationships between capital structure, types of financing, and the financial performance of agro-industrial companies.

3.1.1. Research hypothesis 1

H1: There is a positive relationship between Self-financing capacity and financial performance of agro-industrial businesses.

Self-financing enables companies to reduce their dependence on costly external financing and maintain tighter control over their operations, which could translate into better financial performance (Radu & Bordeianu, 2017). In addition, Nguyen et al. (2020), Aggarwal and Padhan (2017), Feidakis and Rovolis (2007), Batten and Vo (2018) claim that there is an important relationship between asset tangibility, business growth, and market capitalization. Nguyen et al. (2020) proved that there was a negative correlation between asset liquidity and the latter. Therefore, it can be assumed that Radu and Bordeianu's (2017) approach of adding the value of depreciation to net profits (Equation 3) demonstrates an increase in the company's performance, and therefore its value.

H0: There is no relationship between Self-financing capacity and company market capitalization.

3.1.2. Research hypothesis 2

H2: Self-financing capacity plays a significant role in shaping leverage potential and determining the debt requirements necessary to sustain the financial performance of agro-industrial businesses.

Modigliani Miller (1963) and the Trade-Off Theory presented by Myers (1984) argue that debt can be beneficial for companies because of tax advantages and financial leverage. However, excessive debt can lead to excessive financial costs and an increased bankruptcy risk. The latter is examined in terms of debt repayment capacity, which is closely linked to SFC. As the literature has shown, Wagner (2023) defined their motivations based on Self-financing capacity indicator ratios with the aim of demonstrating that a debt level can be determined based on the ability to repay debt.

H0: There is no relationship between Self-financing capacity and company debt levels.

3.1.3. Research hypothesis 3

H3: Assuming that H2 holds, H3 poses that there is a significant positive relationship between debt-to-equity ratio and the market performance of a company. In other words, following the Pecking Order Theory (Myers & Majluf, 1984), optimizing the capital structure portfolio while prioritizing internal funds, then debt, and then equity leads to superior financial performance in agro-industrial companies.

A balanced combination helps minimize the cost of capital and optimizes the capital structure, which can enhance financial performance. Al-Slehat (2020) demonstrated through linear regression analysis that the asset structure and the firm's value were correlated. Shanika Ishari and Madhushanka Abeyrathna (2016) tested with regression and showed a significant effect of the debt-to-equity ratio on return on assets. Therefore, it could be relevant to state that the firm quality proven by H1 might also have a significant relationship with the debt-to-equity ratio. According to Graham and Harvey (2001), Welch (2004), and other authors referenced in the literature, who examined the capital decision-making of large market capitalization enterprises, the Trade-Off Theory's predictions are inconsistent, so that internal resources are preferred over other sources. This preference can be explained by the trend of repurchasing debt

and outstanding shares. As explained by Radu and Bordeianu (2017), SFC is used to indicate the ability of companies to maintain or regain control over their capital.

H0: There is no significant relationship between the debt-to-equity ratio and market capitalization in the agro-industrial sector.

3.2. Conceptual models

The conceptual model of this study is designed to visualize the hypothetical relationships between the different variables of capital structure and the financial performance of agro-industrial companies. Thus, it is possible to illustrate how the three research questions can be modeled and interpreted.

3.2.1. Conceptual model (H1)

$$\text{Financial Performance (Y)} = \beta 0 + \beta 1 * \text{Self-financing capacity (SFC)} + \varepsilon \quad (3.1)$$

In this model, SFC is conceptualized as the independent variable, and financial performance (Y) is the dependent variable. Financial performance (Y) is represented by market capitalization. Self-Financing Capacity is measured by adding depreciation and amortization to the net income. Here, β0 represents the intercept, β1 is the coefficient of the Self-financing capacity, and ε is the residual error.

Market capitalization was chosen because it provides a better perspective of a company's performance and profitability. Additionally, it is more appropriate for evaluating the significance of SFC, as it reflects the company's value. If this is confirmed, SFC would be a good indicator for investors to accurately base their expectations on the relationship with market capitalization.

3.2.2. Conceptual model (H2)

$$\text{Financial Performance (Y)} = \beta 0 + \beta 1 * \text{LC} + \beta 2 * \text{WCC} + \varepsilon \quad (3.2)$$

In this hypothetical framework, the model defines the relationship between financial performance and two independent variables related to credit capacity that an agro-industrial sector company can incur. Therefore, Leverage Capacity (LC) is considered the propensity of SFC to finance the repayment of the principal on bank loans. Thus, the mathematical relationship can be expressed as follows:

$$\text{Leverage Capacity (LC)} = \text{Debt/Self-financing capacity} \quad (3.3)$$

Moreover, as observed in the literature, the SFC can be viewed as a driver of changes in working capital. This, in turn, allows an understanding of a company's ability to meet its cash needs, repay supplier debts, and subsequently leave sufficient operational cash flow to finance ongoing activities. Therefore, it is important to observe the relationship between Working Capital Capacity (WCC) and Y, as follows:

$$\text{WCC} = \text{Change in Working capital / Self-financing capacity} \quad (3.4)$$

The dependent variable is financial performance (Y), measured as in Model 1. $\beta 0$, $\beta 1$, and $\beta 2$ are the coefficients to be estimated and ε is the residual error.

3.2.3. Conceptual model (H3)

$$\text{Financial performance (Y)} = \beta 0 + \beta 1 * \text{LC} + \beta 2 * \text{WCC} + \beta 3 * \text{D/E} + \varepsilon \quad (3.5)$$

This model attempts to reconcile the equilibrium of external financing with company structure. If the variables in the previous models show that investments linked to long-term debt or current liabilities are significantly correlated with value creation relative to Self-financing capacity, it is worth continuing on the lines of POT to establish a significant link between the equilibrium of debt and equity in the financial structure. Therefore, D/E, or commonly called debt-to-equity ratio, is examined to determine whether Myers and Majluf (1984) preferential order holds.

Thus, $\beta 0$, $\beta 1$, $\beta 2$, and $\beta 3$ are the coefficients to be estimated and ε is the residual error.

3.3. Conclusion

This section presents the research hypotheses and conceptual models that guide this empirical study. The hypotheses aim to explore the effects of capital structure on the financial performance of agro-industrial companies, whereas the conceptual models provide a visualization of the hypothesized relationships. The next step is to collect and analyze data to test these hypotheses and validate models H1, H2 and H3.

Chapter 4

Methodology

This chapter describes the methodology used to test the hypotheses in the previous section. It details the research questions, data collection process, data analysis methods, and the justifications and limitations of these methods. This methodology is essential for ensuring the validity and reliability of the results.

4.1. Justification of the models' method to the research hypothesis

To demonstrate the different responses that the research hypotheses aim to reveal, it is crucial to define the links between the research questions discussed in Chapter 1 and show how the conceptual models can provide significant answers during the quantitative analysis of this study.

In the research hypothesis (H1), the hypothesis is related to the various questions posed, specifically how Self-financing capacity influences the financial performance of agro-industrial companies and whether Self-financing has significant, or even fundamental, importance. The objective is to provide research insights into whether the SFC plays a major role in capital structure.

In the second model, the research hypothesis (H2) is considered, where the attempt is to answer questions such as what the impact of leverage on financial performance is up to a certain point or when a company should consider reducing its level of debt. This leads to the consideration of (H0), which addresses the research question of how financial inconsistencies or excessive debt levels can limit the influence of SFC on financial performance.

Finally, the research hypothesis (H3) was constructed on a more realistic model by considering the various capital realities inherent in the companies studied, including their shares. This is linked to questions such as; what the relationship between the debt-equity ratio in agro-industrial companies is, or whether it is possible to establish a viable capital portfolio by limiting external investments through SFC.

4.2. Data base sample and study rationale

To address these research questions, a sample of 23 leading companies in the food industry, listed on the New York Stock Exchange (NYSE) and S&P 500, will be analyzed over an

average of four fiscal years (2020-2023). These companies were chosen because of their significant size and market impact, which allow for a robust and representative analysis of trends within the agro-industrial industry. The rationale for selecting only companies listed in the same market is to achieve a clearer view of market trend homogeneity within the same governmental, economic, or index growth context. The table outlines the database setup used to conduct this thesis study (Refer to Annex D, Table 4.1).

4.3. Data collection

To successfully conduct this study, the financial data collection phase was carried out by extracting information from the companies' annual financial reports, which are available on their websites and financial databases such as Yahoo Finance in IFRS format. The collected information is documented in an Excel file (Refer to Annex D, Table 4.1).

First, it is essential to determine the construction of the dependent variable. Defined as Financial Performance (Y), it was analyzed consistently across all companies and is represented by Market Capitalization (MarketCap), which helped assess overall fluctuating financial performance. Empirical research has highlighted the importance of the relationship between profitability and the structure of asset financing.

Second, it is crucial to define the independent variables of the models, such as Self-Financing Capacity (SFC). The additive method presented by Radu and Bordeianu (2017) was used as a basis, starting with net income. Given that the SFC aims to assess whether it can support variations in Working Capital Requirements (WCR), it is logical to exclude WCR from the SFC calculation using operating cash flow. Indeed, it is possible to observe that operating cash flow consists of Net Income, Depreciation & Amortization, Depletion, Asset Impairment Charge, Stock-based Compensation, Operating Gains/Losses, minus Deferred Tax and Other Non-cash Items, which are considered exceptional and therefore non-operational charges. To validate this method, the details of Radu and Bordeianu's (2017) approach can be found in Annex C, Table 2.1. Owing to data availability under IFRS standards, this allows for the formation of the calculation that will be used in the databases:

$$\text{SFC} = \text{Operating Cash Flow} - \text{Change in Working Capital Requirements} \quad (4.1)$$

Third, as stated in Chapter 3, the mathematical definitions of the independent variables Leverage Capacity (LC) will be calculated according to Equation 3.3 and Working Capital

Capacity (WCC) according to Equation 3.4. The necessary information is collected directly from the balance sheet and cash flow statement.

Finally, equity is calculated from the balance sheet as the difference between the net total of assets and net total of debt, which allows for the calculation of the debt-to-equity ratio, the financial indicator.

To conclude with the dataset completion, after considering the analysis ratios, it is possible to construct the dataset represented in Figure 4.2, Annex E, which will be used for the significance tests in R.

4.4. Data analysis method

The research hypotheses will be tested using multiple regression models. These models allow to understand how several independent variables influence the dependent variable. This method is particularly useful to isolate the impact of each factor on companies' financial performance. Multiple regression was performed using the RStudio software, with a confidence interval of 95% or a confidence coefficient of 0.05.

Consequently, detailed steps and tests are conducted to ensure the robustness and validity of each model. For each test, the relevant aspects of the results obtained are explained. After describing and interpreting the test results for each model, a conclusion was drawn on whether the research hypotheses (H1, H2, and H3) were supported by the results. In addition, the implications of the tests and any necessary adjustments to improve the models were discussed.

4.4.1. Steps for Analyzing Model Significance

In the first step, each model was tested using the F-test, which assessed the overall significance. If the F-tests are significant, the p-value will be less than 0.05, allowing to reject the null hypothesis and conclude that the model is significant overall. In other words, at least one of the independent variables is significant relative to dependent variable. This also provides critical information for analyzing the sample and explanatory quality of each model. During the F-test, the Multiple R-squared values were obtained. This statistic indicates the proportion of variance in the dependent variable explained by the independent variables in the model. It measures the goodness-of-fit of the model and explains how well the independent variables explain the variation in the dependent variable.

In the second step, an Individual Significance Test (t-test), following the same logic as the F-test, was conducted. It determines the values of and the nature of the individual relationships between the independent and dependent variables, through the calculation of estimates. In other words, the estimate of the dependent variable, also called the intercept, captures the value of the dependent variable when all independent variables are equal to zero. The estimate of an independent variable represents the variation in the dependent variable when the independent variable increases by 1. Moreover, the p-values and t-values of the independent variables were calculated from the estimate. Therefore, when the test captures a high t-value, ideally above 2, the smaller the p-value, ideally below 0.05, which confirms the significance of the relationship captured by the estimate by adhering to the confidence interval, leading to the rejection of the null hypothesis.

In the third step, the Ramsey RESET Test was used to verify whether the linearity of the model is respected within the error interval of 0,05, and thus confirm whether the p-values obtained in the t-test and F-test are consistent.

4.4.2. Steps for Analyzing Residuals

In the fourth step, it is possible to refer to the analysis of residuals and their dispersion within the sample. When running the F-test and t-test, it was possible to observe the minimum, maximum, median, first quantile, and third quantile values. The residual standard error (RSE) was obtained by considering the Residual Sum of Squares (RSS) method, indicating the dispersion of the residuals within the sample. Its value should be consistent with that of the dataset, and it is important for this number to be as low as possible. A high RSE result indicates the presence of data that may affect the results of the model.

In the fifth step, the Normality Test of Residuals (Shapiro-Wilk Test) was used to check the normality of the data sample. This assumption is crucial because it ensures the validity of the statistical tests and the confidence intervals used to interpret the model's results. If $p > 0.05$, the null hypothesis is not rejected, and it is concluded that the residuals are normally distributed.

In the sixth step, the Homoscedasticity Test (Breusch-Pagan Test) allowed to verify the correct interpretation of the previous statistical models, such as the significance tests of the regression coefficients. If the test result shows $p > 0.05$, then the null hypothesis is not rejected. It is then concluded that the residuals are homoscedastic, meaning that they have constant variance, regardless of the values taken by the independent variables.

In the seventh step, the Durbin-Watson Test was used to check for the correct interpretation of the previous statistical models, such as the significance tests of the regression coefficients. If $p > 0.05$, the null hypothesis is not rejected, and it is concluded that there is no autocorrelation among the residuals. This means that the prediction errors are not correlated within the models, which is crucial because autocorrelation of the residuals can bias coefficient estimates and lead to errors in statistical inference tests. If autocorrelation is found, it is logical to consider identifying the data that have this effect on the model using a lag analysis plot to correct the model.

4.4.3. Step for Analyzing Model Quality

In the eighth step, evaluating multicollinearity using the Variance Inflation Factor (VIF) allows the verification of the correct interpretation of the previous statistical models, such as the significance tests of the regression coefficients. If all VIFs are below a critical threshold (e.g., $VIF < 10$), this indicates low multicollinearity. Consequently, the independent variables distinctly explained the variance of the dependent variable, facilitating a reliable interpretation of the statistical results. On the other hand, high VIFs indicate strong multicollinearity, which can bias coefficient estimates and affect the validity of the statistical inference tests.

4.4.4. Step for Analyzing Scatter Plots

Simultaneously with steps 3, 5, and 6, these tests were accompanied by four visual graphical representations such as the Residuals vs. Fitted Plot, the Scale-Location Plot, the Normal Q-Q Plot, and the Residuals vs. Leverage Plot. Each of these allowed to draw the same conclusions as the error diagnostics tests and additionally helped to precisely detect values that could negatively influence the model, such as outliers, trends showing non-linearity, or heteroscedasticity.

4.5. Justification of Methods

Multiple regression was chosen because it allowed for the control of confounding variables. By including several independent variables, multiple regression helped to control for the influence of each factor on financial performance. Additionally, it was possible to identify complex relationships between different financial variables and company performance. Finally, it

enabled the estimation of the coefficients for each model (β1, β2, β3), which indicates the strength and direction of the relationships between the independent and dependent variables.

The selected companies were leaders in the food industry, ensuring that the results were applicable to a significant portion of the market. This also ensured the relevance of the financial data used, which are verifiable and reliable, and extracted from public and recognized sources.

4.6. Limitations of the Methodology

The main limitations of this study can be observed in the sample selection. Indeed, a four-year average period may not capture all past and future long-term trends in this industry. Additionally, as it is limited to companies listed on the S&P 500, the results may not be generalizable to smaller companies or other regions.

Furthermore, regarding the sample, some companies have a more significant weight in market capitalization (Appendix 4, Table 4.1), making it crucial to emphasize the analysis and removal of outliers in the database in Chapter 5.

As for the data analysis methods, most are presented in the form of ratios, whereas the dependent variable is expressed in dollars. This presented challenges because, as mentioned, variances may manifest more significantly. Therefore, it was necessary to adjust and transform certain models to stabilize the variance, linearize relationships, or for reasons of interpretability.

4.7. Conclusion

This chapter outlines the research methodology used to test the hypotheses. By combining a representative sample, robust financial data, and rigorous statistical analysis methods, this study provides valuable insights into the financial performance of agro-industrial companies through the relationship between Self-financing capacity and capital structure. Thus, the next section reveals the application of this methodology, by testing the models to answer the research questions and validate or refute the formulated hypotheses.

Chapter 5

Obtained results, findings and discussion

5.1. Model 1: The impact of Self-Financing Capacity on average Market Capitalization

5.1.1. Presentation & Interpretation of Model 1 results

First, it is crucial to present Model 1 such that:

$$\text{Model\_H1} <\text{- lm (Avg\_MarketCap} \sim \text{Avg\_SFC, data = data)} \quad (5.1)$$

Once the model is created, the relationship between average market capitalization (Avg_MarketCap) and the single predictor, average Self-financing capacity (Avg_SFC), can be examined.

Table 5.1: Model 1 – Summary of T-test and F-test

Model_H1				
Coefficients				
Variables	**Estimate**	**Standard Error**	**t value**	**Pr(>|t|)**
Intercept	-1.317e+07	5.203e+06	-2.531	0.0194 *
Avg_SFC	2.056e+01	1.270e+00	16.191	2.44e-13 ***
Residuals				
Min	**1Q**	**Median**	**3Q**	**Max**
-34803682	-9953278	3289113	11715527	35817001
Model significance test				
Residual standard error: 18380000 on 21 degrees of freedom				
Multiple R-squared: 0.9258, **Adjusted R-squared:** 0.9223				
F-statistic: 262.2 on 1 and 21 DF, **p-value:** 2.443e-13				

5.1.1.1. Coefficients analysis

The intercept represents the value of Avg_MarketCap when Avg_SFC is zero. In this test, the intercept value is statistically significant at the 5% level ($p > 0.05$). The practical interpretation of the intercept estimate indicates that when Avg_SFC is equal to zero, the value of market capitalization can be negative. This assumption of a negative value for market capitalization

seems disconnected from reality but appears to reflect the significant positive relationship between the predictor and dependent variables.

Indeed, the independent variable shows a very high level of significance, with a high t-value of 16.191 and a very low p-value of 2.44e-13 (p-value < 0.001), indicating a strong relationship between Avg_SFC and Avg_MarketCap. Furthermore, the estimate of the independent variable confirms the relationship between the two variables, showing that each additional unit of Avg_SFC is associated with an average increase of 20.56 units of Avg_MarketCap.

5.1.1.2. Model Significance Tests

In the overall significance analysis of Model 1, the p-value of the F-statistic, or null hypothesis test, is 2.443e-13. Consequently, this indicator indicates that the null hypothesis H0 is rejected. Thus, H1 is confirmed, indicating its viability through the strong significance level obtained.

Moreover, the Multiple R-squared indicator is 0.9258, indicating that 92.58% of the variance in Avg_MarketCap is explained by Avg_SFC. This is a very high indicator of the fit of the model. Additionally, the adjusted R-squared value is 0.9223, which adjusts the R-squared value for the number of predictors in the model. As it is very close to the Multiple R-squared value, this confirms the quality of the fit.

The coefficient for Avg_SFC is highly significant, indicating a strong positive relationship with Avg_MarketCap. However, the relationship captured by the intercept estimate suggests that there could be a problem with this model. It is possible that the dataset presents trends in its residuals, which could lead to poor estimation of the intercept.

5.1.1.3. Residual Diagnostic Tests

The residuals show a very large range of values, from -34,803,682 to 35,817,001. This large dispersion may indicate heteroscedasticity. The variation suggests that the variance of the errors is not constant across observations.

The gap between the 1st quartile (-9,953,278) and the median (3,289,113), as well as between the median and the 3rd quartile (11,715,527), may also indicate an asymmetric distribution of the residuals.

Additionally, a residual standard error of 18,380,000 combined with a large range of residuals suggests that the model's predictions are highly dispersed around the observed values.

The minimum and maximum residual values are very high, which may indicate the presence of outliers. This could be an additional indicator of heteroscedasticity or another issue with the model specification.

Consequently, after observing the presence of non-constancy in the residuals, this problem could affect the linearity of the model, which would explain and confirm the previous hypothesis concerning the erroneous or poorly captured relationship of the intercept's estimate.

Given the various assumptions made regarding the model's true significance, it is appropriate to conduct further diagnostics. Each diagnosis is supported by a visual representation, such as a scatter plot, to confirm, refine, or affirm the results obtained.

Table 5.2: Model 1 – Residual Diagnostic Tests

Model_H1			
Diagnostic test			
Name of test	**Result**	**P-value**	**Interpretation**
Breusch-Pagan test	BP = 4.3172, df = 1	0.03773	Strict heteroscedasticity
Durbin-Watson test	DW = 2.1529	0.57	No autocorrelation
Shapiro-Wilk normality test	W = 0.94798	0.2656	Residuals normally distributed
Ramsey RESET test	RESET = 8.7011, df1 = 2, df2 = 19,	0.002077	Confirms non-linearity of the model

The analysis begins by conducting the Breusch-Pagan test to check for heteroscedasticity in the model. The application of a p-value of 0.03773, where $p < 0.05$, therefore, means that one fails to reject H0 of the Breusch-Pagan test. This implies that the residual variance is not constant; thus, it is heteroscedastic. Heteroscedasticity within the model, and hence the significance reported earlier, would be biased. This observation is also supported by a graphical analysis of the "Residuals vs. Fitted" plot. There is some curvature and flaring in the residuals, which confirms the results of the Breusch-Pagan test and indicates heteroscedasticity (Refer to Annex F, Figure 5.1).

The same scatter plot also presents a curvature, which suggests non-linearity in the model. This is further evidenced by the Ramsey RESET test, which indicates significant non-linearity in the model, as suggested by the p-value of 0.002077. Based on these facts, it can be said that the linearity of the model is likely to be affected by heteroscedasticity. These two points suggest that the model may be better off with transformation.

To complete the analysis, the "Normal Q-Q" plot indicates that the residuals are generally normally distributed, also favoring the Shapiro-Wilk test. However, it is observed that the tails of the residuals widely deviate from normality on both sides, showing obvious deviations from the diagonal line. This further supports the presence of outliers, which may have an undue influence on the model and diagnostics as a whole (Refer to Annex F, Figure 5.1).

Also, the "Residuals vs. Leverage" plot depicts the influential points in the data. These points strongly influence the shape of the red line segment. For example, Point 2 is off the Cook's distance or confidence interval of 1, highly influencing and thus distorting the model to change its course to stretch beyond the confidence interval set by Cook's distance (Refer to Annex F, Figure 5.1).

Finally, the Durbin-Watson test suggests no autocorrelation, and the plots do not indicate any other autocorrelation sequential patterns in the residuals.

5.1.1.4. Suggested Adjustments

To address these significant issues of heteroscedasticity and the effect of outliers, a logarithmic transformation of the model should be performed, better known as a log-log transformation, which involves taking the logarithms of the dependent and independent variables. These actions are expected to reduce and correct the problems encountered, which include non-linearity due to the non-uniform distribution of residuals and errors in the general significance of the F-test along with diagnostic tests.

5.1.2. Presentation & Interpretation of the Log-Log transformed Model 1 results

Considering the recommended fit, the following equation is used to present the model in R:

$$\text{Model\_H1\_log-log <- lm(log(Avg\_MarketCap) ~ log(Avg\_SFC), data = data)} \quad (5.2)$$

While the model is always additive in the log-transformed space, it implies a multiplicative relationship. By exponentiating both sides, the log-log model can be interpreted as follows:

$$\text{Avg\_MarketCap} = e^{\beta 0} \times (\text{Avg\_SFC})^{\beta 1} \times e^{\epsilon} \quad (5.3)$$

Table 5.3: Log-Log Transformed Model 1 – Summary of T-test and F-test

Log-log transformed_Model_H1				
Coefficients				
Variables	**Estimate**	**Standard Error**	**t value**	**Pr(>|t|)**
Intercept	2.4493	1.5187	1.613	0.122
Avg_SFC	1.0084	0.1053	9.575	4.13e-09 ***
Residuals				
Min	**1Q**	**Median**	**3Q**	**Max**
-0.93083	-0.31539	-0.00475	0.38539	0.85557
Model significance test				
Residual standard error: 0.4782 on 21 degrees of freedom				
Multiple R-squared: 0.8136, **Adjusted R-squared:** 0.8047				
F-statistic: 91.67 on 1 and 21 DF, **p-value:** 4.126e-09				

5.1.2.1. Coefficients analysis

Initially, it is observed that the intercept has become non-significant at the 95% confidence interval, which is notably due to a decrease in its standard error. The intercept in a log-log model represents the log of the value of the dependent variable when all explanatory variables are at their minimum (logarithmic) value. This transformation can make the intercept less statistically significant, because the significance of the coefficient of the explanatory variable becomes considerably more crucial in the transformed models. Thus, it can be concluded that the non-significance of the intercept in the t-test is negligible if the t-test results for the predictor variable and the overall significance of the model with the F-test are significant, and if the diagnostic tests show a robust analysis of the relationship between the dependent and independent variables.

Moreover, although non-significant, the intercept estimate becomes positive, revealing a more concrete capture of the relationship with economic reality. Indeed, in the untransformed model, the negative estimate suggested that if Avg_SFC was zero, Avg_MarketCap would be significantly negative. However, in the real-world context, negative market capitalization is incoherent. Even in cases of financial distress, indicated by a negative or zero SFC, the company would be in a situation of bankruptcy, liquidation, and dissolution of its capital but never negative. This version of the transformed model already provides a more accurate representation.

Regarding the predictor variable, it remains significant with a t-value of 9.575 and a highly significant p-value of 4.13e-09. However, similar to the intercept, the logarithmic transformation reduces the standard error, which in turn reduces the t-value. This does not

necessarily indicate a decrease in significance but rather a more precise re-evaluation of the relative importance of the variables.

The positive relationship between market capitalization and Self-financing capacity is also confirmed by the estimate of Avg_SFC. With the log-log transformed version of the model, the interpretation becomes more economically meaningful because it considers the elasticity between the variables. Looking at the Avg_SFC estimate, an elasticity of 1.0084% is observed. In other words, if Avg_SFC increases by 1%, Avg_MarketCap also increases by 1%. In conclusion, this independent variable is supposed to show a positive relationship and indicates that a significant 1% decrease in market capitalization is due to a 1% decrease in Self-financing capacity.

5.1.2.2. Model Significance Tests

As anticipated, the overall significance of the Log-Log model 1 test shows a lower F-statistic, decreasing from 262.2 to 91.67, following this adjustment. This results in a slightly higher but still highly significant p-value of 4.126e-09.

The R-squared value of 81.36% and adjusted R-squared value of 0.8047 also decreases because the log-log transformation changes the nature of this variance by transforming the values into logarithms. This reduces the effect of extreme values and normalizes the distributions, potentially leading to an apparent decrease in R-squared, indicating a more realistic and robust representation of the relationship between the variables.

This allows to confirm H1, that Self-financing capacity plays a significant role in explaining the value of the company and rejecting H0. Thus, it is wise to consider Self-financing capacity as a valuable indicator in the study of a company's performance.

5.1.2.3. Residual Diagnostic Tests

The residuals have a relatively narrow range (-0.93083 to 0.85557), proving that the log-log transformation stabilizes the extreme values. The quartiles show a relatively symmetrical distribution of residuals around the median, close to zero. The residual standard deviation is 0.4782, which is relatively low, indicating that the residuals are close to the values adjusted by the model. This suggests that the transformation has had a positive impact on the distribution of residuals and does not raise major issues in the model.

However, to conduct a thorough analysis of the residuals, it is necessary to perform other residual analysis tests and obtain a real view of the residual plots of the transformed model to confirm the hypothesis of the significance of the transformed model.

Table 5.4: Log-Log transformed Model 1– Residual Diagnostic Tests

Log-log transformed_Model_H1			
Diagnostic tests			
Name of test	**Result**	**P-value**	**Interpretation**
Durbin-Watson test	DW = 2.6468	0.8819	No autocorrelation
Breusch-Pagan test	BP = 0.43084, df = 1	0.5116	No heteroscedasticity
Shapiro-Wilk normality test	W = 0.94148	0.3675	Residuals normally distributed
Ramsey RESET Test	RESET = 2.414, df1 = 2, df2 = 19,	0.1164	Confirms linearity of the model

To echo the results of the Shapiro-Wilk normality test, which confirms a normal distribution of the residuals, the “Normal Q-Q” plot is also presented. The points or residuals, all lie approximately on the reference line, indicating a normal distribution (Refer to Annex G, Figure 5.2).

With the “Scale-Location” plot, it is possible to check the homoscedasticity, or constant variance, of the residuals. The points are randomly scattered without a clear pattern, aligning with our Breusch-Pagan result, which indicates that there is no heteroscedasticity in the model (Refer to Annex G, Figure 5.2).

Additionally, the “Residuals vs Fitted” plot confirmed the same findings, showing that the model no longer follows a flared shape but instead a linear and consistent form. This further confirms the results obtained from the Breusch-Pagan test and Ramsey RESET test (Refer to Annex G, Figure 5.2).

Furthermore, the “Residuals vs. Leverage” plot shows that there are no longer any significant influential points in the dataset. The remaining influential points are no longer extreme and are all normally distributed within the 95% confidence interval, and consequently, all are below Cook's distance. Therefore, it is considered that outliers no longer significantly influence the log-log transformed model 1 (Refer to Annex G, Figure 5.2).

Finally, the Durbin-Watson test indicates no autocorrelation, and the plots show no sequential patterns in the residuals that would suggest any form of autocorrelation.

In conclusion, given that all the tests have shown significance and that the residual diagnostics are non-problematic such that the key assumptions of linear regression are not

violated, *the non-significant estimate can be considered negligible*. It can be affirmed that the model provides a robust explanation of the relationships between the present variables.

5.1.3. Discussion of the Theoretical Implications of Model 1 Results

The strong positive relationship between SFC and market capitalization clearly highlights the motivation behind the Pecking Order Theory (Myers & Majluf, 1984), which states that firms should prefer using internal funds before seeking external financing. Firms with higher Self-financing capacities are more highly valued, suggesting a reliance on internal funding.

Nevertheless, it is also possible to confirm what Radu and Bordeianu (2017) mentioned that the size of the Self-financing capacity plays a role in a firm's performance or market capitalization. This is justifiable in the observations and reasons for adjusting the analysis, as outliers influenced the results. Thus, after this adjustment, the authors' statements were confirmed, indicating that it informs the company's capital owners of the potential capacity to use "entrusted capital effectively", and therefore indirectly reflects the quality of the company.

Building of this, Nguyen et al. (2020) assert that firm quality and asset tangibility have a significantly positive relationship with market value. The view supported by this model can be closely associated with Model 1, as Self-financing capacity includes net income, depreciation and amortization, and asset impairment, which provides a clear picture of the asset structure. Similarly, this finding highlights the work of Feidakis and Rovolis (2007), Aggarwal and Padhan (2017), and Batten and Vo (2018), who argue that firm value or market capitalization are positively impacted by the proportion of fixed assets. *In other words, the quality and tangibility of a company's asset management are directly visible as they increase the value of the SFC and as the results prove, the value of a company.*

Therefore, this shows the rationality between the theoretical and empirical research and the significance of the Model 1 results, indicating that H1 holds, and that Self-financing capacity is an important determinant of firm performance.

5.2. Model 2: Exploring Market Capitalization: The Impact of Debt-to-SFC Ratio and Working Capital Capacity

5.2.1. Presentation & Interpretation of Model 2 Results

Following the adjustment made before, it is considered more appropriate to continue the analysis of Model 2 in the same log-log transformed form, which allows a better interpretation and comparison of the results. The dependent variable is expressed in monetary terms, and the independent variables are expressed as ratios as follows:

```
Model_H2 <- lm(log(Avg_MarketCap) ~ log(Avg_LC) + log(Avg_WCC + 3), data = data)
```
(5.4)

It is important to note that a constant of three was added to the variable log(Avg_WCC+3) to ensure that only positive values are used. (Refer to Annex H, Table 5.5). The results of the adjusted data are presented in table 5.6 below.

Table 5.6: Model 2, Summary T-test and F-test

Model_H2				
Coefficients				
Variables	**Estimate**	**Standard Error**	**t value**	**Pr(>|t|)**
Intercept	17.5143	1.1507	15.220	1.84e-12 ***
log(Avg_LC)	-1.1421	0.5427	-2.104	0.0482 *
log(Avg_WCC + 3)	1.0361	0.9455	1.096	0.2861
Residuals				
Min	**1Q**	**Median**	**3Q**	**Max**
-1.6307	-0.4928	-0.2028	0.3799	2.1903
Model significance test				
Residual standard error: 1.015 on 20 degrees of freedom				
Multiple R-squared: 0.2002, **Adjusted R-squared:** 0.1202				
F-statistic: 2.504 on 2 and 20 DF, **p-value:** 0.1071				

5.2.1.1. Model Significance Test

It can be immediately observed that the significance indicators are above the confidence interval. However, it is evident that there is some significance in coefficients β0 and β1. Additionally, the low value R-squared value suggests that there may be a malfunction or issue within the model.

5.2.1.2. Residual Diagnostic Tests

Table 5.7: Model 2 – Residual Diagnostic Tests

Model_H2			
Diagnostic test			
Name of test	**Result**	**P-value**	**Interpretation**
Durbin-Watson test	DW = 0.5983	1.717e-05	Autocorrelation
Breusch-Pagan test	BP = 0.61901, df = 2,	0.7338	No heteroscedasticity
Shapiro-Wilk normality test	W = 0.93743	0.1583	Residuals normally distributed
Ramsey Reset test	RESET = 0.90069, df1 = 2, df2 = 18	0.4238	Linearity

These tests allow for a comparison of the results with the scatter plots. Notably, on the "Residuals vs Leverage Plot," which presents Cook's Distance plot, point 14 can be easily distinguished, showing a disproportionate influence on the model that could explain its impact on the model's significance. Therefore, it is advisable to remove this point from the dataset. Upon removal, it becomes clear that this was the most negative value of the variable log(Avg_WCC + 3), which necessitated the addition of a high constant (+3) (Refer to Annex I, Figure 5.3).

Similarly, the diagnostic results are evident: the issue of significance is also due to autocorrelation, with a result from the Durbin-Watson test of 0.5983 (DW is far from 2) and a p-value of 1.717e-05, which could explain the very low R-squared value. As shown in Figure 5.4, in Annex J, autocorrelation is present at lag 1. However, because this is not a time series, autocorrelation must be analyzed with caution. Thus, the focus is placed on the intercept coefficient results, which show abnormally high significance compared to those of the model, obtained through the F-test. A very high coefficient indicates that the intercept is significantly positive.

This brings the focus to the context of the data structure and the nature of the data being analyzed, as market capitalization, as the name implies, derives its value from past value. However, the present model does not capture this serial variance, because the average is represented by a single data point. Thus, it can be concluded that the present autocorrelation does not fully capture the model and requires an adjustment of the explanatory variables to account for movements in log(Avg_MarketCap).

5.2.1.3. Model Adjustment

Data point 14 will be removed from the dataset for the continuation of this models' examination to observe a sample without influential points. Therefore, influential points will be systematically considered in the subsequent analyses. Additionally, with its removal, the constant added to the independent variable log(Avg_WCC + 1) will now be +1. The adjustments discussed are presented in Table 5.8, as referenced in Annex K.

The autocorrelation issue will be addressed by adding a lag() function to the model to improve its explanatory power. Thus, adding a lag of the dependent variable should complete the model (increasing R-squared) and reduce autocorrelation in the residuals, thereby meeting the assumption of independence among the residuals. This assumption is crucial for reliable hypothesis testing using the model.

5.2.2. Presentation & Interpretation of the Adjusted Model 2 Results for Autocorrelation

Given the adjustments made to the model, the formulation is as follows:

$$\text{lm (formula = log(Avg\_MarketCap) ~ log(Avg\_LC) + log(Avg\_WCC + 1) + lag(log(Avg\_MarketCap)), data = data)} \quad (5.5)$$

Table 5.9: Model 2 – Adjusted for Autocorrelation, Summary of T-test and F-test

Model_H2_Adjustment_1				
Coefficients				
Variables	**Estimate**	**Standard Error**	**t value**	**Pr(>|t|)**
(Intercept)	7.0818	2.7020	2.621	0.017886 *
log (Avg_LC)	-0.7123	0.3540	-2.012	0.060335.
log (Avg_WCC +1)	2.8741	1.5176	1.894	0.075385.
Lag (log (Avg_MarketCap))	0.6485	0.1454	4.461	0.000343 ***
Residuals				
Min	**1Q**	**Median**	**3Q**	**Max**
-1.20736	-0.38817	0.03801	0.45529	0.97911
Model significance test				
Residual standard error: 0.6213 on 17 degrees of freedom				
Multiple R-squared: 0.6716, **Adjusted R-squared:** 0.6137				
F-statistic: 11.59 on 3 and 17 DF, **p-value:** 0.0002233				

5.2.2.1. Coefficients analysis

To begin, it is observed that the coefficients β0 and β3 are significant, whereas β1 and β2 are marginally significant. This indicates that the removal of the influential point and reduction of the constant contributes to improving the explanatory power of the independent variable log (Avg_WCC + 1), as its p-value decreases from 0.2861 to 0.075385.

It can also be seen that the lag (log (Avg_MarketCap)) is highly significant, confirming the previous diagnostics that the value from the lag captures unexplained historical data on the companies' market capitalization.

Although the coefficients for log (Avg_LC) and log (Avg_WCC +1) are only acceptable at the 10% error confidence interval, more information is needed to determine whether this marginal significance can be considered acceptable.

5.2.2.2. Model Significance Tests

The p-value of the F-statistic significantly decreases, indicating that the two adjustments improve the model's significance and explanatory power, as evidenced by the increase in R-squared from 20.02% to 67.16% and a decrease in the p-value from 0.1071 to 0.0002233. However, it is not possible at this stage to affirm that H0 is rejected, as residual diagnostics are yet conducted.

5.2.2.3. Residual Diagnostic Tests

Table 5.10: Model 2 – Adjusted for Autocorrelation, Residual Diagnostic tests

Model_H2_Adjustment_1			
Diagnostic test			
Name of test	**Result**	**P-value**	**Interpretation**
Durbin-Watson test	DW = 2.3371	0.7281	No autocorrelation
Breusch-Pagan test	BP = 5.6066, df = 3	0.1324	No heteroscedasticity
Ramsey Reset test	RESET = 2.8568, df1 = 2, df2 = 15	0.08887	Linearity
Shapiro-Wilk normality test	W = 0.96162	0.5494	Residuals normally distributed

The Durbin-Watson test fails to reject the null hypothesis (p-value > 0.05), suggesting that there is no autocorrelation in the model. This can also be confirmed by the ACF plot, where the segment for lag 1 no longer exceeds the blue dashed confidence interval line (Refer to Annex L, Figure 5.5).

The Ramsey RESET test indicates a relatively low p-value of 0.08887, signifying the potential presence of non-linearity in the model. On the figure 5.5, referred in Annex L, it is visible in the “Residuals vs Fitted” plot, which shows an apparent flared shape. These curves appear to be influenced by points 12, 14, and 19, which are identified as influential. This p-value is very important, as it nuances the acceptance of marginally significant coefficients. Indeed, at an acceptable 10% error threshold, the coefficients are considered significant, but at the same threshold, the model becomes theoretically non-linear (Refer to Annex M, Figure 5.6).

Therefore, it can be considered that the significance of the model, as proven by the F-test, is biased and thus not acceptable at the 10% level, and at the 5% level, the explanatory variables of the model are not significant in a potentially non-linear model.

Although the Shapiro-Wilk test on the normal distribution of residuals is significant, the Normal Q-Q plot shows the presence of points at the extremes of the curve. These points are the same as those already identified in the “Residuals vs Fitted” plot, suggesting that they may be causing the misalignment of the model's linearity and the explanatory variables (Refer to Annex M, Figure 5.6).

5.2.3. Presentation & Interpretation of Adjusted Model 2 Results Due to Non-Linearity

The adjustment consists of removing influential points that may have induced this non-linearity. During this process, two phases of adjustment will be observed because, after removing the influential points, other influential points appeared on different plots, showing signs of non-linearity in the model coupled with a decrease in the significance of the independent variable Avg_WCC + 1.

5.2.3.1. First Adjustment

Following the analysis that identified influential points contributing to the non-linearity of Model 2, points 12, 14, and 19, which were considered influential, were removed (Refer to Annex N, Table 5.11).

Table 5.12: Model 2 – Adjusted for Non-Linearity, Summary of T-test and F-test

Model_H2_Adjustment_2				
Coefficients				
Variables	**Estimate**	**Standard Error**	**t value**	**Pr(>|t|)**
(Intercept)	6.0208	2.7044	2.226	0.042927 *
log(Avg_LC)	-0.6814	0.3268	-2.085	0.055847 .
log(Avg_WCC + 1)	2.4639	1.9064	1.292	0.217129
lag(log(Avg_MarketCap))	0.7054	0.1426	4.947	0.000215 ***
Residuals				
Min	**1Q**	**Median**	**3Q**	**Max**
-0.87745	-0.35950	-0.03027	0.38317	0.81579
Model significance test				
Residual standard error: 0.5295 on 14 degrees of freedom				
Multiple R-squared: 0.7771, **Adjusted R-squared:** 0.7294				
F-statistic: 16.27 on 3 and 14 DF, **p-value:** 7.702e-05				

Table 5.13: Model 2 – Adjusted for Non-Linearity, Residual Diagnostic Tests

Model_H2_Adjustment_2			
Diagnostic test			
Name of test	**Result**	**P-value**	**Interpretation**
Durbin-Watson test	DW = 2.3699	0.6676	No autocorrelation
Breusch-Pagan test	BP = 1.1647, df = 3	0.7615	No heteroscedasticity
Ramsey Reset test	RESET = 2.8568, df1 = 2, df2 = 15	0.0622	Linearity
Shapiro-Wilk normality test	W = 0.96015	0.6045	Residuals normally distributed

As observed above, the results still show marginal significance for the independent variable Avg_LC, but the result of the RESET test at 0.06221 does not allow to validate this significance at the 10% error interval. However, the graphs presented in Figure 5.7, as referenced in Annex O, indicate that points 12, 16, and 17 have become influential, which suggests that they play a role in this non-linearity. Indeed, the vertically oriented curve observed in the “Residuals vs. Fitted” plot indicates the significant nonlinear influence of these points, reinforcing the idea of excluding them from the dataset. A trend in the distribution of residuals in this plot suggests that this is indeed the case (Refer to Annex O, Figure 5.7).

5.2.3.2. Second Adjustment

Following the analysis that identified influential points contributing to the non-linearity of Model 2, points 12, 16, and 17, which were considered influential, were removed (Refer to Annex P, Table 5.14).

Table 5.15: Model 2 – Adjustment 2 for non-linearity, Summary T-test and F-test

Model_H2_Adjustment_3				
Coefficients				
Variables	**Estimate**	**Standard Error**	**t value**	**Pr(>|t|)**
(Intercept)	4.93111	1.82847	2.697	0.0208 *
log(Avg_LC)	-0.66294	0.23094	-2.871	0.0152 *
log(Avg_WCC + 1)	4.11539	1.39433	2.952	0.0132 *
lag(log(Avg_MarketCap))	0.77115	0.09673	7.972	6.75e-06 ***
Residuals				
Min	**1Q**	**Median**	**3Q**	**Max**
-0.41279	-0.22991	-0.06961	0.20122	0.56092
Model significance test				
Residual standard error: 0.353 on 11 degrees of freedom				
Multiple R-squared: 0.9172, **Adjusted R-squared:** 0.8946				
F-statistic: 40.61 on 3 and 11 DF, **p-value:** 3.049e-06				

Table 5.16: Model 2 – Adjustment 2 for non-linearity, Residual Diagnostic Tests

Model_H2_Adjustment_3			
Diagnostic test			
Name of test	**Result**	**P-value**	**Interpretation**
Durbin-Watson test	DW = 2.1309	0.3742	No autocorrelation
Breusch-Pagan test	BP = 4.1417, df = 3	0.2466	No heteroscedasticity
Ramsey Reset test	RESET = 2.2394, df1 = 2, df2 = 9	0.1624	Linearity
Shapiro-Wilk normality test	W = 0.89577	0.08205	Residuals normally distributed
Variance Inflation Factor (VIF)	Log (Avg_LC) = 1.172274 Log (Avg_WCC+1) = 1.040508 lag(log(Avg_MarketCap)) =1.155670		No multicollinearity

5.2.3.3. Residual Diagnostics Tests

In a more logical approach, it is preferable to focus first on diagnostic tests. There is no longer an issue with linearity, and other diagnostic tests also indicate that the results obtained from the F-test can be evaluated with confidence. However, it is important to highlight the results from the Shapiro-Wilk test, which indicate that the residuals are less well distributed. This can be

explained by the reduction in sample size. Nevertheless, although the p-value for this test is not very high (0.08205), it is now necessary to check whether the results from the F-test are significant within the 95% confidence interval, which can allow the determination of the robustness of these diagnostics and the improvements made to the model through adjustments.

Additionally, the trend is no longer visible, and the residuals appear to be randomly distributed in the "Residuals vs. Fitted" plot (Annex Q, Figure 5.8).

5.2.3.4. Model Significance Tests

Initially, it is noted that the adjustments aimed at resolving the non-linearity issue rendered all explanatory variables significant at the 95% threshold. Therefore, it can be concluded that these variables explain the model well, with an R-squared of 91.72%. Indeed, the strong significance of the lag variable previously contributed to strengthening the model by explaining that market capitalization is inevitably influenced by its past value. Nevertheless, the explanatory power of the independent variables gradually increased as adjustments were made, particularly when Avg_LC became significant after the second adjustment, followed by Avg_WCC+1 becoming significant during the final adjustment.

Regarding the analysis of the estimates for these explanatory variables, logical impacts on the relationships can already be considered, which aligns with the conclusions drawn from Model 1. For Avg_LC, a significant negative relationship with Avg_MarketCap is observed, indicating that when SFC decreases or debt increases more rapidly than Self-financing capacity, that is, when this debt coverage ratio or leverage capacity increases by 1%, market capitalization decreases by 0.66294%. As mentioned in Chapter 3 in the theoretical explanation of this model, the higher this ratio, the less capable companies are to meet their debt levels, sending a negative signal to banks and investors, which is explained by the significantly negative relationship presented here.

The estimate for the independent variable Avg_WCC +1 requires a different interpretation owing to the addition of a constant and adjustments for outliers that are primarily related to this variable. Indeed, a 100% increase in this ratio seems disconnected from reality because, in the economic context of leading companies in the food sector, variations in working capital requirements (WCR) are rarely greater than in SFC. Nevertheless, it is interesting to analyze and understand the significant positive relationship in depth. By dissecting the calculation of the WCR equation and the calculation of the Avg_WCC + 1 variable while considering a constant of 1, an increase in WCR either describes an increase in inventory or accounts receivable, indicating a need expressed by a positive change in working capital. This should

explain the increase in market capitalization. Indeed, this increase could be justified by the fact that these elements signify growth; therefore, this ratio serves to express the Self-financing capacity for growth. This also demonstrates that accounts payable to suppliers, which negatively impact WCR, would have a negative relationship with market capitalization. This aligns with the previous point, indicating that debt, whether through borrowing or supplier credit, does not contribute to the improvement of market capitalization when compared to SFC, the internal resources of the company.

5.2.4. Discussion of the Theoretical Implications of Model 2 Results

In a certain sense, the Pecking Order Theory (Myers & Majluf, 1984) is confirmed, suggesting that it is better to rely on SFC, that is, internal financial capacities, rather than systematically resort to debt. However, outliers significantly affected the tests, leading to the conclusion that a certain average balance should be maintained. The remaining database shows Leverage capacity (LC) ratios falling between 3% and 12% and Working Capital Capacity (WCC + 1) ratios ranging from -15% to +12%.

These results indicate that internal and external bank financing levels have a significant pivotal role in market capitalization, providing management with substantial leverage through internal decisions to impact business value. These results further confirm that what is important is that the company's tangibility and profitability, measured by SFC, justify its value growth (Nguyen et al., 2020). A strong external visibility of financial health indicates to investors and bankers that a company has a real adaptive capacity to face situations in which it encounters bank interest rate volatility and relies on its ability to use SFC.

This also confirms the zero-debt policy and the tendency of companies to eliminate debt rather than rely on tax shields. This aligns with the empirical point mentioned in the Trade-Off Theory by Titman and Wessels (1988), Rajan and Zingales (1995), and Fama and French (2002), who state that highly profitable companies, in this case, those with high SFC, tend to borrow less.

As Selmer mentioned, SFC allows for financing WCR, which was captured by the model 2 results. Furthermore, Wagner (2023) stipulated that it is important not to have too much WCR to avoid monopolizing SFC, which was confirmed here by the impact of outliers on the linearity of Model 2 and the relatively harmonious range of -15% to +12%, which aligns well with the constant.

SFC allows for assessment of working capital needs to achieve operational cash flows. Therefore, the SFC provides an understanding of the overall current debt capacity that can be managed and how it impacts a company. This positive result indicates that the higher this ratio, the more a company can afford to finance a large amount of WCR, leading to greater support for growth. This increase in operational performance generates better figures, which, in turn, increase market capitalization as the final cash flows improve.

Thus, H0 can be rejected, and H2 is confirmed, indicating that SFC has a greater impact than debt and that its ability to finance a company's growth contributes to a significant expansion of market capitalization, ultimately reflecting its strength. Finally, the analysis confirms that the initial rationale holds, as SFC indeed plays a critical role in shaping leverage potential and determining the debt requirements needed to maintain the financial performance of agro-industrial businesses.

5.3. Model 3: Evaluating Market Capitalization: The Sequential Impact of capital portfolio

5.3.1. Presentation & Interpretation of Model 3 Results

After concluding that the results presented in Model 2 follow the Pecking Order Theory on hierarchical orders, the analysis continues with Model 3. This model is missioned to confirm the theory and tests whether equity has a significant relationship with the increase in market capitalization in the capital structure. Thus, Model 3 is presented in R as follows:

```
Model_H3 <- lm(formula = log(Avg_MarketCap) ~ log(Avg_LC) + log(Avg_WCC + 1) +
    log(Avg_DE) + lag(log(Avg_MarketCap)), data = data)
```
(5.6)

Table 5.17: Model 3 – Summary of T-test and F-test

Model_H3				
Coefficients				
Variables	**Estimate**	**Standard Error**	**t value**	**Pr(>|t|)**
Intercept	4.6799	1.8812	2.488	0.0321 *
log(Avg_LC)	-0.7295	0.2481	-2.941	0.0148 *
log(Avg_WCC + 1)	3.7683	1.4772	2.551	0.0288 *
log(Avg_DE)	0.1852	0.2255	0.821	0.4306
log(lag(Avg_MarketCap))	0.7948	0.1023	7.768	1.52e-05 ***
Residuals				
Min	**1Q**	**Median**	**3Q**	**Max**
-0.49232	-0.21554	-0.04784	0.18655	0.60280
Model significance test				
Residual standard error: 0.3583 on 10 degrees of freedom				
Multiple R-squared: 0.9224, **Adjusted R-squared:** 0.8914				
F-statistic: 29.73 on 4 and 10 DF, **p-value:** 1.577e-05				

5.3.1.1. Model Significance Tests

When analyzing the results of the F-test, it is observed that Model 3 is significant within the 95% confidence interval, with a p-value of 1.577e-05. Similarly, the value of R-squared also increases, moving from 91.72% to 92.24%. The addition of the variable seems to capture the expression of the dependent variable even more precisely, thereby enhancing the model's representation of the capital structure.

5.3.1.2. Coefficient analysis

Regarding the analysis of independent variables, all variables presented in Model 2 remained significant, and the captured relationships remained relatively stable. However, the addition of the variable Avg_DE showed a non-significant positive relationship, with a p-value of 0.4306 and an estimate of 0.1852.

Although the T-test result shows that the independent variable does not have a strictly confirmable impact, it is still observable that the potentially positive relationship follows the hierarchical order of financing. Indeed, when the debt-to-equity ratio increases, market capitalization may increase. In other words, considering the increase in debt relative to equity, the market value of companies in this industry should increase.

Finally, it is impossible to accept H3, which stipulates that financial performance follows the Pecking Order Theory (POT) as a whole, with a non-significant positive debt-to-equity ratio relationship. Nonetheless, it is appropriate to verify that the non-significance of Avg_DE is not induced by a problem in the residuals of the dataset.

5.3.1.3. Residual Diagnostic Tests

Table 5.18: Model 3 – Residual Diagnostic Tests

Model_H3			
Diagnostic test			
Name of test	**Result**	**P-value**	**Interpretation**
Durbin-Watson test	DW = 2.1834	0.4636	No Autocorrelation
Breusch-Pagan test	BP = 4.5652, df = 4,	0.3349	No heteroscedasticity
Shapiro-Wilk normality test	W = 0.96329	0.7494	Residuals normally distributed
Ramsey Reset test	RESET = 1.522, df1 = 2, df2 = 8,	0.2753	Linearity
Variance Inflation Factor (VIF)	log (Avg_LC) = 1.312491 log (Avg_WCC +1) = 1.133253 log (Avg_DE) = 1.348960 lag(log(Avg_MarketCap)) = 1.254703		No multicollinearity

Considering the above table, it is observed that none of the tests appear to show diagnostic errors. Similarly, when examining the scatter plots presented in Annex R, Figure 5.9, no trend or presence of outliers is considered that could affect the distribution of the multiple regression tests of the coefficients (Refer to Annex R, Figure 5.9).

Following this, it is possible to conclude that Hypothesis H3 does not hold completely and thus fails to reject the null hypothesis H0, as presented in Chapter 3.

5.3.2. Discussion of the theoretical implications of model 3 results

Given the results previously outlined in Model 3, it is more appropriate to draw a general conclusion describing the steps involved in constructing Model 3 to provide an overview of this empirical study. It was crucial to demonstrate that the capital structure of companies could adhere to the Pecking Order Theory (Myers & Majluf, 1984) while acknowledging the fundamental existence of Self-financing capacity. Model H2 concludes that market capitalization or market value is significantly and strongly influenced by the propensity to maximize Self-Financing Capacity (SFC) over all other forms of debt, a conclusion maintained in Model 3.

Although the model captures a non-significant positive relationship that aligns with the general financial theory, it is not possible to statistically confirm that the debt-to-equity ratio and external capital financing play a fundamental role in market value creation. The non-significance of the debt-to-equity ratio, as highlighted by model H3, contrasts with the findings of Shanika Ishari and Madhushanka Abeyrathna (2016), whose Pearson correlation and regression analysis indicated that the debt-to-equity mix significantly impacts financial performance. This divergence between the results underscores the complexity of financial dynamics and suggests that the relationship between leverage and performance may vary across industries, time periods, or sample compositions, requiring further exploration.

This brings back the focus on the Trade-Off Theory (Myers, 1984), which suggests that companies aim for a threshold between debt and equity, balancing the gains and costs of debt. As seen in the studies by Graham and Harvey (2001) and Welch (2004), companies tend to make decisions that do not strictly follow this theoretical model, explaining why this relationship is not significant. Moreover, while SFC and current and fixed debt relative to SFC are significant, debt with equity is not necessarily a driver of market capitalization creation.

Thus, it is paramount to conclude that the research question of this thesis can be positively addressed, confirming that Self-Financing Capacity is a major element of capital structure of an agro-industrial enterprise, as evidenced by its financial performance. This underscores the resolution of this thesis's research question and contributes substantially to understanding the dynamics within the agro-industrial sector's financial strategies.

Chapter 6

Recommendations

6.1. Integration of Theoretical Frameworks

The investigation shows that the Trade-Off Theory and the Pecking Order Theory are not mutually inconsistent. Both theories add to the understanding of capital structure change: The Trade-Off Theory explains how a financially successful firm can increase the level of its debt for tax shields, but the Pecking Order Theory shows that the same firms tend to favor internal financing in order to avoid more debt in a specific order of financing sources.

Notably, these models are robust but suffer from certain limitations; for instance, the Trade-Off Theory fails to explain the negative correlation between profitability and the level of debt. It is at this point that the POT becomes clearer, although it also needs more development to overcome some evidential ambiguities relating to the assumptions of the theory.

6.2. Recommendations Based on Self-Financing Capacity

The crucial role of the SFC in determining the debt ratios found in the capital structures of agro-industrial firms is emphasized. Therefore, it is recommended that these companies recognize and value SFC as a means of determining an optimal level of indebtedness, which is highly correlated with the organization's ability to generate future cash flows. Such capacity not only finances Capex, but also efficiently manages working capital. Consequently, upholding a minimal recovery rate that strengthens leverage negotiations with financial institutions may positively influence interest rates.

6.3. Empirical Observations and Portfolio Construction

Empirical insights suggest that firms frequently finance investment using available resources, as depicted in academic texts, influenced by fluctuating interest rates and market volatility. Decision-making processes are generally adapted based on SFC; firms assess whether utilizing debt is more beneficial than leveraging available cash flow. Furthermore, portfolio construction should consider SFC in relation to debt, highlighting the significance of asset valuations in supporting growth, as evidenced by firms that operate with minimal equity.

6.4. The impact of SFC on Market capitalization and Investor perceptions

SFC significantly impacts the market valuation of a firm as well as its financial performance. Most companies operating in this industry maintain a debt to Self-financing capacity (Leverage Capacity) ratio between 3% and 12%, showing that adherence to this range significantly enhances value over time. A solid SFC indicates to investors that management effectively fosters growth and manages asset quality, which is critical to sustaining competitiveness in the market and ensuring investor confidence.

The models examining SFC demonstrate a strong alignment with the Pecking Order Theory, particularly regarding the significant relationship between self-financing and debt. This suggests that companies should first be financed using both sources, prioritizing internal Self-financing capacity, followed by debt. Given this, optimizing market capitalization for investors should avoid relying on equity, as its relationship with debt has been shown to be unsignificant. Therefore, the Pecking Order Theory is validated in this context, and its principles should be followed in this sector, as the prioritization of internal financing over external debt emerges clearly from the analysis of SFC and debt interactions.

6.5. Limitations and Future Research

Initially, the analysis included all 23 companies within the scope of this study. In Model 1, no companies were removed, and the analysis was conducted on the full sample. However, during the subsequent stages of the study, certain companies were excluded because of influential data points identified in the diagnostic tests. Although these companies were removed from the final models, they were critically considered throughout the analysis. Their influence on the results, particularly through an examination of influential points, contributed to a broader interpretation of the findings. It is important to recognize that these adjustments represent a methodological limitation. Although the initial intent was to include all 23 companies, the removal of certain firms may limit the generalizability of the findings. However, the excluded companies still played a role in shaping the overall conclusions, as their impact was factored into diagnostic tests and subsequent analysis. Therefore, in other words, the final models did not include all 23 companies, but their influence was incorporated into the scope of the research and its conclusions.

In addition, this study has other methodological limitations. For instance, Models 2 and 3 may have exhibited autocorrelation issues because they were not designed as time-series

analyses. Consequently, the results are most applicable to large, publicly traded companies, and may not be generalizable to smaller firms or different market contexts.

Future studies should seek to address these limitations by expanding the models to better account for complexities introduced by the Trade-Off Theory, asymmetric information theories, and external factors such as exchange rates. Doing so would provide a more comprehensive framework to explain capital structure intricacies across various firm sizes, sectors, and economic environments.

6.6. Conclusion

Although Hypothesis 3 (H3) was not supported, its analysis emphasized the crucial importance of SFC in capital structures. This dissertation argues that effective management of SFC, debt, and working capital with respect to SFC is critical for accomplishing financial sustainability and enhancing value creation. Recommendations confirm that companies should manage financial policies with a much-increased awareness of SFC to avoid over-issuance of either debt or equity, which could decrease shareholder wealth. The nuanced management of these factors is paramount for firms to maximize their potential growth and ensure robust financial health.

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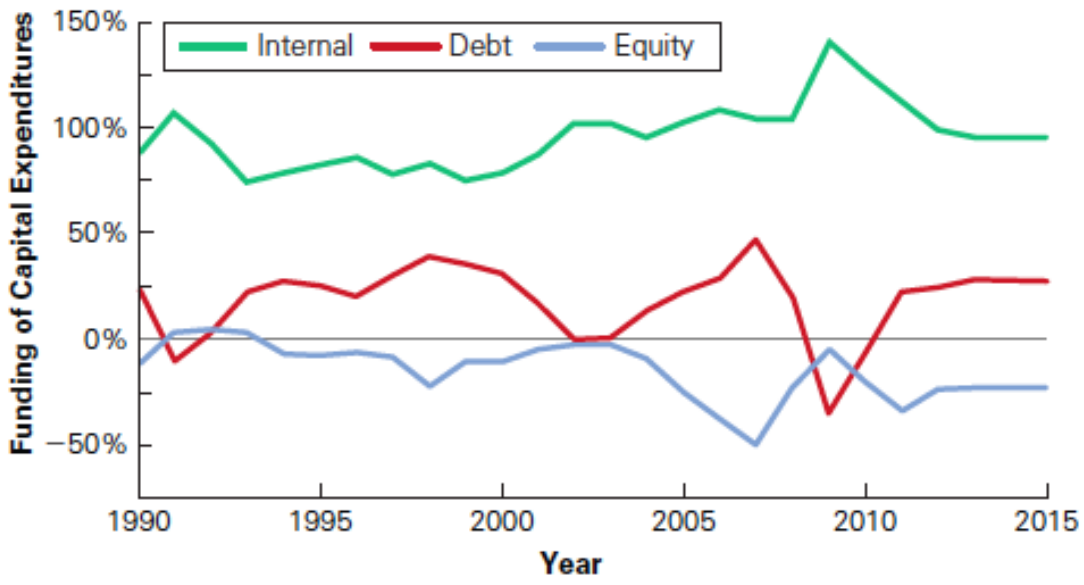
Annexes

Annex A

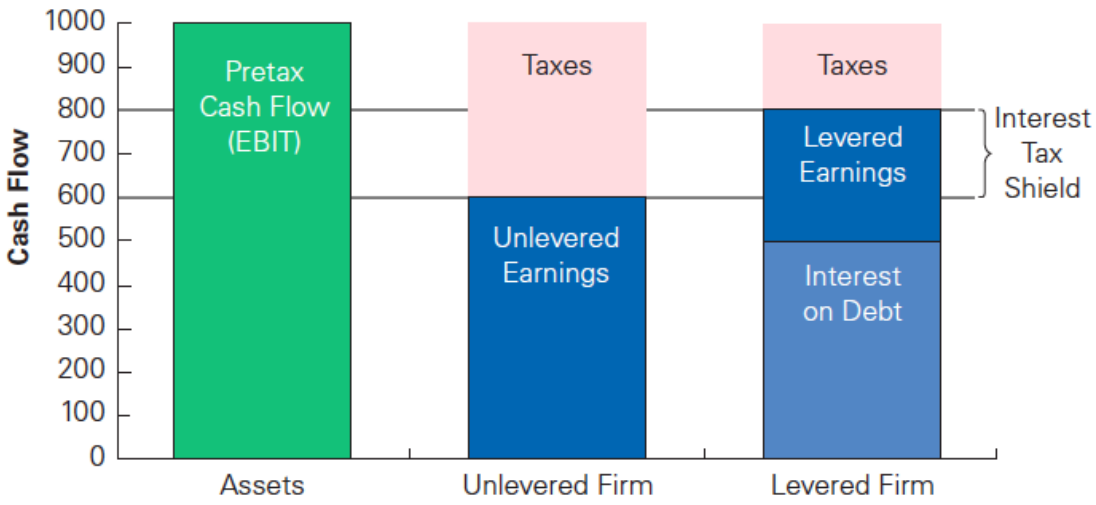
Figure 1.1: Funding of capital expenditures by US corporations



Source: Berk and DeMarzo, 2017.

Annex B

Figure 2.1: The cash flows of the Unlevered and Levered firm



Source: Berk and DeMarzo, 2017.

Annex C

Table 2.1: Determination of Value Adjustments for Fixed Assets, Current Assets and Provisions

Crt. no.	Specification	Symbol
1	Value adjustments on tangible and intangible assets:	*Aji = rd. 2 – 3*
2	- Expenditures (6811 "*Operating Expenses on Depreciation of Fixed Assets*" + item 6813 "Operating Expenses for Impairment Adjustments")	*Chaji*
3	- Revenue (7813 "*Income from impairment adjustments")*	*Vaji*
4	Value adjustments for current assets:	*Ajc = rd. 5 – 6*
5	- Expenditures (654 *"Loss from receivables and miscellaneous debtors"* + 6814 "*Operating expenses related to depreciation of current assets")*	*Chajc*
6	- Revenues (754 "*Revenues from receivables and various debtors*" + item 7814 "*Income from impairment adjustments for circulating assets")*	*Vajc*
7	Adjustments for provisions:	*Ajp = rd. 8 – 9*
8	- Expenditure (6812 "*Operating Expenses on Provisions*")	*Chajp*
9	- Revenue (7812 "Income from provisions")	*Vajp*
10	*Value adjustments for financial assets and investments held as current assets*	*Ajf = rd. 11 – 12*
11	- Expenditure (item 686 *"Financial expenses on depreciation, provisions and adjustments for impairment")*	*Chajf*
12	*- Revenue (786 "Financial Income Adjustments for Impairment")*	*Vajf*
13	*Value adjustments on fixed assets, current assets and provisions on provisions*	*Aj = rd. 1 + 4 + 7 + 10*

Source: Radu and Bordeianu, 2017.

Annex D

Table 4.1: Data collection table

Dataset							
N°	*Companies name*	*TT Equity*	*TT debt*	*TT asset*	*Market Capitalization*	*SFC*	*Change in WCR*
1	**PepsiCo, Inc. (PEP)**	$ 52 093 000	$ 42 401 250	$ 94 494 250	$ 231 877 500	$ 12 074 250	$ -202 500
2	**The Coca-Cola Company (KO)**	$ 51 337 250	$ 41 691 750	$ 93 029 000	$ 255 317 500	$ 11 317 250	$ 141 000
3	**Mondelez International, Inc. (MDLZ)**	$ 48 393 750	$ 20 969 750	$ 69 363 500	$ 91 422 500	$ 4 516 250	$ -458 500
4	**The Kraft Heinz Company (KHC)**	$ 70 963 250	$ 22 555 750	$ 93 519 000	$ 45 380 000	$ 4 540 750	$ -356 250
5	**General Mills, Inc. (GIS)**	$ 18 872 975	$ 12 590 425	$ 31 463 400	$ 40 485 000	$ 2 993 575	$ 20 800
6	**Tyson Foods, Inc. (TSN)**	$ 26 330 750	$ 9 628 500	$ 35 959 250	$ 24 125 000	$ 3 273 000	$ -239 000
7	**Conagra Brands, Inc. (CAG)**	$ 12 809 625	$ 9 437 200	$ 22 246 825	$ 16 580 000	$ 2 031 475	$ -340 225
8	**The Hershey Company (HSY)**	$ 5 488 771	$ 5 110 188	$ 10 598 959	$ 39 290 000	$ 2 237 535	$ -129 143
9	**Hormel Foods Corporation (HRL)**	$ 9 531 044	$ 2 809 030	$ 12 340 075	$ 23 517 500	$ 1 206 279	$ -172 837
10	**Campbell Soup Company (CPB)**	$ 6 575 500	$ 5 438 500	$ 12 014 000	$ 14 405 000	$ 1 302 250	$ -113 500
11	**McCormick & Company, Incorporated (MKC)**	$ 7 667 250	$ 5 078 425	$ 12 745 675	$ 22 970 000	$ 920 300	$ -26 650
12	**Archer-Daniels-Midland Company (ADM)**	$ 44 685 500	$ 10 379 500	$ 55 065 000	$ 38 845 000	$ 4 201 750	$ -1 165 000
13	**Sysco Corporation (SYY)**	$ 9 873 833	$ 12 363 326	$ 22 237 159	$ 38 425 000	$ 2 165 721	$ -120 369
14	**Bunge Global (BG)**	$ 17 780 750	$ 6 575 750	$ 24 356 500	$ 12 967 500	$ 2 096 750	$ -4 264 500
15	**Ingredion incorporated (INGR)**	$ 4 841 750	$ 2 423 250	$ 7 265 000	$ 6 295 000	$ 786 750	$ -179 250
16	**Kellogg (K)**	$ 10 190 000	$ 7 382 750	$ 17 572 750	$ 21 702 500	$ 1 685 750	$ 60 000
17	**Lamb Weston Holding Inc. (LW)**	$ 1 738 800	$ 3 144 025	$ 4 882 825	$ 12 307 500	$ 607 975	$ -31 225
18	**J.M. Smucker Company (SJM)**	$ 11 279 800	$ 5 621 275	$ 16 901 075	$ 14 175 000	$ 1 253 075	$ 28 200
19	**Brown-Forman Corporation (BF-B)**	$ 4 499 250	$ 2 710 250	$ 7 209 500	$ 28 332 500	$ 926 000	$ -166 000
20	**Molson Coors Beverage company (TAP)**	$ 19 708 200	$ 7 090 175	$ 26 798 375	$ 11 082 500	$ 2 146 375	$ -15 700
21	**Darling Ingredients Inc. (DAR)**	$ 5 129 591	$ 2 873 037	$ 8 002 628	$ 9 632 500	$ 710 023	$ -58 995
22	**Post Holdings (POST)**	$ 5 366 200	$ 6 512 825	$ 11 879 025	$ 6 082 500	$ 562 075	$ -55 825
23	**TreeHouse Foods, Inc. (THS)**	$ 2 852 400	$ 1 911 100	$ 4 763 500	$ 2 427 500	$ 190 075	$ -29 075

Source: Data retrieved from Yahoo Finance.

Annex E

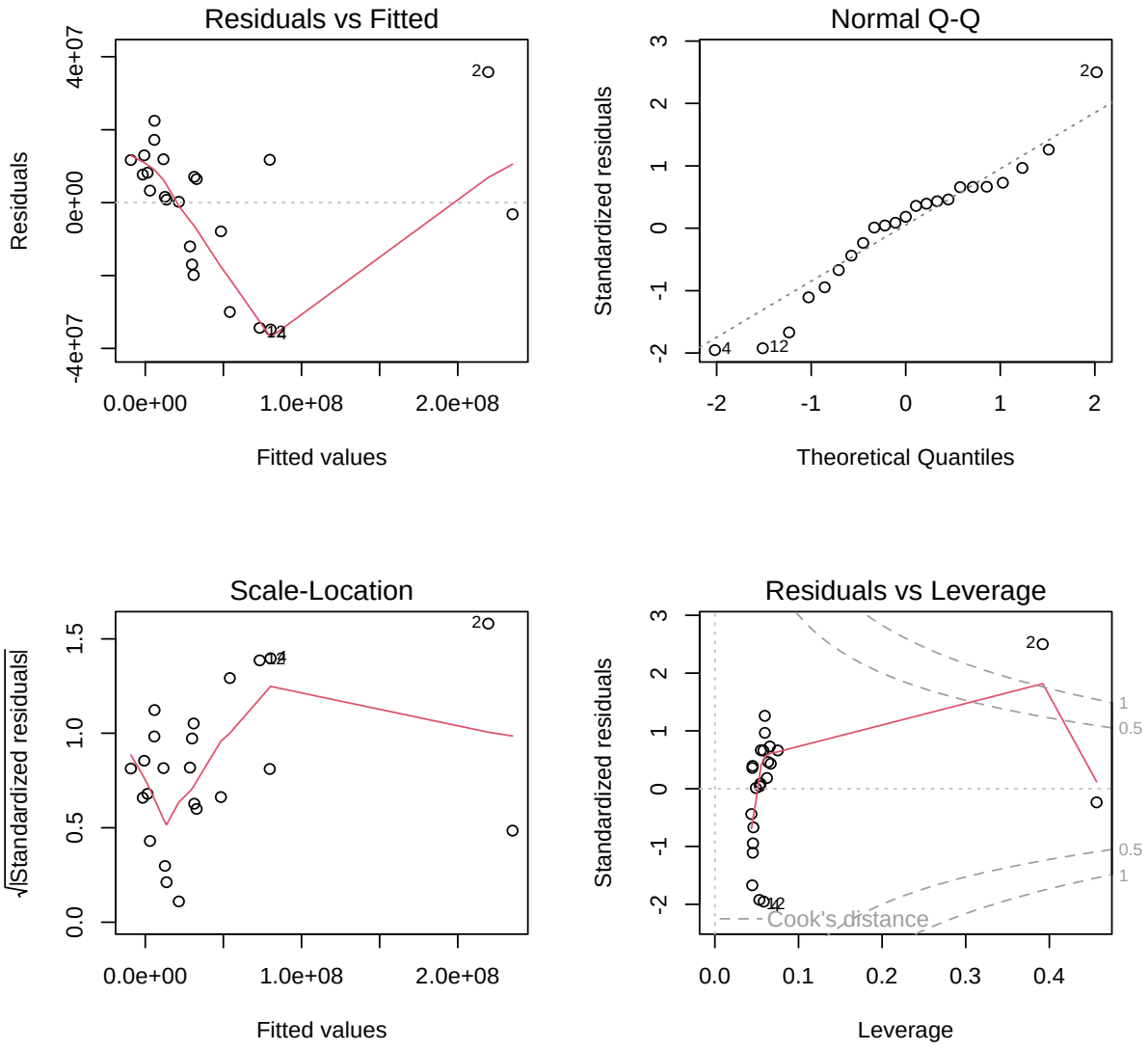
Table 4.2: Dataset for R-studio

Dataset						
Nº	Companies name	Avg_MarketCap	Avg_DE	Avg_SFC	Avg_LC	Avg_WCC
1	**PepsiCo, Inc. (PEP)**	$ 231 877 500	0,814	$12 074 250	3,512	-0,017
2	**The Coca-Cola Company (KO)**	$ 255 317 500	0,812	$11 317 250	3,684	0,012
3	**Mondelez International, Inc. (MDLZ)**	$ 91 422 500	0,433	$ 4 516 250	4,643	-0,102
4	**The Kraft Heinz Company (KHC)**	$ 45 380 000	0,318	$ 4 540 750	4,967	-0,078
5	**General Mills, Inc. (GIS)**	$ 40 485 000	0,667	$ 2 993 575	4,206	0,007
6	**Tyson Foods, Inc. (TSN)**	$ 24 125 000	0,366	$ 3 273 000	2,942	-0,073
7	**Conagra Brands, Inc. (CAG)**	$ 16 580 000	0,737	$ 2 031 475	4,645	-0,167
8	**The Hershey Company (HSY)**	$ 39 290 000	0,931	$ 2 237 535	2,284	-0,058
9	**Hormel Foods Corporation (HRL)**	$ 23 517 500	0,295	$ 1 206 279	2,329	-0,143
10	**Campbell Soup Company (CPB)**	$ 14 405 000	0,827	$ 1 302 250	4,176	-0,087
11	**McCormick & Company, Incorporated (MKC)**	$ 22 970 000	0,662	$ 920 300	5,518	-0,029
12	**Archer-Daniels-Midland Company (ADM)**	$ 38 845 000	0,232	$ 4 201 750	2,470	-0,277
13	**Sysco Corporation (SYY)**	$ 38 425 000	1,252	$ 2 165 721	5,709	-0,056
14	**Bunge Global (BG)**	$ 12 967 500	0,370	$ 2 096 750	3,136	-2,034
15	**Ingredion incorporated (INGR)**	$ 6 295 000	0,500	$ 786 750	3,080	-0,228
16	**Kellogg (K)**	$ 21 702 500	0,725	$ 1 685 750	4,380	0,036
17	**Lamb Weston Holding Inc. (LW)**	$ 12 307 500	1,808	$ 607 975	5,171	-0,051
18	**J.M. Smucker Company (SJM)**	$ 14 175 000	0,498	$ 1 253 075	4,486	0,023
19	**Brown-Forman Corporation (BF-B)**	$ 28 332 500	0,602	$ 926 000	2,927	-0,179
20	**Molson Coors Beverage company (TAP)**	$ 11 082 500	0,360	$ 2 146 375	3,303	-0,007
21	**Darling Ingredients Inc. (DAR)**	$ 9 632 500	0,560	$ 710 023	4,046	-0,083
22	**Post Holdings (POST)**	$ 6 082 500	1,214	$ 562 075	11,587	-0,099
23	**TreeHouse Foods, Inc. (THS)**	$ 2 427 500	0,670	$ 190 075	10,054	-0,153

Source: Data retrieved from Yahoo Finance.

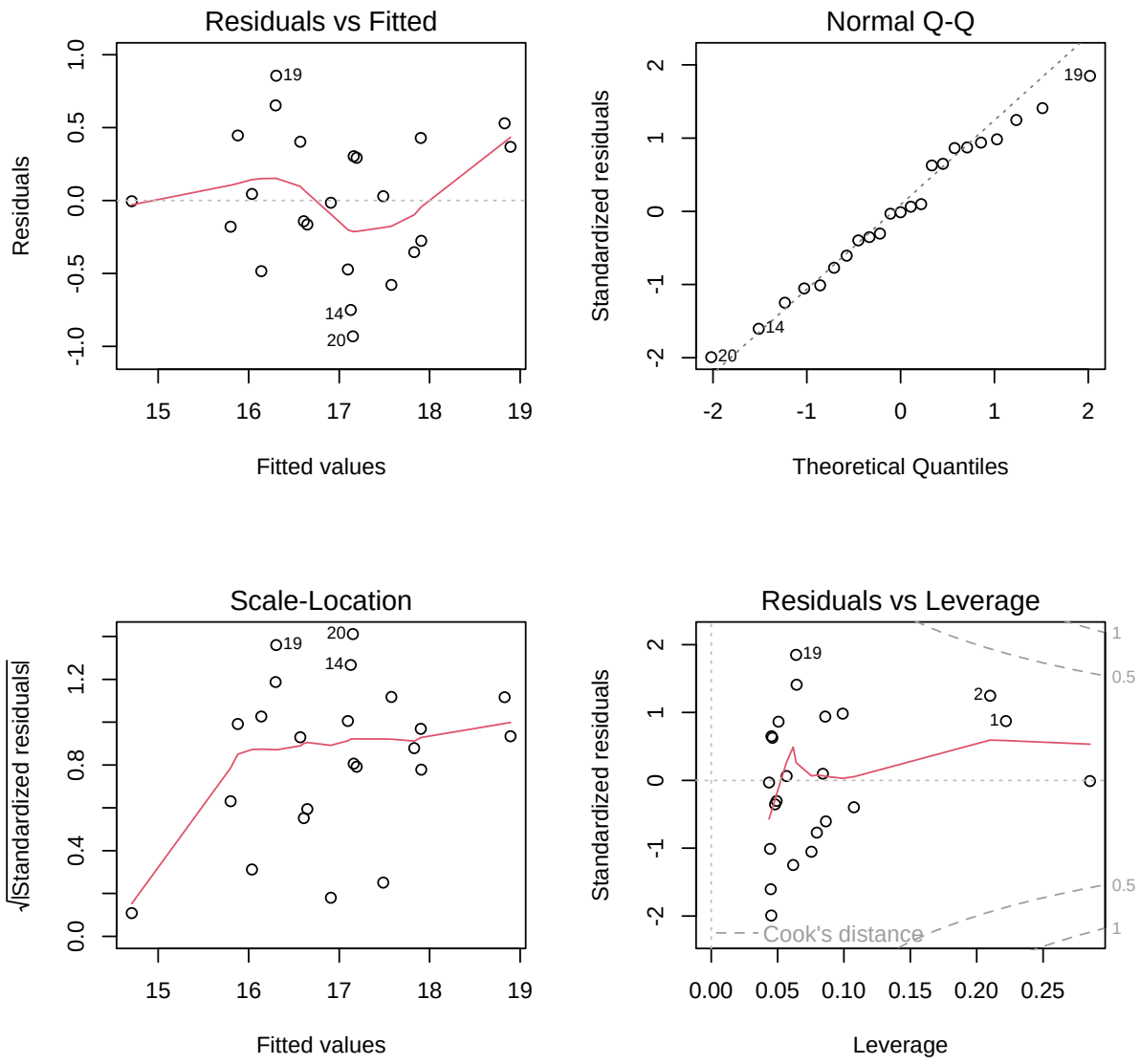
Annex F

Figure 5.1: Model 1 – Residual Diagnostic Scatter Plots



Annex G

Figure 5.2: Log-Log transformed Model 1– Residual Diagnostic Scatter Plots



Annex H

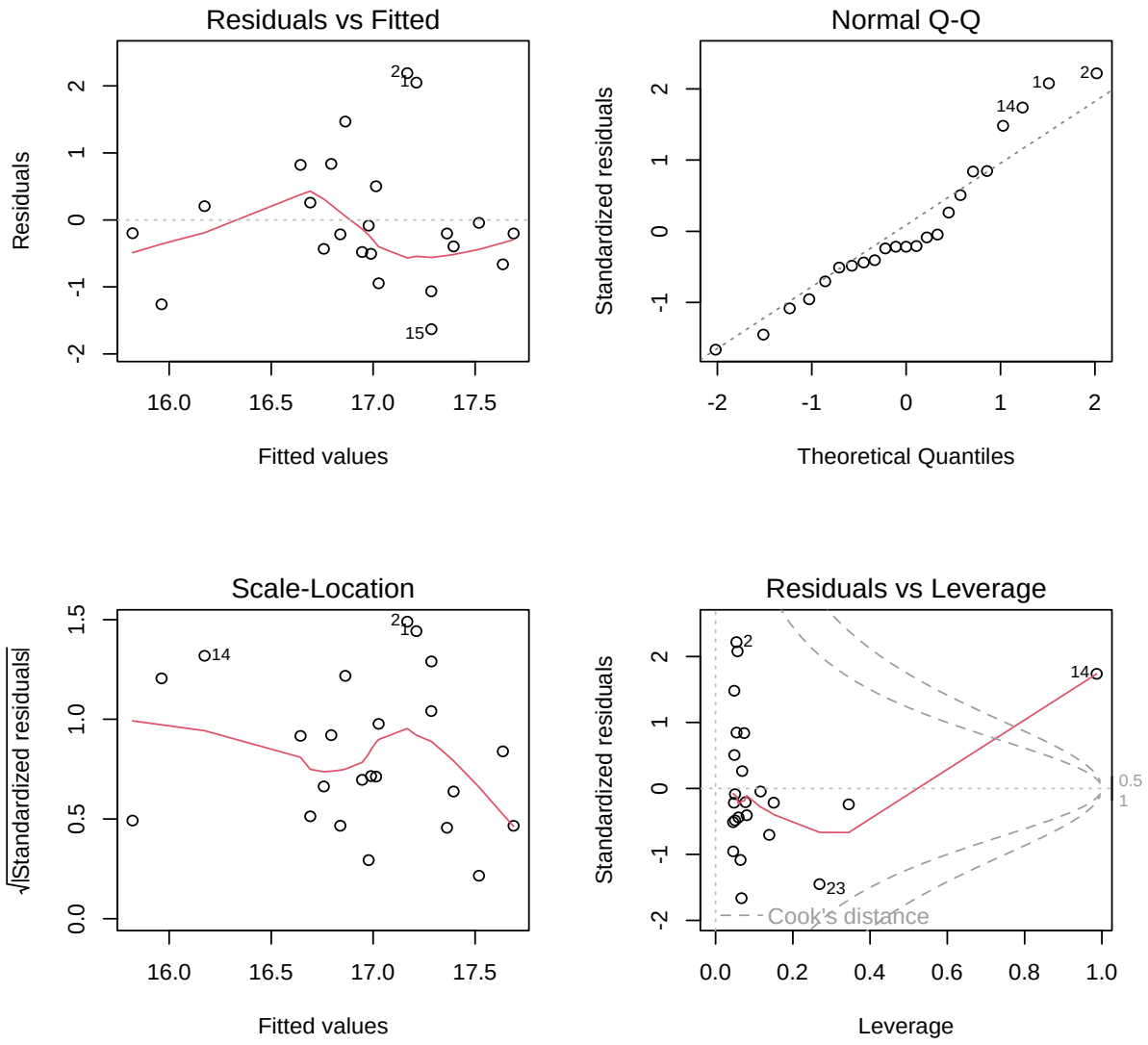
Table 5.5: Dataset adjustment 1

Dataset - Adjustment 1							
N°	Company	Avg_MarketCap	Avg_DE	Avg_SFC	Avg_LC	Avg_WCC	Avg_WCC+3
1	**PepsiCo, Inc. (PEP)**	$ 231 877 500	0,814	$ 12 074 250	3,512	-0,017	2,983
2	**The Coca-Cola Company (KO)**	$ 255 317 500	0,812	$ 11 317 250	3,684	0,012	3,012
3	**Mondelez International, Inc. (MDLZ)**	$ 91 422 500	0,433	$ 4 516 250	4,643	-0,102	2,898
4	**The Kraft Heinz Company (KHC)**	$ 45 380 000	0,318	$ 4 540 750	4,967	-0,078	2,922
5	**General Mills, Inc. (GIS)**	$ 40 485 000	0,667	$ 2 993 575	4,206	0,007	3,007
6	**Tyson Foods, Inc. (TSN)**	$ 24 125 000	0,366	$ 3 273 000	2,942	-0,073	2,927
7	**Conagra Brands, Inc. (CAG)**	$ 16 580 000	0,737	$ 2 031 475	4,645	-0,167	2,833
8	**The Hershey Company (HSY)**	$ 39 290 000	0,931	$ 2 237 535	2,284	-0,058	2,942
9	**Hormel Foods Corporation (HRL)**	$ 23 517 500	0,295	$ 1 206 279	2,329	-0,143	2,857
10	**Campbell Soup Company (CPB)**	$ 14 405 000	0,827	$ 1 302 250	4,176	-0,087	2,913
11	**McCormick & Company, Incorporated (MKC)**	$ 22 970 000	0,662	$ 920 300	5,518	-0,029	2,971
12	**Archer-Daniels-Midland Company (ADM)**	$ 38 845 000	0,232	$ 4 201 750	2,470	-0,277	2,723
13	**Sysco Corporation (SYY)**	$ 38 425 000	1,252	$ 2 165 721	5,709	-0,056	2,944
14	**Bunge Global (BG)**	$ 12 967 500	0,370	$ 2 096 750	3,136	-2,034	0,966
15	**Ingredion incorporated (INGR)**	$ 6 295 000	0,500	$ 786 750	3,080	-0,228	2,772
16	**Kellogg (K)**	$ 21 702 500	0,725	$ 1 685 750	4,380	0,036	3,036
17	**Lamb Weston Holding Inc. (LW)**	$ 12 307 500	1,808	$ 607 975	5,171	-0,051	2,949
18	**J.M. Smucker Company (SJM)**	$ 14 175 000	0,498	$ 1 253 075	4,486	0,023	3,023
19	**Brown-Forman Corporation (BF-B)**	$ 28 332 500	0,602	$ 926 000	2,927	-0,179	2,821
20	**Molson Coors Beverage company (TAP)**	$ 11 082 500	0,360	$ 2 146 375	3,303	-0,007	2,993
21	**Darling Ingredients Inc. (DAR)**	$ 9 632 500	0,560	$ 710 023	4,046	-0,083	2,917
22	**Post Holdings (POST)**	$ 6 082 500	1,214	$ 562 075	11,587	-0,099	2,901
23	**TreeHouse Foods, Inc. (THS)**	$ 2 427 500	0,670	$ 190 075	10,054	-0,153	2,847

Source: Data retrieved from Yahoo Finance.

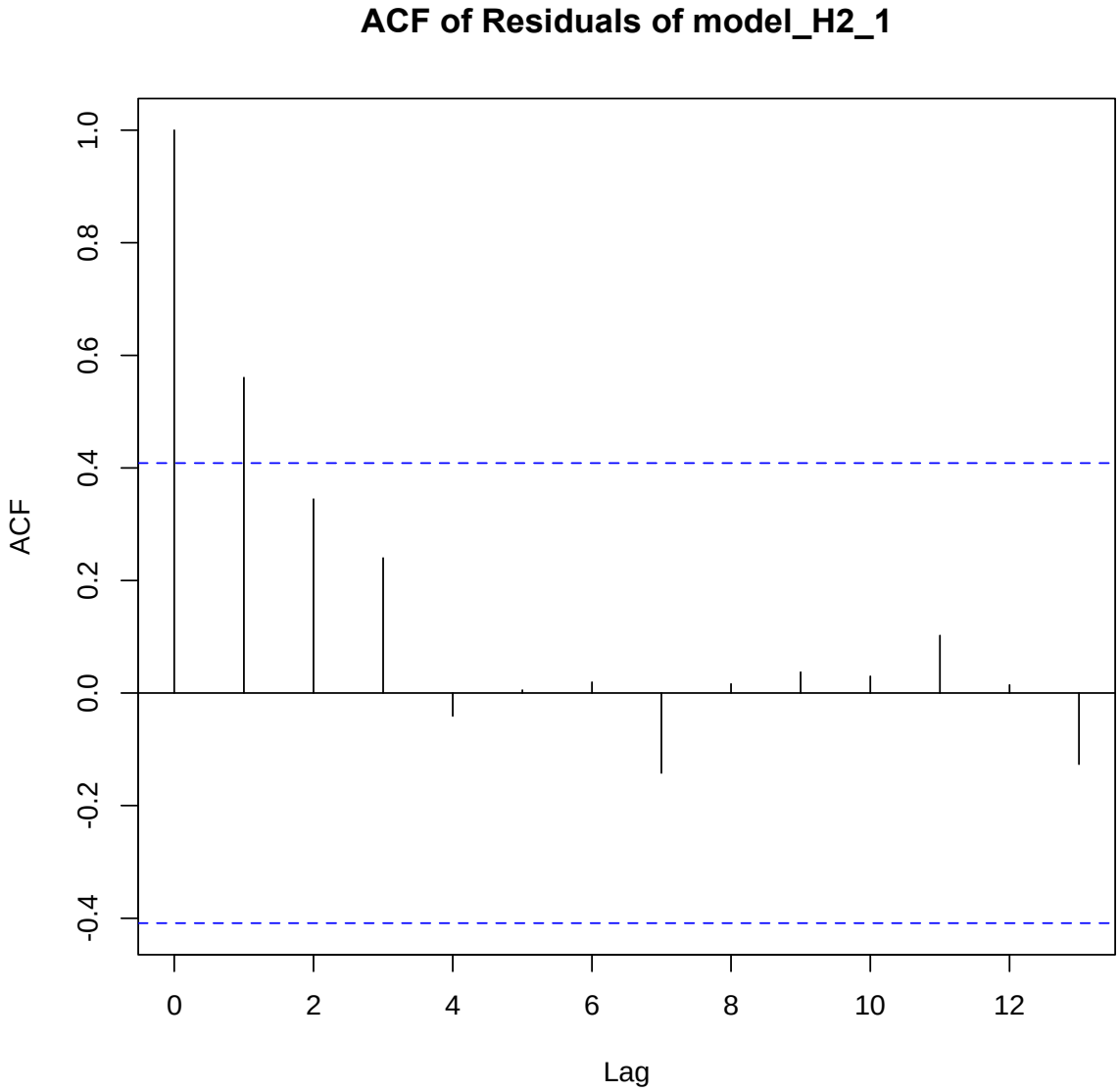
Annex I

Figure 5.3: Model 2 – Residual Diagnostic Scatter Plots



Annex J

Figure 5.4: Model 2 – ACF Plot



Annex K

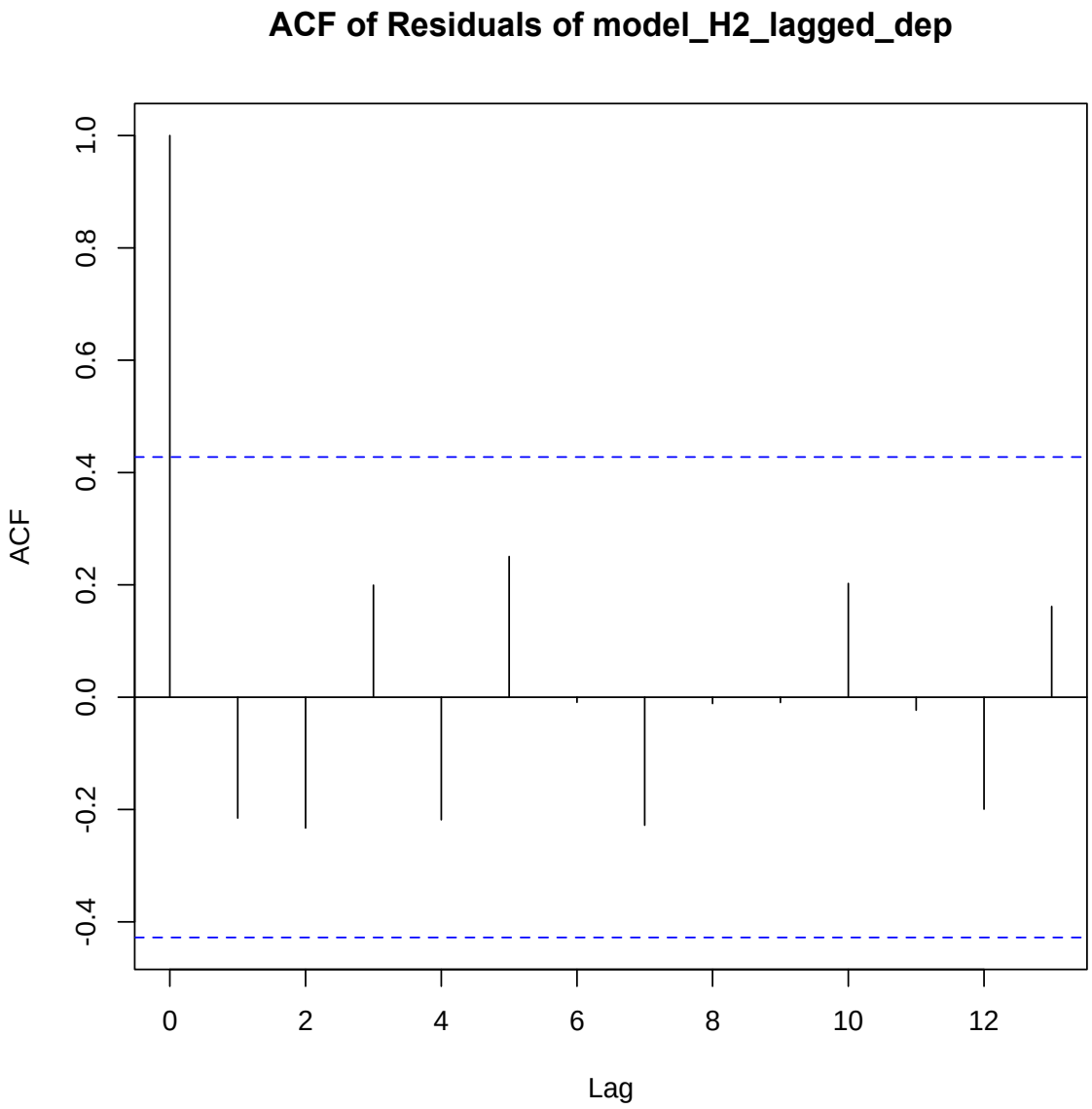
Table 5.8: Dataset adjustment 2

Dataset - Adjustment 2							
Nº	Company	Avg_MarketCap	Avg_DE	Avg_SFC	Avg_LC	Avg_WCC	Avg_WCC+1
1	**PepsiCo, Inc. (PEP)**	$ 231 877 500	0,814	$ 12 074 250	3,51171	-0,016771	0,9832288
2	**The Coca-Cola Company (KO)**	$ 255 317 500	0,812	$ 11 317 250	3,68391	0,012459	1,0124589
3	**Mondelez International, Inc. (MDLZ)**	$ 91 422 500	0,433	$ 4 516 250	4,64318	-0,101522	0,8984777
4	**The Kraft Heinz Company (KHC)**	$ 45 380 000	0,318	$ 4 540 750	4,96741	-0,078456	0,9215438
5	**General Mills, Inc. (GIS)**	$ 40 485 000	0,667	$ 2 993 575	4,20582	0,006948	1,0069482
6	**Tyson Foods, Inc. (TSN)**	$ 24 125 000	0,366	$ 3 273 000	2,94180	-0,073022	0,9269783
7	**Conagra Brands, Inc. (CAG)**	$ 16 580 000	0,737	$ 2 031 475	4,64549	-0,167477	0,8325232
8	**The Hershey Company (HSY)**	$ 39 290 000	0,931	$ 2 237 535	2,28385	-0,057717	0,9422834
9	**Hormel Foods Corporation (HRL)**	$ 23 517 500	0,295	$ 1 206 279	2,32867	-0,143281	0,8567189
10	**Campbell Soup Company (CPB)**	$ 14 405 000	0,827	$ 1 302 250	4,17623	-0,087157	0,9128432
11	**McCormick & Company, Incorporated (MKC)**	$ 22 970 000	0,662	$ 920 300	5,51823	-0,028958	0,9710421
12	**Archer-Daniels-Midland Company (ADM)**	$ 38 845 000	0,232	$ 4 201 750	2,47028	-0,277265	0,7227346
13	**Sysco Corporation (SYY)**	$ 38 425 000	1,252	$ 2 165 721	5,70864	-0,055579	0,9444208
14	**Ingredion incorporated (INGR)**	$ 6 295 000	0,500	$ 786 750	3,08008	-0,227836	0,772164
15	**Kellogg (K)**	$ 21 702 500	0,725	$ 1 685 750	4,37950	0,035592	1,0355925
16	**Lamb Weston Holding Inc. (LW)**	$ 12 307 500	1,808	$ 607 975	5,17131	-0,051359	0,948641
17	**J.M. Smucker Company (SJM)**	$ 14 175 000	0,498	$ 1 253 075	4,48598	0,022505	1,0225046
18	**Brown-Forman Corporation (BF-B)**	$ 28 332 500	0,602	$ 926 000	2,92684	-0,179266	0,8207343
19	**Molson Coors Beverage company (TAP)**	$ 11 082 500	0,360	$ 2 146 375	3,30333	-0,007315	0,9926853
20	**Darling Ingredients Inc. (DAR)**	$ 9 632 500	0,560	$ 710 023	4,04640	-0,083089	0,9169111
21	**Post Holdings (POST)**	$ 6 082 500	1,214	$ 562 075	11,58711	-0,099319	0,9006805
22	**TreeHouse Foods, Inc. (THS)**	$ 2 427 500	0,670	$ 190 075	10,05445	-0,152966	0,8470341

Source: Data retrieved from Yahoo Finance.

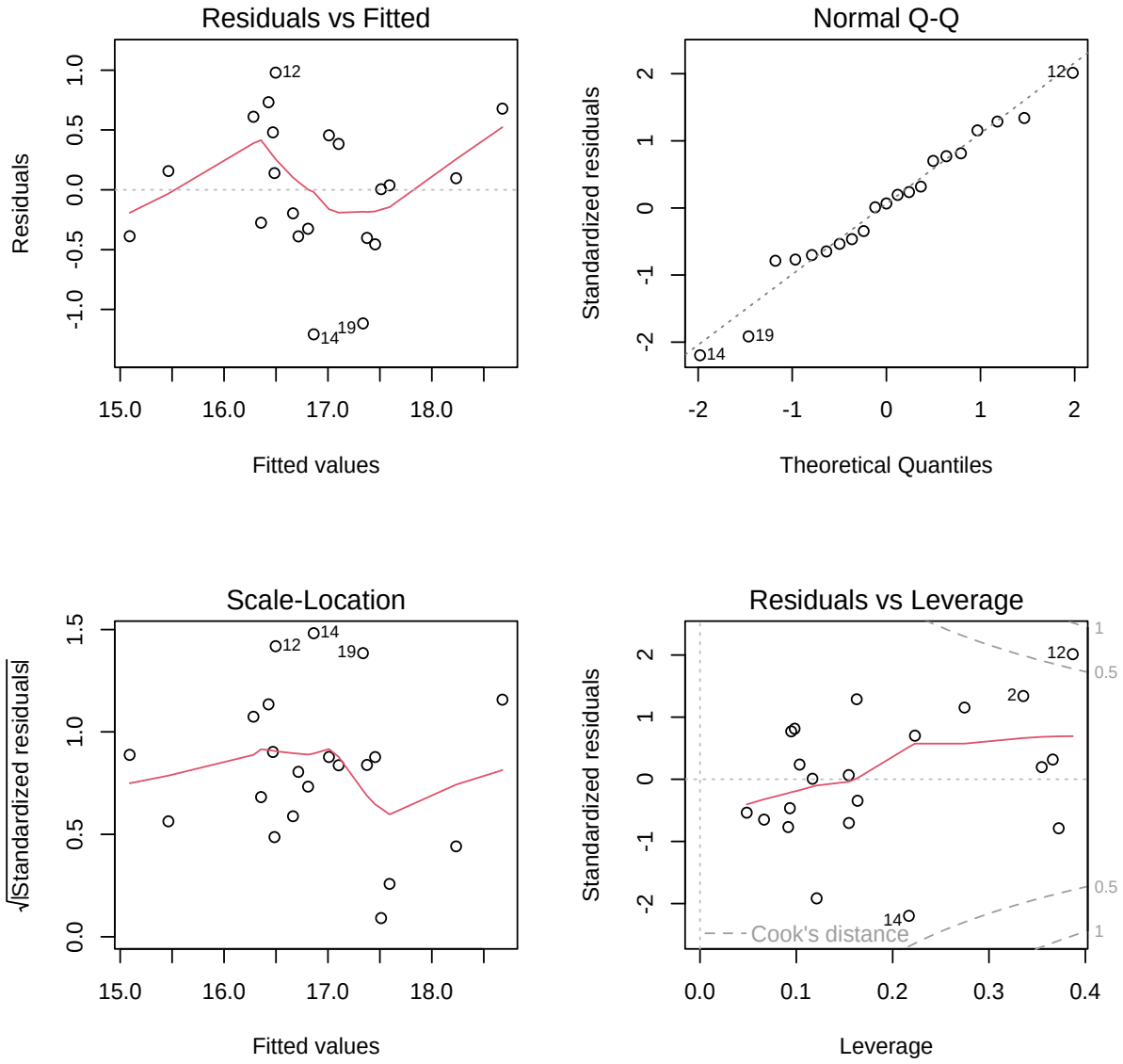
Annex L

Figure 5.5: Model 2 – Adjusted for Autocorrelation, ACF Plot



Annex M

Figure 5.6: Model 2 – Adjusted for Autocorrelation, Residual Diagnostic Scatter Plots



Annex N

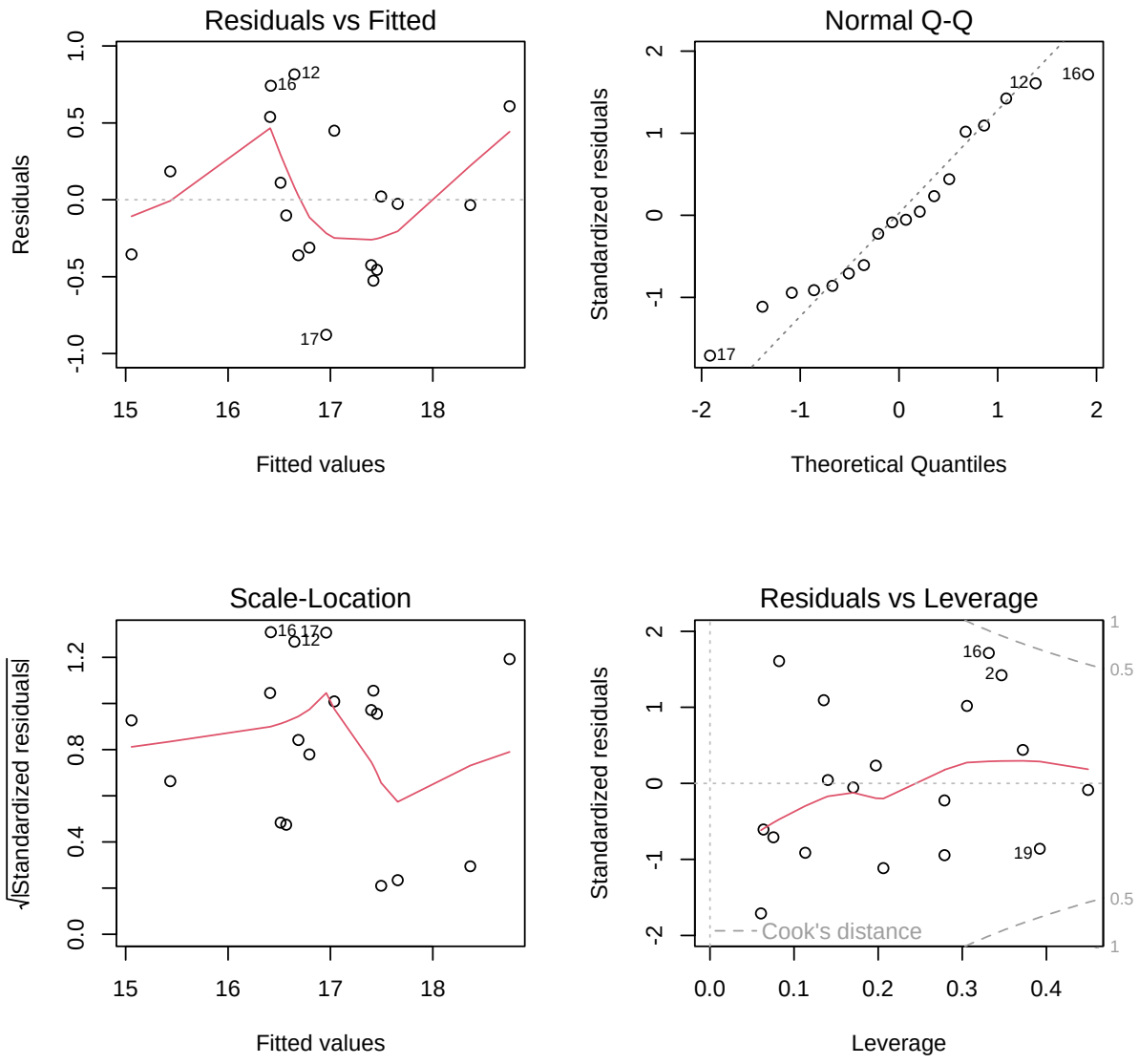
Table 5.11: Dataset adjustment 3

Dataset - Adjustment 3							
N°	Company	Avg_MarketCap	Avg_DE	Avg_SFC	Avg_LC	Avg_WCC	Avg_WCC+1
1	**PepsiCo, Inc. (PEP)**	$ 231 877 500	0,814	$ 12 074 250	3,51171	-0,016771	0,9832288
2	**The Coca-Cola Company (KO)**	$ 255 317 500	0,812	$ 11 317 250	3,68391	0,012459	1,0124589
3	**Mondelez International, Inc. (MDLZ)**	$ 91 422 500	0,433	$ 4 516 250	4,64318	-0,101522	0,8984777
4	**The Kraft Heinz Company (KHC)**	$ 45 380 000	0,318	$ 4 540 750	4,96741	-0,078456	0,9215438
5	**General Mills, Inc. (GIS)**	$ 40 485 000	0,667	$ 2 993 575	4,20582	0,006948	1,0069482
6	**Tyson Foods, Inc. (TSN)**	$ 24 125 000	0,366	$ 3 273 000	2,94180	-0,073022	0,9269783
7	**Conagra Brands, Inc. (CAG)**	$ 16 580 000	0,737	$ 2 031 475	4,64549	-0,167477	0,8325232
8	**The Hershey Company (HSY)**	$ 39 290 000	0,931	$ 2 237 535	2,28385	-0,057717	0,9422834
9	**Hormel Foods Corporation (HRL)**	$ 23 517 500	0,295	$ 1 206 279	2,32867	-0,143281	0,8567189
10	**Campbell Soup Company (CPB)**	$ 14 405 000	0,827	$ 1 302 250	4,17623	-0,087157	0,9128432
11	**McCormick & Company, Incorporated (MKC)**	$ 22 970 000	0,662	$ 920 300	5,51823	-0,028958	0,9710421
12	**Sysco Corporation (SYY)**	$ 38 425 000	1,252	$ 2 165 721	5,70864	-0,055579	0,9444208
13	**Kellogg (K)**	$ 21 702 500	0,725	$ 1 685 750	4,37950	0,035592	1,0355925
14	**Lamb Weston Holding Inc. (LW)**	$ 12 307 500	1,808	$ 607 975	5,17131	-0,051359	0,948641
15	**J.M. Smucker Company (SJM)**	$ 14 175 000	0,498	$ 1 253 075	4,48598	0,022505	1,0225046
16	**Brown-Forman Corporation (BF-B)**	$ 28 332 500	0,602	$ 926 000	2,92684	-0,179266	0,8207343
17	**Darling Ingredients Inc. (DAR)**	$ 9 632 500	0,560	$ 710 023	4,04640	-0,083089	0,9169111
18	**Post Holdings (POST)**	$ 6 082 500	1,214	$ 562 075	11,58711	-0,099319	0,9006805
19	**TreeHouse Foods, Inc. (THS)**	$ 2 427 500	0,670	$ 190 075	10,05445	-0,152966	0,8470341

Source: Data retrieved from Yahoo Finance.

Annex O

Figure 5.7: Model 2 – Adjustment 1 for Non-Linearity, Residual Diagnostic Scatter Plots



Annex P

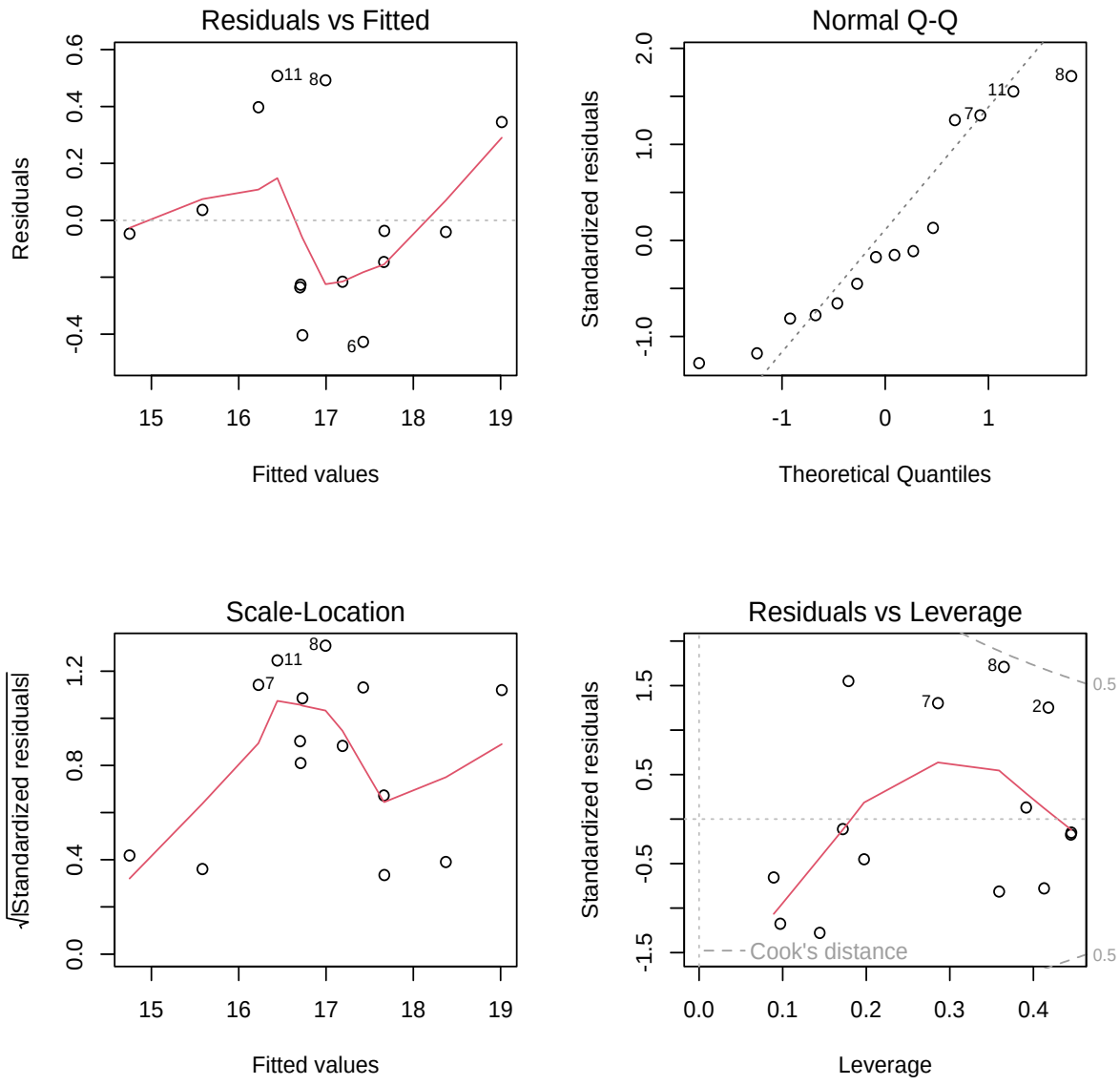
Table 5.14: Dataset adjustment 4

Dataset - Adjustment 4							
N°	Company	Avg_MarketCap	Avg_DE	Avg_SFC	Avg_LC	Avg_WCC	Avg_WCC+1
1	**PepsiCo, Inc. (PEP)**	$ 231 877 500	0,814	$ 12 074 250	3,51171	-0,016771	0,9832288
2	**The Coca-Cola Company (KO)**	$ 255 317 500	0,812	$ 11 317 250	3,68391	0,012459	1,0124589
3	**Mondelez International, Inc. (MDLZ)**	$ 91 422 500	0,433	$ 4 516 250	4,64318	-0,101522	0,8984777
4	**The Kraft Heinz Company (KHC)**	$ 45 380 000	0,318	$ 4 540 750	4,96741	-0,078456	0,9215438
5	**General Mills, Inc. (GIS)**	$ 40 485 000	0,667	$ 2 993 575	4,20582	0,006948	1,0069482
6	**Tyson Foods, Inc. (TSN)**	$ 24 125 000	0,366	$ 3 273 000	2,94180	-0,073022	0,9269783
7	**Conagra Brands, Inc. (CAG)**	$ 16 580 000	0,737	$ 2 031 475	4,64549	-0,167477	0,8325232
8	**The Hershey Company (HSY)**	$ 39 290 000	0,931	$ 2 237 535	2,28385	-0,057717	0,9422834
9	**Hormel Foods Corporation (HRL)**	$ 23 517 500	0,295	$ 1 206 279	2,32867	-0,143281	0,8567189
10	**Campbell Soup Company (CPB)**	$ 14 405 000	0,827	$ 1 302 250	4,17623	-0,087157	0,9128432
11	**McCormick & Company, Incorporated (MKC)**	$ 22 970 000	0,662	$ 920 300	5,51823	-0,028958	0,9710421
12	**Kellogg (K)**	$ 21 702 500	0,725	$ 1 685 750	4,37950	0,035592	1,0355925
13	**Lamb Weston Holding Inc. (LW)**	$ 12 307 500	1,808	$ 607 975	5,17131	-0,051359	0,948641
14	**J.M. Smucker Company (SJM)**	$ 14 175 000	0,498	$ 1 253 075	4,48598	0,022505	1,0225046
15	**Post Holdings (POST)**	$ 6 082 500	1,214	$ 562 075	11,58711	-0,099319	0,9006805
16	**TreeHouse Foods, Inc. (THS)**	$ 2 427 500	0,670	$ 190 075	10,05445	-0,152966	0,8470341

Source: Data retrieved from Yahoo Finance.

Annex Q

Figure 5.8: Model 2 – Adjustment 2 for Non-Linearity, Residual Diagnostic Scatter Plots



Annex R

Figure 5.9: Model 3 – Residual Diagnostic Scatter Plots