

WAGENINGEN UNIVERSITY

Performance assessment of Dutch agricultural and horticultural cooperatives

*A study to explore the performance of cooperatives and the
relationship between performance and capital structure*

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ABSTRACT

The purpose of this research was to examine trends in the performance of Dutch agricultural and horticultural cooperatives between 1993 and 2012, and to examine the relationship between the performance efficiency scores and important variables that reflecting the capital structure. This research used Data Envelopment Analysis with bootstrapping to estimate weights for aggregating a set of key performance indicators to measure performance in terms of performance efficiency scores. The relationship between the performance efficiency scores and variables that reflecting the capital structure was examined by using truncated regression. Based on the financial and economic performance, this study reveals that the input supply cooperatives have performed best in comparison to cooperatives from other categories, while the hortibusiness cooperatives have generally performed worst. The results changed after adding the presence of the member benefit defined as price guarantee. In that case, the hortibusiness cooperatives have performed best in comparison to the cooperatives from the other categories, while the dairy cooperatives have performed worst. Overall, it is concluded that there remains a considerable scope of improvements for all type of cooperatives and in addition, it is concluded that the considered variables that reflecting the capital structure have a significant effect on the obtained performance efficiency scores.

Key words: Cooperatives, Data Envelopment Analysis, Financial Ratio Analysis

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SUMMARY

The financial and economic performance of cooperatives has been a popular topic of research in theoretical and empirical studies in the economic literature. This research attempts to make a valuable contribution to the economic literature concerning the performance assessment of agricultural cooperatives. The main aim of this research is to assess the performance of Dutch agricultural and horticultural cooperatives between 1993 and 2012, and to examine the relationship between the performance and the variables that reflecting the capital structure, i.e. the allocated and unallocated equity capital and the allocated and unallocated debt capital.

Chapter 2 provides an overview of the capital structures that apply to agricultural and horticultural cooperatives in Western Europe and Northern America. Distinction is made between six cooperative models, namely 1) proportional investment cooperatives, 2) member-investor cooperatives, 3) new generation cooperatives, 4) cooperatives with capital seeking companies, 5) investor-share cooperatives, and 6) investor-oriented cooperatives. It is observed that cooperatives generally started to allocate capital in order to improve their balance sheet ratios. However, most cooperatives came back from the decision to allocate capital, while the unallocated capital became dominant again due to the favorable properties of this capital form.

Chapter 3 shows the methodology that is used within this research. A major part of the existing studies concerning the performance assessment of cooperatives made use of financial ratio analysis that enables to provide a quick indication on the position of the cooperative in different dimensions, like solvency, liquidity, profitability, and activity. However, this ratio analysis fails to provide a unified and representative evaluation of the overall cooperative performance. Data Envelopment Analysis with bootstrapping is selected to counter this limitation and to derive a single summary measure of efficiency for each cooperative, which is based on the comparison with other cooperatives in the sample, in order to assess the performance of the cooperatives. In addition, it was decided to use truncated regression to examine the relationship between performance and capital structure.

Chapter 4 discusses the dataset that has been created for this research. The dataset consists of cooperatives that belong, from current and historical point of view, to the largest cooperatives in the Dutch agribusiness and hortibusiness in terms of turnover and covers a period of twenty years, ranging from 1993 to 2012. The number of cooperatives is decreasing since mergers and acquisitions have taken place. Distinction is made between dairy cooperatives, hortibusiness cooperatives, input supply cooperatives, and other cooperatives. The dataset includes ten variables that have enabled the calculation of eleven financial ratios, the presence of four different member benefits, and variables that reflecting the capital structure. No outliers are observed. The results show that the value of total assets has increased over time, the developments in the provisions have been quite volatile, the allocated capital has decreased, and the unallocated capital has increased.

Chapter 5 provides the results obtained from the DEA method and the truncated regression. The first part of this chapter summarizes the results for the obtained composite indicators that are estimated by using three different sets of outputs. In the first set of outputs, cooperatives are viewed as profit maximizing firms. The second set of outputs considers the general objective of cooperatives that assumes that serving the interests of the CF and the MFs is, in addition to profitmaking, also important. The second set of outputs is the basis of the third set of outputs to which the member benefit of a price guarantee is added. Different results are observed. Based on the financial and economic performance, obtained from using the first and second output sets, this study reveals that the input supply cooperatives have performed best in comparison to the cooperatives from the other categories, while the hortibusiness cooperatives have performed worst. However, based on the results obtained from the third output set, it is concluded that the horticultural cooperatives have performed best in comparison to the cooperatives from the other categories, while the dairy cooperatives have performed worst. The second part of this empirical part discusses the truncated regression applied to examine the relationship between the performance efficiency scores and the variables reflecting the capital structure. The results of the regression analysis indicate that all variables reflecting the capital structure are statistically significant at a 5% level. Based on the results, it is concluded that the value of total assets and both the allocated debt capital/total assets and the unallocated debt capital/total assets have a negative effect on performance, while both the allocated equity capital/total assets and the unallocated equity capital/total assets have a positive effect on performance.

Chapter 6 discusses the results and implications for future research. It is concluded that the results of this research have to be interpreted with care due to three important limitations: 1) inflation is disregarded, 2) the internal validity of the results obtained from a set of outputs with a member benefit is endangered, and 3) it is difficult to translate these results to a broader context since the focus is on Dutch agricultural and horticultural cooperatives. The key recommendation for future research is to develop of measurement tool to address members' objectives and/or member benefits that provide continuous outcomes in order to enable researchers to make better and fairer inter-cooperative comparisons, and comparisons between cooperatives and IOFs.

Chapter 7 presents the conclusions of this research. Based on the financial and economic performance scores, it is concluded that the input supply cooperatives have performed best in comparison with the cooperatives from the other categories, while the hortibusiness cooperatives have performed worst. After adding the presence of a member benefit, it is concluded that the hortibusiness cooperatives have performed best, while the dairy cooperatives have performed worst over all periods of time considered. Despite the differences in performance, a considerable scope remains for the improvement of the performance of cooperatives from all categories, i.e. dairy cooperatives, hortibusiness cooperatives, input supply cooperatives and other cooperatives. In addition, mergers and acquisitions between cooperatives have caused that the performance of the cooperatives from different categories have converged over time. It is also concluded that the considered variables that reflecting the capital structure have a significant effect on the performance efficiency scores.

1. INTRODUCTION

1.1. BACKGROUND

The Netherlands has a rich cooperative entrepreneurship. The five historical reasons to start co-operating have been: 1) the need for countervailing power, 2) to gain access to industrially produced goods and services, 3) make use of efficiency by economies of scale, 4) to manage risk, and 5) to improve members' income (Van Dijk, 1997). Cooperatives are unique forms of private business organizations (Barton, 1989; Van Dijk, 2000) with a rather complex organizational structure (Michelsen, 1994). A challenging characteristic of the cooperative is the concept of "dual nature", introduced by Draheim (1955) who argued that the cooperative represent an association of members and simultaneously an enterprise owned by the same members. The concept of "dual nature" is also expressed in the twofold entrepreneurship of cooperatives, i.e. distinction is made between the cooperative firm (CF) and its member firms (MFs). In grass-root situation, the market of the final product, processed in collaboration with others, is brought under cooperative responsibility and MFs can realize a better margin for their products because of the CF that adds value to the final product. The value of the products is ultimately derived from the results of the CF (Van Dijk, 2000; Van Dijk & Klep, 2005).

Despite the complexity of the organizational structure of cooperatives, there is consensus in the economic literature that a cooperative can be defined as a user-owned, user-controlled, and user-benefit organization that aims to serve the goals of the CF and its MFs as good as possible (Barton, 1989; Sexton & Iskow, 1993; Van Dijk & Klep, 2005; Soboh et al., 2009a). Cooperatives usually operate on the same market like investor-owned firms (IOFs). However, there are major differences between the objectives and business strategies of CFs and IOFs (Schrader et al., 1985; Sexton & Iskow, 1993). Lerman & Parliament (1990) have argued that these differences have led to differences in profitability, capital structure and (operating) efficiency of both cooperatives and IOFs. Theoretical and empirical analyses have already demonstrated that the economic and financial performances of cooperatives and IOFs differ significantly (see inter alia: Staatz, 1984; Caves & Petersen, 1986; Gentzoglani, 1997).

1.2. PROBLEM STATEMENT

Soboh et al. (2009a) argued that both the definition and the heterogeneity of the organizational structure of cooperatives have been stumbling blocks in analyzing performance. Various theoretical and empirical studies have been performed to measure the financial and economic performance of agricultural cooperatives. An overview of these studies is provided by Soboh et al. (2009a) who classified existing empirical studies concerning the performance assessment of cooperatives into two different categories. The first category consists of studies that measure financial and economic ratios and the second category consists of studies that measure (economic) efficiency (Sexton & Iskow, 1993). A major part of these empirical studies made use of financial ratio analysis, despite the fact

that there is no clear link between the financial ratios and the economic theory. Financial ratio analysis provides a quick indication on the position of the cooperative in certain dimensions, like solvency, liquidity, profitability, and activity (Hillier et al., 2010). However, this analysis fails to provide a unified and representative evaluation of the overall performance of the cooperative (Salmi & Martikainen, 1994). The challenge is therefore to derive a single summary measure of different key performance indicators for each cooperative in order to assess the performance of cooperatives.

1.3. OBJECTIVES

The purpose of this theoretical and empirical study is to evaluate the performance of Dutch agricultural and horticultural cooperatives in the recent past, between 1993 and 2012. The rationale of this study is that a theoretical and empirical evaluation of the performance of cooperatives could be valuable to CFs, MFs, creditors, lenders, and those who are interested in the performance of Dutch agricultural and horticultural cooperatives. The objectives of this research are:

- To provide a theoretical overview of the different capital structures that apply to agricultural and horticultural CFs in Northern America and Western Europe.
- To provide an overview of the developments in the capital structure of Dutch agricultural and horticultural cooperatives in the recent past, between 1993 and 2012.
- To examine the performance of Dutch agricultural and horticultural cooperatives in the recent past, between 1993 and 2012.
- To examine the link between the performance scores of Dutch agricultural and horticultural cooperatives from in the recent past, between 1993 and 2012, and their capital structure.

1.4. OUTLINE

Chapter 2 presents a theoretical overview of the different capital structures that apply to agricultural and horticultural CFs in Northern America and Western Europe. Chapter 3 provides an overview of methodologies that are selected to examine the performance of Dutch agricultural and horticultural cooperatives in the recent past, between 1993 and 2012, and to examine the relationship between the performance and the variables that reflect the capital structure. Chapter 4 assesses the data that has been used. Chapter 5 obtains insight in the results of this study. Chapter 6 provides a discussion and recommendations for future research. Chapter 7 presents the conclusions.

2. COOPERATIVE CAPITAL STRUCTURES

2.1. INTRODUCTION

This chapter provides an overview of the different capital structures that apply to agricultural and horticultural CFs in Northern America and Western Europe. The chapter starts with a description of the capital structure of Traditional Cooperatives (TCs). Afterwards the “capitalization dilemma” is discussed, which has caused a movement from the capital structure of TCs towards new cooperative models with new kind of capital structures. These cooperative models are discussed and, in addition, examples of existing cooperatives are presented.

2.2. TRADITIONAL COOPERATIVES

The International Co-operative Alliance (1995) has formulated seven cooperative principles that are based on empirical evidence and practical experience. The common view of the ICA is that CFs has to follow these principles in order to be successful. One of these principles refers to the capital structure of the CF and the economic participation of MFs. This principle states that members should contribute fairly to the equity capital of the CF. At least part of this capital is common property of the CF. In the most traditional form, all equity capital is derived from the MFs and owned by the CF (Van Dijk & Klep, 2005). TCs rely therefore primarily on unallocated equity capital, generated from operations, and unallocated debt capital, generated from bank financing (Barton, 2004).

The contribution of an individual member to the capital structure of the CF is proportional to their use of the cooperative (Van Dijk, 1995). Depending on the type of cooperative, a “performance-based price” is paid or received by members (Van Bekkum, 2006). For example, the price paid by a marketing cooperative acts like a financial buffer, i.e. the price will increase after a good result and will decrease after a disappointing result. Therefore, the value of the equity capital will decrease after a poor financial performance and will increase after a good financial performance (Van Dijk, 1995).

2.3. CAPITALIZATION DILEMMA

Especially agricultural cooperatives have played an important role in the market economies of Northern America and Western Europe as indicated by their sales and market share (Chaddad & Cook, 2004). However, the capitalization of cooperatives has been a problem (Barton, 2004) during the late eighties and the early nineties. Research from the NCR (1990) shows that Dutch cooperatives have improved their balance sheet ratios in the eighties by attracting more equity capital or by increasing the retained earnings. The NCR noticed that the average solvency over 50 Dutch agricultural and horticultural cooperatives increased by nearly seven percentage points over the period 1982-1988, while the total member funding increased in the same period relatively more than the equity capital. This indicates that cooperatives only partially succeeded in attracting equity capital from their MFs. Dutch cooperatives therefore started to initiate new financing models. Problems surroun-

ding cooperative funding are not new or a typical Dutch phenomenon. Cooperatives in countries like France, Ireland, Germany and Denmark faced the same trends which have led to new financing models or an initial public offering of CFs (NCR, 1990).

Important driving forces behind the problems surrounding the capitalization of cooperatives are: increased consumer concerns for food quality and safety, market deregulations, technological changes and globalization (Kalogeras et al., 2007). Another driving force is the process of industrialization (Stefanson & Fulton, 1997) that has been defined by Boehlje (1996) as “*the application of modern industrial manufacturing, production, procurement, distribution and coordination concepts to the food and industrial product chain*”. These driving forces have led to a growing competition between cooperatives and IOFs worldwide. However, many cooperatives have faced a capitalization dilemma (Van Dijk & Klep, 2005). On one hand, there is a growing need for risk capital to pursue investments (NCR, 1990; Van Dijk & Klep, 2005) and on the other hand, members are critical about such investments because the expected return of investments will be gained in the future which causes the possibility that these members will not benefit from these investments (Van Dijk & Klep, 2005). Cooperatives had to find therefore other ways to attract more equity capital.

2.4. NEW COOPERATIVE MODELS

Cooperatives have experimented over time with several new cooperative models varying from fine tuning the traditional cooperative model to converting towards cooperative models that are close to the structure of IOFs (Barton, 2004). Determinants of the TC organizational structure are examined by several authors, like for example LeVay (1983), Cook (1995) & Nilsson (1998). Chaddad & Cook (2004) used an ownership-control rights typology to create an understanding of the new cooperative models. An elaboration of these approaches and their capital structure, derived from Chaddad & Cook (2004), is presented below. If possible, a practical example of the transition from a TC towards the new cooperative model is given.

- 1) *Proportional Investment Cooperatives* – This model forces members of the cooperative to contribute equity capital in proportion to their use through policies like base capital plans, narrowed product scopes, and capital acquisition (Chaddad & Cook, 2004). There are no examples of Dutch agricultural cooperatives that moved towards the model of a proportional investment cooperative. However, the transition towards this model has been frequently used in restructuring processes of large U.S. dairy cooperatives, like Riceland, CoBank, Land O’ Lakes, and Dairy Farmers of America (Chaddad & Cook, 2002; Hanisch & Müller, 2012).
- 2) *Member-Investor Cooperatives* – Within this model, the cooperative distributes net earnings in proportion to member shareholdings instead of their transactions with the CF. Therefore, members will have more incentives to invest and retain equity capital in the cooperative (Chaddad & Cook, 2004). An example of a TC that switched towards the model of member-investor cooperative concerns Campina Melkunie (Chaddad & Cook, 2002). Campina Melkunie

was managed on the basis of adding value to the member production. However, the CF required gradually more long-term equity capital. Therefore, new kinds of bonds were issued to the members. The bonds were compulsory, proportional to the volume of the delivered milk, and transferable to non-members. In addition, the CF established market conditions for the allocation of capital to prevent a situation in which the investor-relationship between the CF and their members becomes too important (Van Dijk, 1997).

Another example of a cooperative who switched towards the model of a member-investor cooperative is Friesland Dairy Foods (Hanisch & Müller, 2012). Friesland Dairy Foods decided that the high milk prices, due to good results in Asia, were harmful for the incentives of farmers. In order to become more effective, the CF followed the weighted average of the best paying dairy firms in the country. At the same time members were invited to become shareholders in the activities of the CF in Asia. The unallocated equity was transformed in A-shares, held by the CF. Members could have B-shares without a proportionality-to-milk restriction. These shares were possible because of the fact that the price determination was made independent of Board decisions. Cooperative shares are in principle based on their nominal value and can only gain higher value by means of the expected future value of the CF. That future value increases by the expected profits of the CF. However, profits of the CF are at the expense of the price benefits of members. This was the reason that members abolished the system. Ultimately, the A-shares and B-shares were converted into a new form of unallocated member capital in 2007, after a merger with Campina (Van Dijk, 1997). After the merger between Friesland Dairy Foods and Campina, the new cooperative decided to get rid of the complex financial structure and members are therefore currently no longer shareholders anymore (Hanisch & Müller, 2012).

- 3) *New Generation Cooperatives* – This model relaxes the restriction on residual claim transferability but maintains the user-ownership principle. The rationale for the transferability is to provide liquidity and capital appreciation through secondary market valuation (Chaddad & Cook, 2004). An example of a cooperative that is moved towards the model of a New Generation Cooperative (NGC) is AVEBE, a cooperative that produces starch potatoes. The transferability of the delivery rights shares, i.e. secondary market, and restricted membership are two unique elements that distinguish the NGC from a TC structure (Kalogeras et al., 2007). The shares of AVEBE are freely transferable between members. Within the production period, each member is responsible for producing and delivering the amount of potato assigned to their shares (Van Dijk, 1995; Kalogeras et al., 2007).
- 4) *Cooperatives with Capital Seeking Companies* – This model weakens the restriction that the ownership rights should be restricted to members. However, the cooperative does not convert to an IOF because external equity capital is acquired by a separate legal company, i.e. a strategic alliance, a trust company, or a publicly held subsidiary (Chaddad & Cook, 2004). There is no example of a Dutch agricultural cooperative that moved towards a model of a co-

operative with capital seeking companies. However, an example of a cooperative from the banking sector that applied this model is the Rabobank Group. The Rabobank Group is an international financial services provider that operates on the basis of cooperative principles (Rabobank, 2014).

- 5) *Investor-Share Cooperatives* – In this model, the CF acquires non-member capital without converting to an IOF. The investor-share cooperative issues separate equity shares in addition to the traditional cooperative ownership rights (Chaddad & Cook, 2004). An example of a cooperative that moved in the direction of an investor-share cooperative is the Dutch meat company Dumeco. This company was established in 1995 out of two CFs and an IOF. Both cooperatives had to deal with unusual market circumstances. Virtually no member commitment remained due to an overcapacity in both Dutch and German slaughtering plants. Therefore it appeared difficult to finance the CF with member capital. A merger between two CFs and an IOF was therefore established as the CFs threatened to go broke. The new company was set up as IOF and users were invited to become member-investors. Profits of the new firm were distributed as co-maker fees which are transferred as certificates of shares. These certificates are transferable among members and non-members (Van Dijk, 1997).
- 6) *Investor-Oriented Firms* – In this model, the CF changes to a private profit organization. The conversion is usually followed by public listing which allows the organization to acquire additional risk capital from investors (Chaddad & Cook, 2004). In the Netherlands, none of the agricultural cooperatives have followed this transition path. However, the pharmaceutical wholesaler OPG, owned by a CF of pharmacists, converted into a public listed company in the early nineties (Van Dijk, 1995).

Despite the differences in the applied models, cooperatives generally moved, under the pressure of the capitalization dilemma, towards a process of allocating capital. However, most cooperatives returned over time towards the capital structure of TCs by introducing retained patronage refunds, i.e. revolving equity, and retained earnings, i.e. permanent, unallocated capital (Barton, 2004). This development is supported by the findings of Van Dijk (2004), who found that the general reserves of cooperatives grew relatively stronger (+69%) compared to the allocated equity capital (-25%) and the allocated debt capital (+33%) over the period 1993-2003. The findings of Van Dijk (2004) are based on an analysis of the 26 largest cooperatives in 2003 from the Dutch agribusiness and hortibusiness. Van Dijk (2004) argued that the movement from allocated towards unallocated capital occurred because of the favorable properties of the unallocated equity form. This type of capital is not retrievable and therefore permanently available. These characteristics are more difficult to achieve with allocated capital forms.

3. METHODOLOGY

3.1. INTRODUCTION

This chapter presents the methodological approach of this research and provides background information on the performance assessment of cooperatives and IOFs. Within this section, the most common used method, i.e. financial ratio analysis, is discussed. The limitations of this method are discussed in the section thereafter. These limitations are prevented by the estimation of composite indicators by using Data Envelopment Analysis (DEA) to assess the performance of cooperatives. The methodology to examine the relationship between the performance and variables that reflecting the capital structure of cooperatives is presented in the last section.

3.2. FINANCIAL RATIO ANALYSIS

The objectives of cooperatives and IOFs differ significantly (Schrader et al., 1985), as reflected in the strategy and the financial performances of these firms (Sexton & Iskow, 1993) in terms of profitability, capital structure and operating efficiency (Lerman & Parliament, 1990). Traditional measures of financial performance are useful to examine the economic viability of a firm. According to Staatz (1984) and Gentzoglanis (1997), theoretical and economic analyses have demonstrated that the performance of cooperatives, measured in terms of profitability, leverage, solvency, liquidity and efficiency, could be significantly different from the performance of IOFs.

The most commonly used method for measuring and evaluating the financial performance of cooperatives and IOFs is financial ratios analysis. There is a long tradition concerning the development and use of financial ratios to evaluate the performance of business firms (see inter alia: Altman, 1968; Horrigan, 1968; Barnes, 1987; Ambrose & Seward, 1988). This section describes the financial ratios theoretically from a cooperative perspective. Distinction is made between performance measured in terms of solvency, liquidity, profitability and activity (Sexton & Iskow, 1993).

Solvency ratios are used as indicator of financial performance (Baourakis et al., 2002; Boyd et al., 2007). These ratios describe the preference of the management of a cooperative for equity capital versus debt capital (McKee, 2008). Chesnick (2000) defines the purpose of solvency ratios to measure the extent to which a firm has certain obligations that have to be met; regardless the cash flow of the firm. Solvency depends on the answer to the question whether the firm is able to repay its debt through the sale of its assets after liquidation (Blommaert & Blommaert, 2008). The following solvency ratios are obtained from literature:

$$1) \text{ Total debt ratio} = \frac{\text{Total debt}}{\text{Total assets}}$$

The total debt ratio is the most common used solvency ratio and takes into account all debts of all maturities to all creditors. This ratio can also be defined as solvency ratio. An outcome of 0.60 indicates that the firm has € 0.60 in debt for every € 1 in assets. Therefore there is € 0.40 in equity (€ 1 – €

0.60) for every € 0.60 in debt (Hillier et al., 2010). The lower the ratio, the better the solvency is (Blommaert & Blommaert, 2008). The total debt ratio can be improved by taking steps to either increase the value of the assets, or to pay off debt (Chesnick, 2000). Two useful variations, i.e. the debt-equity ratio and the equity multiplier, can be derived from the total debt ratio (Hillier et al., 2010).

$$\text{a. Debt - equity ratio} = \frac{\text{Total debt}}{\text{Total equity}}$$

$$\text{b. Equity multiplier} = \frac{\text{Total assets}}{\text{Total equity}}$$

Interesting is that, given any one of these three ratios, one could immediately calculate the other ratios. This shows that all three ratios provide the same kind of information (Hillier et al., 2010).

$$2) \text{ Total equity ratio} = \frac{\text{Total equity}}{\text{Total assets}}$$

A similar ratio like the total debt ratio is the total equity ratio. In comparison with the total debt ratio, the total debt in the formula of the total debt ratio is replaced by total equity. The most important difference between both ratios is that a higher outcome of the total equity ratio indicates better performance, while a relatively high outcome of the total debt ratio indicates a worse performance.

$$3) \text{ Interest coverage ratio} = \frac{\text{EBIT}}{\text{Interest}}$$

Another common measure of long-term solvency is the interest coverage ratio. The interest coverage ratio measures how well a firm has its interest obligations covered. A problem with the interest coverage ratio is that it is based on EBIT, i.e. earnings before interest and taxes, which is not really a measure of cash available to pay interest because the depreciation has been deducted out (Hillier et al., 2010). The higher the interest coverage ratio, the smaller the risk that the firm cannot meet its interest obligations (Blommaert & Blommaert, 2008).

$$4) \text{ Cash coverage ratio} = \frac{\text{EBIT} + \text{Depreciation}}{\text{Interest}}$$

The cash coverage ratio is a basic measure of the firm's ability to generate cash from their operations. This ratio is frequently used as a measure of cash flow available for cooperatives to meet its financial obligations (Hillier et al., 2010).

Liquidity ratios measure the ability to fulfill short term commitments with (liquid) assets (Chesnick, 2000). High liquidity reflects an ability to repay debts and is valuable for obtaining debt capital (McKee, 2008). These ratios can therefore also be interpreted as short-term solvency, i.e. the capacity of the firm to meet its short-term liabilities (Hillier et al., 2010). Liquidity management is commonly used in economic literature to assess the financial performance of firms (Adelaja et al., 1999;

Barton et al., 1993; Richards & Manfredo, 2003). The following liquidity ratios are obtained from literature:

$$1) \text{ Current ratio} = \frac{\text{Current assets}}{\text{Current liabilities}}$$

The current ratio is one of the best known and most applied ratios to evaluate the performance of a firm. The expectation is to see a current ratio of at least 1. A ratio of less than 1 could indicate that the net working capital, i.e. current assets minus current liabilities, is negative. This could indicate potential financial problems (Hillier et al., 2010). Another liquidity ratio that might be interested for short-term creditors (Hillier et al., 2010), is the cash ratio.

$$2) \text{ Cash ratio} = \frac{\text{Cash}}{\text{Current Liabilities}}$$

Profitability ratios attempt to answer the question whether a firm is able to make any money for their members and/or shareholders. Chesnick (2000) states that profitability ratios measure the success of firms in earning a net return on its operations. The following profitability ratios are obtained from literature:

$$1) \text{ Profit margin} = \frac{\text{Net income}}{\text{Sales}}$$

Firms pay a great deal of attention to their profit margin (Hillier et al., 2010). Generally, IOFs pay more attention to profit margins compared to cooperatives.

$$2) \text{ Returns on assets (ROA)} = \frac{\text{Net income}}{\text{Total assets}}$$

The return on assets (ROA) is a measure of profit per asset value (Hillier et al., 2010).

$$3) \text{ Return on equity (ROE)} = \frac{\text{Net income}}{\text{Total equity}}$$

The return on equity (ROE) is a measure of how the shareholders have fared during the year. Benefiting shareholders or members is an important goal for many firms, so the ROE is, in an accounting sense, the true bottom line of performance (Hillier et al., 2010).

Activity ratios are also commonly used in the agribusiness literature to assess financial performance (Hazledine, 1989; Lerman & Parliament, 1990). A highly efficient firm is able to use its labor and capital resources to produce output at a lower cost compared to other firms. The following activity ratios are considered:

$$1) \text{ Total asset turnover} = \frac{\text{Net sales}}{\text{Total assets}}$$

Total asset turnover is one of the most common used activity ratios that measures the amount of sales generated for every asset used. A relatively high outcome of the ratio compared to the outcomes of other cooperatives could indicate that the cooperative is using relatively less assets to generate sales, while a low outcome could indicate that the cooperative is using too many assets to generate sales. Therefore, in general, it is assumed that the higher the outcome of the total asset turnover ratio, the better the performance of the corresponding cooperative.

As mentioned above, financial ratio analysis enables to decompose performance in terms of solvency, liquidity, profitability and activity. It is concluded that literature is rich in providing financial indicators that examine performance. Despite the fact that these indicators are useful, there are two important limitations that lower the relevance of this analysis, especially for cooperatives.

The first limitation concerns the possibility of inconsistency. Ratio analysis is mostly univariate in nature and emphasis is therefore placed on the individual signs of the ratios (Altman, 1968; Athanassopoulos & Ballantine, 1995). Financial ratio analysis in this fashion is therefore sensitive for interpretation errors (Altman, 1968). Ling & Liebrand (1998) noticed that current tools to measure cooperative performance are useful, but they fall short in providing a clear cut comparison between firms. The second limitation concerns the inherent problems of financial ratios discussed by Chesnick (2000), who states that some of these problems are intrinsic with the ratios while other problems are caused by the cooperative's nature. Chesnick (2000) states, for example, that low profitability ratios can be misleading due to the fact that cooperatives are not only profit motivated but also focused on serving their members interests. This could create a conflict of interest.

Incorporating only financial ratios just shows the economic and financial performance of cooperatives and does not do justice to the specific cooperative objectives. Therefore, four different member benefits are observed and added to the analysis. The first member benefit refers to a price guarantee, i.e. a price cap or reserve price, offered by the CF to its MFs. On one hand, MFs who are selling their products to the CF take their advantage by knowing in advance what the reserve price is that they will receive. On the other hand, MFs who are buying products from the CF take their advantage by knowing in advance what the maximum price is that they have to pay. The second member benefit refers to the security of sales which means that the CF allows the MF to sell its products to the CF and the MF knows therefore in advance that the CF will buy its products. The uncertainty that the MF cannot sell its products therefore disappears. The third member benefit is closely related to the second member benefit and refers to the security of supply which means that the CF allows the MF to buy its required products, like raw materials, from the CF and the MF can therefore always consult the CF for the procurement of their required products. The fourth member benefit refers to transfer pricing. The possibility exist that CFs make use of transfer pricing to benefit from their participating interest in group companies, joint ventures, and other participating interests. The MFs take advantage of transfer pricing because the CF can achieve a lower cost price that lowers the costs for the CF in comparison to "normal circumstances". However, the difference between IOFs and cooperatives is

that the advantage of IOFs only results in a higher profit margin for the IOF, while the advantage of the CF reaches the MFs.

3.3. DATA ENVELOPMENT ANALYSIS

The limitations of financial ratio analysis, like explained above, can be avoided by estimating a composite indicator to assess the performance of cooperatives. The OECD (2008) defined a composite indicator as mathematical collection of indicators to measure multidimensional concepts that cannot be captured in one single indicator. Composite indicators have become a useful tool for comparing the performance of firms (OECD, 2008). The composite indicator can be estimated by using Data Envelopment Analysis (DEA). The DEA method is first introduced by Charnes et al. (1978). This method is a nonparametric approach to measure the efficiency of decision-making units (DMUs) relative to a benchmark of best performing firms (Ray, 2004). A simplification of a cooperative performance frontier is presented in Fig. 3.1. Each dot in the chart represents a cooperative and a frontier is drawn among the outside cooperatives. The cooperatives lying on the frontier are firms that represent the benchmark of best performing firms, while the cooperatives that are not on the frontier are ranked based on the distance between the dot in the chart and the frontier, i.e. the cooperative furthest away from the frontier is considered as worst performing firm. The more performance indicators there are added, the more dimensions there are used to estimate the composite indicators.

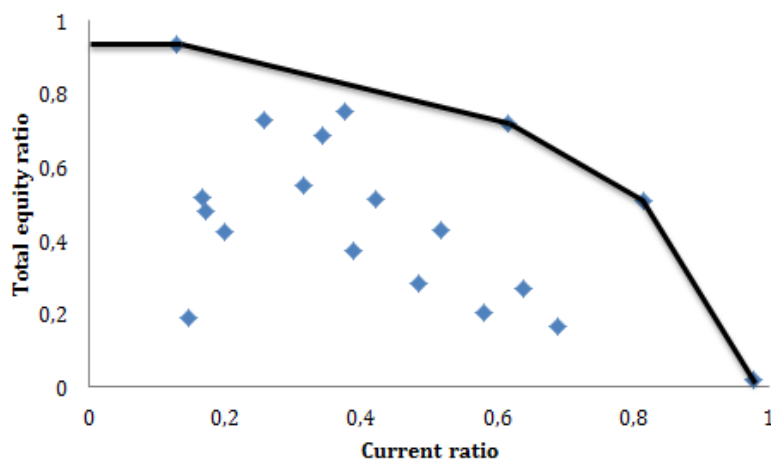


Fig. 3.1. An example of a cooperative performance frontier

The DEA model was first introduced by Charnes et al. (1978), who built on earlier work of Farrell (1957). The original CCR model was only applicable to technologies characterized by constant returns to scale. However, Banker et al. (1984) extended the original CCR model to accommodate technologies that expose variable returns to scale. In subsequent years, a large number of researchers have provided a contribution to the methodology which has resulted into a large volume of literature surrounding CCR and BCC models, and the DEA approach emerged as a valid alternative to regression analysis to measure efficiency (Ray, 2004). The DEA method was used by several authors, see inter alia Doucouliagos & Hone (2000), Singh, et.al. (2001), Boyle (2004), and Soboh et al. (2009b), to

assess the performances of IOFs and cooperatives. The DEA method has the ability to obtain a composite indicator that captures a set of performance indicators into a single summary measure of performance. The DEA model is therefore very useful to measure the performance of cooperatives. The linear programming model for deriving the composite indicator (C_{j_0}) of CF j_0 is derived from Horta et al. (2012) and presented below:

$$C_{j_0} = \max \sum_{r=1}^s u_r y_{rj_0}$$

Subjected to:

$$\sum_{r=1}^s u_r y_{rj} \leq 1, \quad j = 1, \dots, n$$

$$u_r \geq 0, \quad r = 1, \dots, s \quad (1)$$

In model (1), y_{rj} corresponds to the value of the output indicator r ($r = 1, \dots, s$) in cooperative j ($j = 1, \dots, n$), where higher values correspond to better performance. Model (1) is based on the model formulation of Cherchye et al. (2004) and is equivalent to the original DEA model (Charnes et al., 1978), with all indicators considered as outputs and a “dummy input” equal to a value of one for all cooperatives (Horta et al., 2012). Output indicators with a negative value are left out in the DEA method. The rationale of the DEA procedure, like presented in model (1), is well defined by Horta et al. (2012), who state that since it is difficult to identify a priori a set of weights to each indicator that all firms would agree, each cooperative select its own weights, such that its composite indicator is as high as possible compared to the composite indicators of other cooperatives evaluated with similar weights. A value of the composite indicator equal to one indicates best performance.

A limitation of the DEA method is that it is a deterministic approach which implies that the evaluation of performance assumes that there are no random factors which affect the location of the frontier. This assumption causes the possibility of random noise or measurement errors in the data. To prevent that this limitation becomes harmful for the results, bootstrapping is applied to ensure a robust performance evaluation (Horta et al., 2012). Bootstrapping is introduced by Efron (1979). The steps to obtain the bias, the bias corrected efficiency scores, the standard deviations and the confidence intervals are developed by Simar & Wilson (1998) and presented below. The elaboration of these steps is derived from Horta et al. (2012).

- 1) Compute the performance estimates \hat{C}_j for each DMU $j = 1, \dots, n$ by solving model (1).
- 2) Use Kernel density estimation and the reflection method to generate a random sample of size n from $\{\hat{C}_j, j = 1, \dots, n\}$, resulting in $\{C_{jb}^*, j = 1, \dots, n\}$.
- 3) Generate a pseudo dataset $\{(x_j^*, y_j^*), j = 1, \dots, n\}$ in order to form a bootstrap technology.
- 4) Compute the bootstrap estimate of performance C_{jb}^* of \hat{C}_j for each $j = 1, \dots, n$.
- 5) Repeat steps 2-4 B times ($B = 2000$) to obtain a set of estimates $\{C_{jb}^*, b = 1, \dots, B\}$.

After computing the bootstrap values, the bias of \hat{C}_j can be obtained as:

$$\widehat{bias}_B(\hat{C}_j) = B^{-1} \sum_{b=1}^B \hat{C}_{jb}^* - \hat{C}_j \quad (2)$$

The bias-corrected estimates of C_j can be obtained as:

$$\hat{\hat{C}}_j = \hat{C}_j - \widehat{bias}_B(\hat{C}_j) = 2\hat{C}_j - B^{-1} \sum_{b=1}^B \hat{C}_{jb}^* \quad (3)$$

and the confidence intervals for C_j are obtained by performing the following steps: (1) sort the values $(\hat{C}_{jb}^* - \hat{C}_j)$ for $b = 1, \dots, B$ in increasing order, and delete $((\alpha/2) \times 100)\%$ of the elements at either end of the sorted array: (2) set $-\hat{b}_\alpha^*$ and $-\hat{a}_\alpha^*(\hat{a}_\alpha^* \leq \hat{b}_\alpha^*)$, equal to the end points of the sorted array. The estimated $(1 - \alpha)\%$ confidence interval is obtained as:

$$\hat{C}_j + \hat{a}_\alpha^* \leq C_j \leq \hat{C}_j + \hat{b}_\alpha^* \quad (4)$$

3.4. TRUNCATED REGRESSION

Based on the previous chapter, it is concluded that the Dutch agricultural and horticultural co-operatives have undertaken changes in their capital structure in order to improve their performance. However, the question is whether there actually exist a relationship between the performance of co-operatives and the variables representing the capital structure. Truncated regression is used to examine this relationship. This kind of regression is preferred over normal OLS regression since the truncated regression takes into account that the performance efficiency scores are equal or below a value of 1. Truncated regression is used to explore the variables of the capital structure that are associated with good performance levels. The truncated regression model is specified by Horta et al. (2012) according to algorithm #2 proposed by Simar & Wilson (2007):

$$C_{jt} = \alpha_0 + z_{jt}\beta + \varepsilon_{jt} \quad (5)$$

Subscript j represents the j^{th} cooperative ($j = 1, \dots, n$), subscript t represents the time period ($t = 1, \dots, l$), α_0 is an intercept, z_{jt} represents the set of regressors previously identified, β denotes the regression coefficients and $\varepsilon_{jt} \sim N(0, \sigma_\varepsilon^2)$ is the error term with a $N(0, \sigma_\varepsilon^2)$ distribution with a truncation at $(1 - \alpha_0 - z_{jt}\beta)$. Note that C_{jt} corresponds to the performance level of cooperative j in year t , estimated by using model (1) and the bootstrapping technique (Horta et al., 2012).

4. DATA

4.1. INTRODUCTION

This chapter discusses the dataset that has been created for this research. The dataset contains data of cooperatives that belong, from current and historical point of view, to the largest cooperatives in the Dutch agribusiness and hortibusiness in terms of turnover. The data is collected from the statutes, the consolidated balance sheets and the consolidated financial statements of the annual reports¹ of the corresponding cooperatives. The dataset covers a time period of twenty years, ranging from 1993 to 2012. As a result of a relatively large number of mergers and acquisitions, the total number of 41 CFs in the first years of dataset is ultimately reduced to 21 CFs in 2012. Distinction is made between dairy cooperatives, hortibusiness cooperatives, input supply cooperatives, and other cooperatives. This subdivision is also used in the past by the Dutch National Cooperative Council (NCR) in annually published overviews of the Dutch largest agricultural and horticultural cooperatives in terms of their turnover. In addition to the distinction based on the type of cooperative, the dataset is divided in three parts, namely 1) a part on financial ratios, 2) a part on member benefits and 3) a part on the variables that reflecting the capital structure. These parts are discussed below in separate sections.

4.2. DESCRIPTIVE STATISTICS OF THE FINANCIAL RATIOS

The part of the dataset on financial ratio analysis consists of ten different variables, namely 1) total assets, 2) total equity capital, 3) Earnings Before Interest and Taxes (EBIT), 4) depreciations, 5) interest expenses, 6) current assets, 7) current liabilities, 8) net results, 9) net sales and 10) total number of members. The data enables to calculate all financial ratios like presented in the previous chapter. However, not all financial ratios could be taken into account in the DEA analysis due to the limitation that only a limited number of inputs and outputs can be used for the estimation of the composite indicator. Therefore, four financial ratios are selected: the total equity ratio represents solvency, the current ratio measures liquidity, the return on equity ratio is a measure of profitability, and the assets turnover ratio is an activity ratio that measures the firms' efficiency in deploying assets. Reference is made to the previous chapter for the definitions and formulas of these ratios.

The descriptive statistics of the selected ratios are presented in table 4.1. The entire time period of the data set is divided into four equal periods of five years. The specification of these periods is shown in the first column of the table. For each time period, the mean and standard deviation of the observations are presented for the dairy cooperatives, the hortibusiness cooperatives, the input supply cooperatives, and the other CFs. In addition, the mean and standard deviation are shown for all

¹ The annual reports of cooperatives cover a period of twelve months but not all of these reports cover a calendar year, i.e. from 1 January until 31 December.

observations within each time period. The standard deviations in the table are presented in parentheses. The dataset is checked for outliers, but no outliers are observed.

Table 4.1.

Descriptive statistics of the considered cooperatives.

Period	Type of cooperative	No. of obs.	Solvency	Liquidity	Profitability	Activity
			<i>Total equity ratio</i>	<i>Current ratio</i>	<i>Return on equity</i>	<i>Asset turnover ratio</i>
1993 – 1997	Dairy	39	0.308 (0.119)	1.205 (0.342)	0.647 (1.154)	2.833 (0.394)
	Hortibusiness	58	0.203 (0.091)	0.685 (0.424)	0.068 (0.086)	3.730 (1.345)
	Input supply	56	0.459 (0.077)	1.829 (0.501)	0.079 (0.049)	2.731 (0.455)
	Others	25	0.397 (0.146)	1.197 (0.472)	0.045 (0.049)	1.604 (1.026)
	Total	178	0.334 (0.155)	1.241 (0.680)	0.199 (0.600)	2.896 (1.164)
1998 – 2002	Dairy	25	0.322 (0.086)	1.109 (0.178)	0.320 (0.290)	2.688 (0.536)
	Hortibusiness	33	0.262 (0.130)	0.638 (0.421)	0.052 (0.055)	3.370 (1.684)
	Input supply	52	0.479 (0.121)	1.772 (0.676)	0.058 (0.060)	2.480 (0.416)
	Others	30	0.410 (0.156)	1.255 (0.343)	0.040 (0.070)	1.720 (0.947)
	Total	140	0.385 (0.155)	1.278 (0.666)	0.100 (0.172)	2.563 (1.144)
2003 – 2007	Dairy	25	0.348 (0.127)	1.131 (0.260)	0.234 (0.186)	2.247 (0.356)
	Hortibusiness	29	0.264 (0.138)	0.821 (0.355)	0.087 (0.065)	3.353 (1.401)
	Input supply	45	0.548 (0.130)	2.050 (0.827)	0.071 (0.065)	2.536 (0.518)
	Others	30	0.464 (0.151)	1.485 (0.457)	0.042 (0.083)	1.939 (1.007)
	Total	129	0.426 (0.177)	1.464 (0.771)	0.100 (0.131)	2.525 (1.040)
2008 – 2012	Dairy	20	0.414 (0.165)	1.439 (0.483)	0.173 (0.143)	2.216 (0.400)
	Hortibusiness	25	0.325 (0.157)	0.869 (0.440)	0.014 (0.071)	3.530 (1.447)
	Input supply	36	0.500 (0.095)	1.781 (0.583)	0.067 (0.055)	3.310 (1.552)
	Others	30	0.502 (0.135)	1.578 (0.528)	0.058 (0.054)	1.956 (1.139)
	Total	111	0.447 (0.157)	1.463 (0.636)	0.073 (0.109)	2.788 (1.447)

4.3. THE PRESENCE OF THE MEMBER BENEFITS

The part of the dataset on the presence of member benefits covers the four member benefits that are discussed in the previous chapter. Based on the annual reports, the statutes and the websites of the corresponding cooperatives, the assessment has been made whether the benefits are present or not. The presence of the member benefits is ultimately included in the general performance assessment of the cooperatives by using discrete data, i.e. a value of one is assigned if the benefit is present and a value of zero is assigned if the benefit is not present. Discrete data is used because there is no continuous data available. An overview of the presence of the selected member benefits is presented in table 4.2.

Table 4.2.

Overview of the presence of the member benefits.

Type of CF	Presence of the benefit	Price guarantee	Security of sales	Security of supply	Transfer pricing
Dairy	Yes	5	109	0	107
	No	104	0	109	2
Hortibusiness	Yes	145	145	20	123
	No	0	0	125	22
Input supply	Yes	0	20	189	175
	No	189	169	0	14
Other	Yes	20	100	35	97
	No	95	15	80	18

During the assessment on the presence of the member benefits, potential rights and obligations of both the CFs and the MFs are not taken into account. This mainly applies to the member benefits “security of sales” and “security of supply”. The presence of these member benefits is assessed by looking whether it is possible for MFs to sell to or buy from the CF. Potential mandatory quantities or quality guarantees are disregarded. The assessment on the presence of a “price guarantee” of input supply cooperatives requires some explanation. Important aspects within this assessment are the changes in the auction system of hortibusiness cooperatives. According to McAfee & McMillan (1987), the auctioneer begins a traditional Dutch auction with a high asking price and this price is lowered until a participant of the auction is willing to accept this price or until the reserve price of the MF is met. MFs take their advantage in this traditional form by fixing a reserve price for their products. However, more auction methods are developed over time. Nowadays, it is still possible for MFs to charge a reserve price. However, according to the statutes of the CFs, this price is now used as target price and the CF is free to deviate in a wide range from that price. The extent of the advantage of MFs is therefore reduced compared to the past. However, this study is based on the presence of member benefits and not on the magnitude of the benefit. Therefore, the assumption is made that the member benefit is still present. For the assessment on the presence of “transfer pricing”, the underlying assumption is made that MFs always benefit from the advantages, i.e. the realization of a lower cost price, that are gained by the CFs from their interest in group companies, joint ventures, and other participating interests.

4.4. DESCRIPTIVE STATISTICS OF THE CAPITAL STRUCTURE

The last part of the dataset on the developments in capital structure includes six different variables, namely 1) the total assets, 2) the provisions, 3) the allocated equity capital, 4) the unallocated equity capital, 5) the allocated debt capital, and 6) the unallocated debt capital. The allocated equity capital is the equity capital on behalf of the members, like shares or certificates, while the unallocated

equity capital is the equity capital that is not on behalf of the members, i.e. on behalf of the cooperative like the general reserve. The allocated debt capital is the debt capital on behalf of the members, like for example members' loans and members debt accounts, while the unallocated debt capital is the debt capital that is not on behalf of the members, i.e. on behalf of the cooperative.

Table 4.3 shows the descriptive statistics of the variables representing the capital structure of all considered cooperatives together, i.e. no distinction is made between the different categories. Based on this table, it is observed that the total assets have increased over time. The provisions have first increased and decreased afterwards. Both the total equity capital and the total debt capital have increased, just like the unallocated equity capital and the unallocated debt capital. The allocated debt capital has decreased, while the allocated equity capital have first decreased and sharply increased afterwards. However, this increase in allocated equity capital is driven by the establishment of FrieslandCampina that started with a relatively large amount of allocated equity capital. A decrease in the allocated equity capital would have been observed if FrieslandCampina had been excluded. The next chapter discusses the developments in the capital structure in more detail.

Table 4.3.

The descriptive statistics of the variables that reflecting the capital structure of the cooperatives.

	1993	1999	2005	2011
Total assets (x € 1,000)	6,546,350	8,182,934	9,369,639	12,121,075
Index (1993=100)	100	125	143	185
Provisions (x € 1,000)	520,999	652,141	581,507	376,385
Index (1993=100)	100	125	112	72
Total equity capital (x € 1,000)	1,993,255	2,466,525	3,146,414	4,906,918
Index (1993=100)	100	124	158	246
Allocated equity capital (x € 1,000)	339,128	265,748	253,933	1,087,926
Index (1993=100)	100	78	75	321
Percentage of total equity capital	17	11	8	22
Unallocated equity capital (x € 1,000)	1,654,127	2,200,777	2,892,481	3,818,992
Index (1993=100)	100	133	175	231
Percentage of total equity capital	83	89	92	78
Total debt capital (x € 1,000)	4,032,096	5,064,268	5,641,718	6,837,772
Index (1993=100)	100	126	140	170
Allocated debt capital (x € 1,000)	510,549	473,442	619,243	247,392
Index (1993=100)	100	93	121	48
Percentage of total debt capital	13	9	11	4
Unallocated debt capital (x € 1,000)	3,521,547	4,590,826	5,022,475	6,590,380
Index (1993=100)	100	130	143	187
Percentage of total debt capital	87	91	89	96

5. RESULTS

5.1. INTRODUCTION

This chapter shows the (empirical) results of this research and starts with presenting the developments in the capital structure of the considered cooperatives. The second part of this chapter presents the results of the performance assessment of the cooperatives. The obtained performance efficiency scores are used in the section thereafter to explore the relationship between the performance efficiency scores and variables that reflecting the capital structure by applying a truncated regression with the performance efficiency scores as dependent variable and the variables that reflecting the capital structure as explanatory variables.

5.2. DEVELOPMENTS IN CAPITAL STRUCTURE

The first part of this chapter discusses the developments in the capital structure of the considered cooperatives. These developments are presented in Fig. 5.1-5.4. Each Fig. consists of three graphs: the first graph relates to the balance sheet totals, the second graph to the total equity capital and the third graph to the total debt capital. The year 1993 is the index year for the dairy cooperatives, the hortibusiness cooperatives, and the input supply cooperatives, while 1994 is the index year for the other cooperatives. The timespan of Fig. 5.1-5.4 is twenty years, between 1993 and 2012. An important general remark is that the figures include a size effect meaning that the relatively large cooperatives play a decisive role in the developments that are presented in the graphs. This applies for example to the dairy cooperatives where the size of FrieslandCampina is considerably larger compared to the size of the other dairy cooperatives in the same years.

The developments in the capital structure of the dairy cooperatives are presented in Fig. 5.1. Based on the first graph, it is concluded that the total assets, the equity capital and the debt capital have increased, while the provisions have decreased. The explanation of these developments is found in the second and third graph. Remarkable is that both the allocated equity capital and the allocated debt capital have generally decreased while both the unallocated equity capital and the unallocated debt capital have increased. However, the increase in unallocated capital is relatively larger than the decrease in allocated capital and therefore both the total equity capital and the total debt capital have increased and consequently the total assets have increased. Striking observations in the second and the third graph are the sharp decrease in allocated debt capital and the sharp increase in total equity capital and allocated equity capital in 2008. These developments are caused by the merger between Friesland and Campina, because the new cooperative FrieslandCampina has started with a relative large amount of allocated equity capital and a relative small amount of unallocated equity capital.

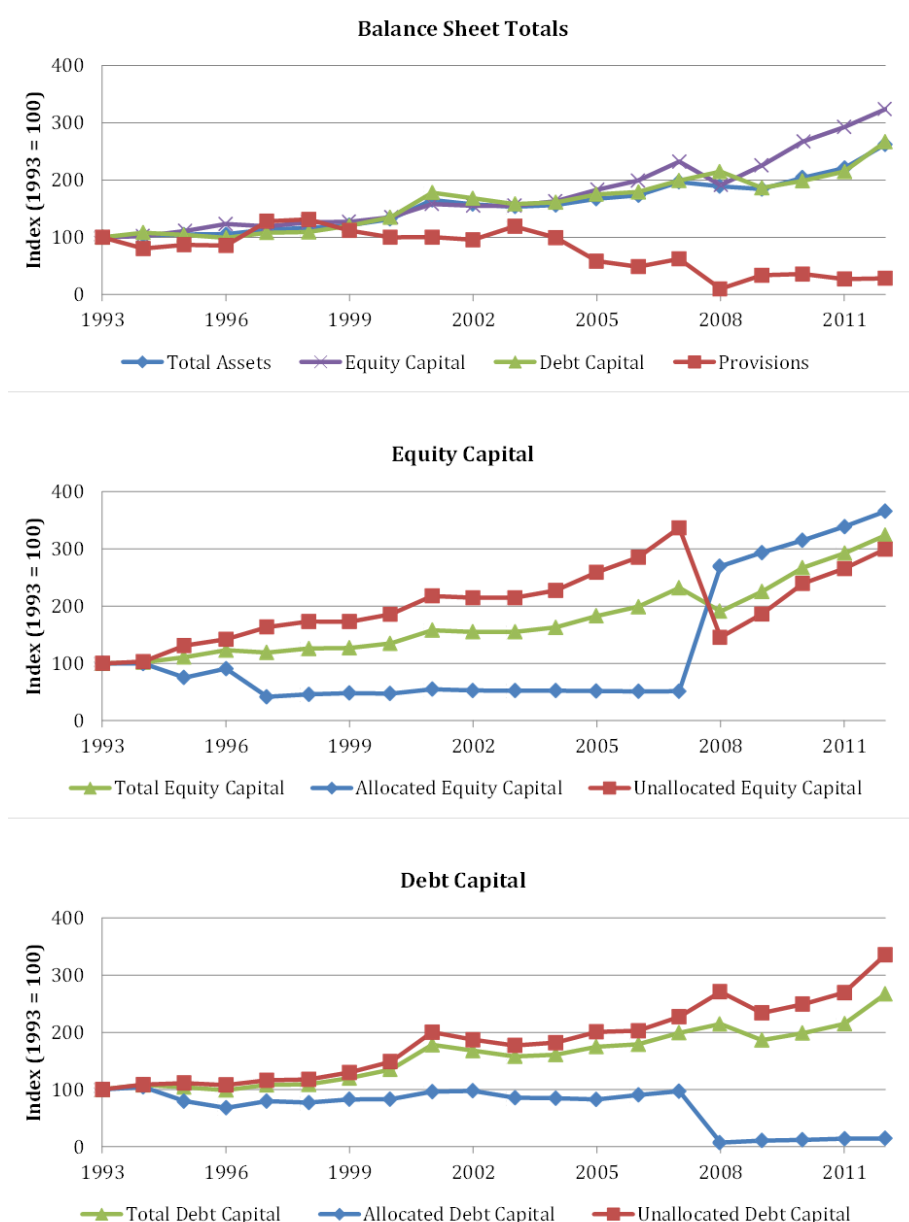


Fig. 5.1. The developments in the capital structure of dairy cooperatives between 1993-2012.

The developments in the capital structure of the hortibusiness cooperatives are presented in Fig. 5.2. Based on the first graph, it is concluded that the total assets has increased in the first years, then they were almost stable, and afterwards they have decreased. The total equity capital has increased, the provisions were quite volatile in nature and the total debt capital has first increased and slightly decreased afterwards. The explanation of these developments is found in the second and third graph of Fig. 5.2. A striking observation from the second graph is the sharp decrease in allocated equity capital that is caused by the hortibusiness cooperative Flora in 2000 and the establishment of FloraHolland in 2001. It is shown that the allocated equity capital has first increased sharply, then it started to decrease and afterwards it was quite stable. The unallocated equity capital increased over time. From the third graph, it is concluded that the unallocated debt capital has first increased and slightly de-

creased afterwards. A sharp decrease in the allocated debt capital is observed in 2006 and 2010. The decrease of 2006 is caused by the flower auction Aalsmeer, while the decrease of 2010 is caused by the Greenery. The developments in total equity capital and total debt capital are the main drivers behind the volatile developments of the total assets.

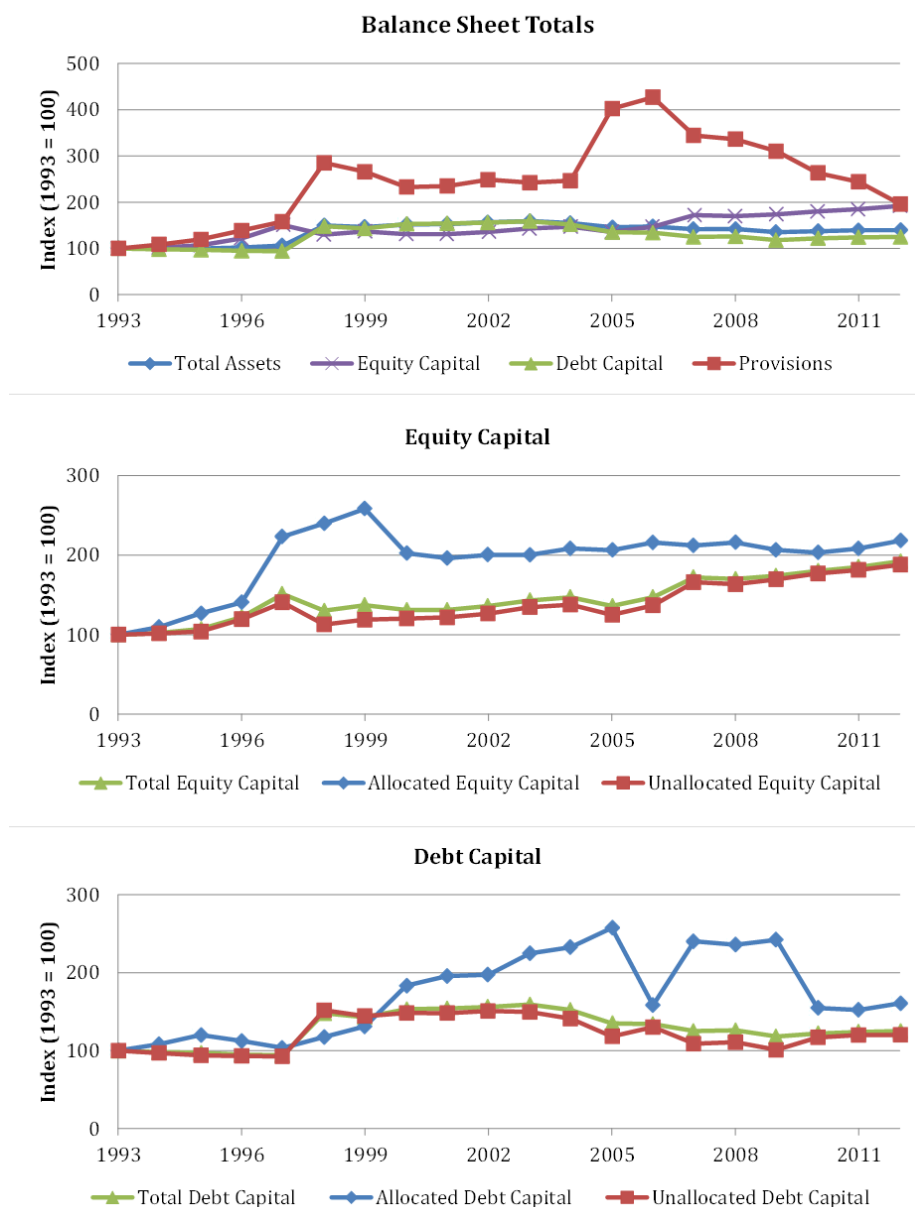


Fig. 5.2. The developments in the capital structure of hortibusiness cooperatives between 1993-2012.

The developments in the capital structure of the input supply cooperatives are presented in Fig. 5.3. Based on the first graph, it is concluded that the total assets and the total debt capital were quite stable in the beginning and have increased afterwards. The total equity capital has increased, and the provisions decreased but contain a sharp increase in the last two years. An explanation for these developments is presented in the second and the third graph. Within these graphs, it is shown that the

unallocated equity capital and the unallocated debt capital have increased. In addition, a decreasing trend in the allocated debt capital and the allocated equity capital is observed. The decrease in allocated equity capital towards zero is caused by Cehave, an input supply cooperative for compound feed and fertilizer, which is the only cooperative in this category that has allocated equity capital. In 1996, this capital has been reduced to zero. The decrease in the allocated equity capital and the allocated debt capital is relatively smaller than the increase in the unallocated equity capital and the unallocated debt capital. Consequently, the total equity capital and the total debt capital have increased and the total assets have therefore increased as well.

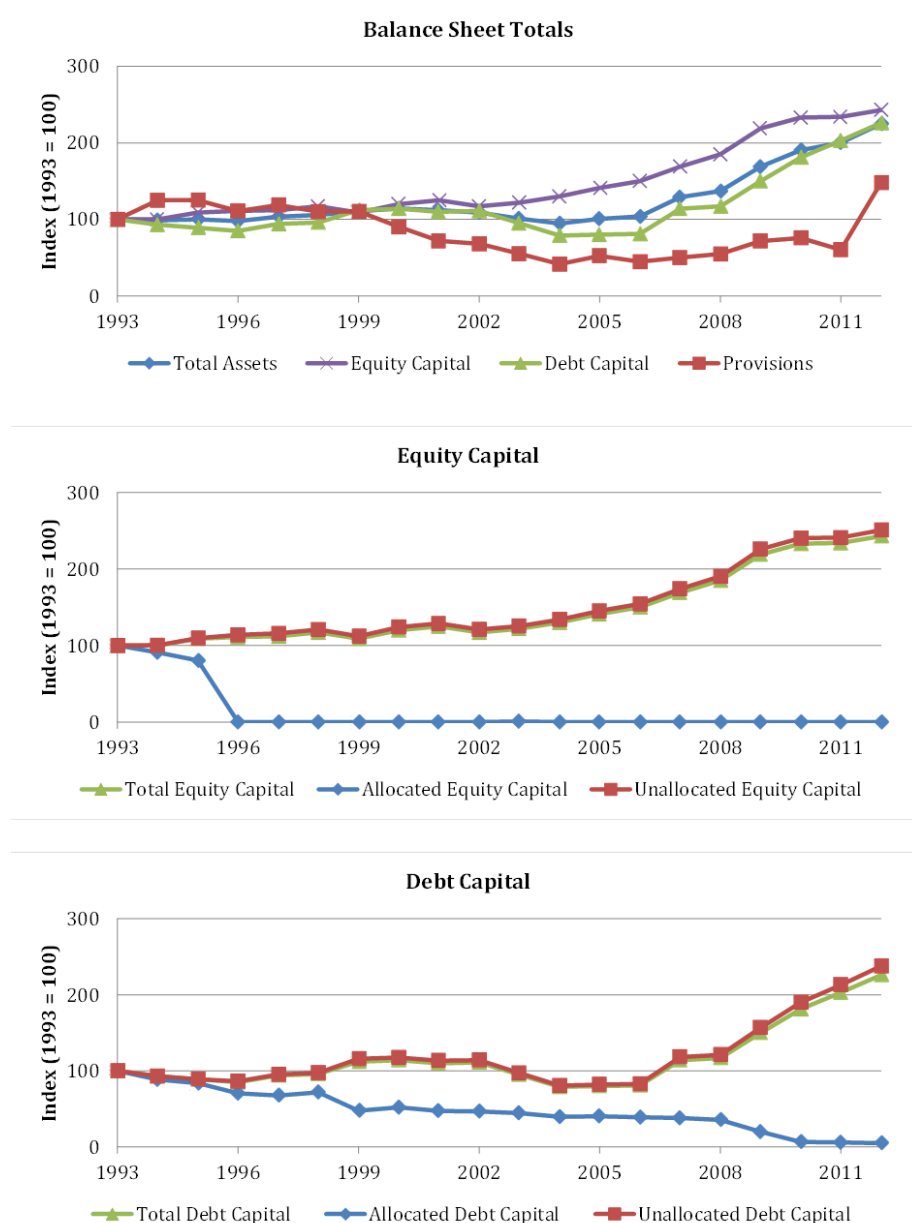


Fig. 5.3. The developments in the capital structure of input supply cooperatives between 1993-2012.

The developments in the capital structure of the others cooperatives are presented in Fig. 5.4. Based on the first graph, it is concluded that the total assets, the provisions and the debt capital have a quite volatile nature, while the equity capital has increased over time. Based on the second graph, it is concluded that the unallocated equity capital has increased and the allocated equity capital has first increased and decreased afterwards. However, the increase in unallocated equity capital is relatively larger than the decrease in allocated equity capital. Therefore, the total equity capital has increased. Striking is the volatile nature of allocated debt capital and unallocated debt capital caused by the changing developments in the allocated and unallocated capital. The volatile nature of the debt capital is the main driver of the volatile nature of the total assets.

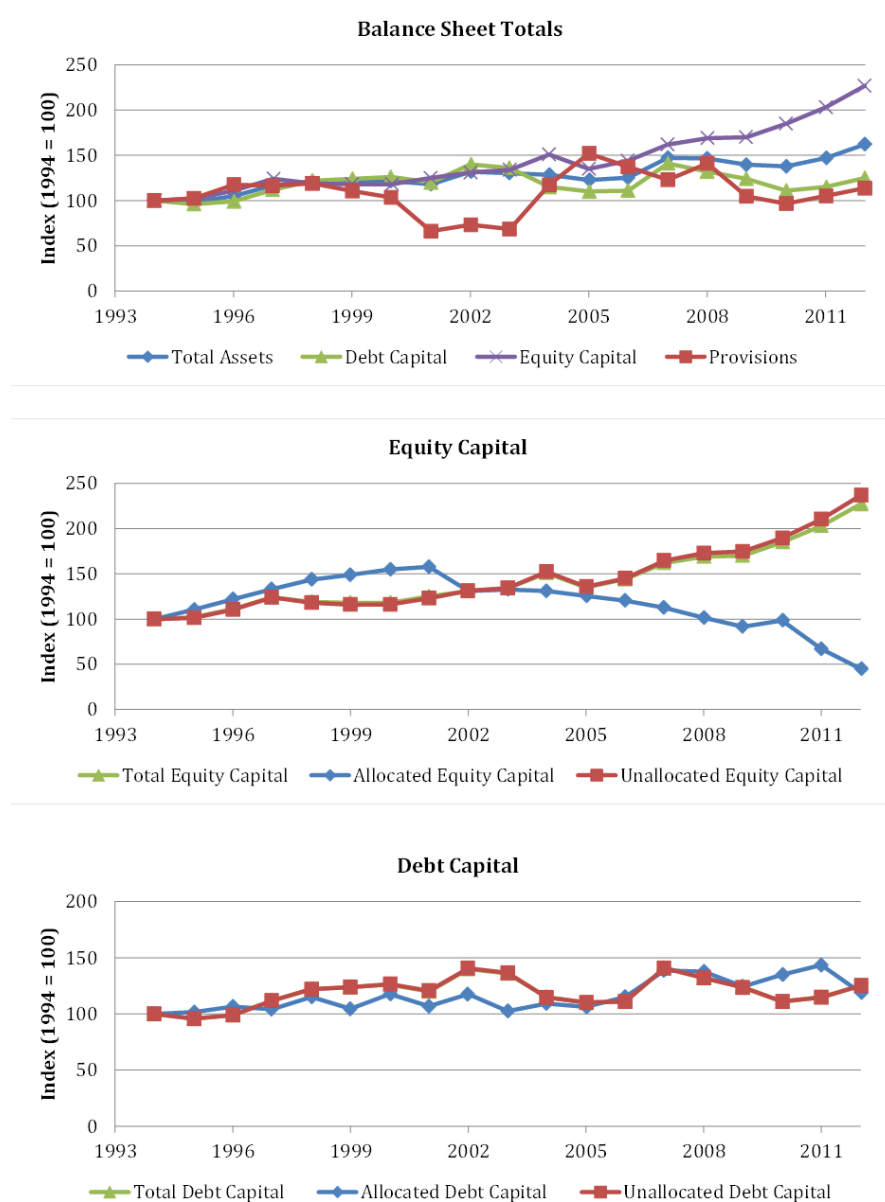


Fig. 5.4. The developments in the capital structure of other cooperatives between 1993-2012.

Based on Fig. 5.1-5.4, some general developments are observed with respect to the variables that reflecting the capital structure. The total assets have increased over time, while the developments in the provisions are rather volatile. Both the total equity capital and the total debt capital have increased, just like the unallocated equity capital and the unallocated debt capital, while both the allocated equity capital and the allocated debt capital have decreased. These findings are rather interesting since Van Dijk (2004) has indicated that research has shown that it would be more attractive for members to invest in allocated capital in the future. This statement has been questioned by Van Bekkum (2006), who argued that the incentives for members to invest in the cooperative are rather limited. It is concluded that the predictions of Van Dijk (2004) did not materialize and based on Fig. 5.1-5.4, the conclusion is drawn that the allocated capital has lost popularity, while the unallocated capital has increased.

5.3. PERFORMANCE ASSESSMENT

The second part of this chapter examines the development in the performance level of the considered cooperatives between 1993-2012. Estimations of the composite performance indicators for each cooperative are therefore required. These indicators are based on the comparison with the pooled frontier representing the best practices in the 20 years analyzed. Cooperatives from multiple categories are compared on yearly basis, indicating a total of 20 runs, i.e. one run for each year. The statistical software R is used with the FEAR package, developed by Wilson (2008).

The composite indicators are estimated by using three sets of outputs in the DEA models. In the first output set, cooperatives are considered as profit maximizing firms with the total equity ratio, the current ratio, the return on equity, and the asset turnover ratio as underlying key performance indicators. All four categories of financial ratio analysis, i.e. solvency, liquidity, profitability, and activity, are therefore represented. The second output set represents the cooperative objective that assumes that serving the interests of CF and MFs is, in addition to profitmaking, also very important. The return on equity ratio, that represents the profitability of the cooperatives, is therefore disregarded. The second output set is the basis of the third output set to which the member benefit of a price guarantee, i.e. a minimum or maximum price for the MFs, is added.

Tables 5.1-5.3 report the summary results for the obtained composite indicators. For example, the original efficiency score presented under dairy cooperatives over the period 1993-1997 is calculated by first computing the average of the composite indicators of all dairy cooperatives for each year and by finally taking the average of the five years. The results of the original efficiency scores are presented in terms of the Shephard distance function that provides values that are lower or equal than one for the output efficiency. There is irrefutable evidence that a group of cooperatives performed better during the considered period if a group of cooperatives does not achieve the maximum score, despite the fact that the performance is evaluated with a set of weights that maximize the score of the composite indicator. The bootstrap results are shown as well, including the average of the bias-corrected efficiency scores, bias, standard deviation, and 95% confidence intervals for the bias-corrected com-

posite indicators. The bootstrapped results show that the bias-corrected efficiency scores are within relatively narrow confidence intervals, i.e. the lower bound and the upper bound are relatively close. Consequently, there is statistical confidence for the bias-corrected estimates. Furthermore, since the estimated bias is much larger than the standard deviation of the cooperatives, the bias-corrected estimates are preferred to the original estimates, like explained by Fried et al. (2008).

Table 5.1 shows the original and bootstrapped results for cooperatives considered as profit maximizing firms. The efficiency scores have to be interpreted as follows: the bias-corrected efficiency score of 0.753 for the dairy cooperatives during the period 1993-1997 indicate that there is a scope of improvement of 24.7 percent for all key performance indicators included during the considered period of time. Based on table 5.1, it is concluded that the bias-corrected efficiency score of the last period, i.e. 2008-2012 is larger than the score of the first period, i.e. 1993-1997. Based on the bias-corrected efficiency scores, it is concluded that the input supply cooperatives have performed best in comparison to the cooperatives from the other categories during all periods of time included, while the other cooperatives have performed worst during the first period, i.e. 1993-1997. The hortibusiness cooperatives have performed worst during the second period, i.e. 1998-2002, and the last period, i.e. 2008-2012, while the dairy cooperatives have performed worst in comparison to the cooperatives from the other categories during the period 2003-2007.

It is concluded that the average of the bias-corrected efficiency scores of all cooperatives is reduced in the last period between 2008 and 2012 in comparison to the average efficiency scores of the third period between 2003 and 2007. However, this decrease is explained by the impact of the economic crisis. The considered cooperatives seem to have suffered from the financial and economic consequences of the economic crisis. Another remarkable observation is that the performance of the cooperatives from the different categories converged which is, in addition to the original and bias-corrected efficiency scores, also reflected in the composition of the confidence intervals. This development is shown most clearly in the bias-corrected efficiency scores. In the first period between 1993 and 1997, the difference between the best performing cooperatives, i.e. the input supply cooperatives, and the worst performing cooperatives, i.e. the other cooperatives, is .156, while this difference is reduced to .121 in the last period between 2008 and 2012.

The confidence intervals are used to examine whether a category is significantly outperforming another category. Based on the absence of an overlap between the confidence intervals during the first period between 1993 and 1997, it is concluded that input supply cooperatives significantly outperform the hortibusiness cooperatives and the other cooperatives. The same is observed from the results of the second period between 1998 and 2002. In the subsequent periods, none of cooperatives is significantly outperforming cooperatives from other categories since there is an overlap between the confidence intervals.

Table 5.1.

Original and bootstrapped results for cooperatives considered as profit maximizing firms and with four financial ratios as underlying set of outputs.

Period	Type of cooperative	No. of obs.	Original eff. score	Bias-corr. eff. score	Bias	St. dev.	Lower bound	Upper bound
1993-1997	Dairy	39	0.753	0.610	0.143	0.029	0.593	0.742
	Hortibusiness	50	0.665	0.580	0.085	0.003	0.546	0.658
	Input supply	52	0.839	0.733	0.105	0.005	0.693	0.827
	Others	24	0.662	0.577	0.085	0.003	0.547	0.653
	Total	165	0.733	0.629	0.104	0.010	0.598	0.723
1998-2002	Dairy	25	0.743	0.558	0.185	0.032	0.555	0.732
	Hortibusiness	31	0.629	0.513	0.116	0.007	0.482	0.620
	Input supply	49	0.831	0.711	0.120	0.006	0.671	0.819
	Others	25	0.654	0.573	0.081	0.003	0.535	0.646
	Total	130	0.733	0.609	0.124	0.011	0.579	0.723
2003-2007	Dairy	24	0.751	0.604	0.147	0.016	0.576	0.741
	Hortibusiness	28	0.718	0.608	0.110	0.006	0.571	0.710
	Input supply	44	0.841	0.727	0.115	0.008	0.690	0.832
	Others	26	0.760	0.668	0.092	0.003	0.626	0.752
	Total	122	0.775	0.661	0.115	0.008	0.624	0.766
2008-2012	Dairy	19	0.800	0.619	0.182	0.019	0.599	0.790
	Hortibusiness	20	0.665	0.557	0.108	0.005	0.520	0.658
	Input supply	32	0.822	0.678	0.144	0.010	0.650	0.811
	Others	27	0.734	0.638	0.097	0.004	0.595	0.727
	Total	98	0.763	0.631	0.132	0.009	0.599	0.754

Table 5.2 shows the original and bootstrapped results by taking the cooperative objective of serving the goals of the CF and their MFs into consideration. The interpretation of the results is the same as the interpretation of the results from the previous table. Based on table 5.2, it is concluded that the original efficiency scores and the bias-corrected efficiency scores of the total number of cooperatives have constantly increased overtime. The impact of the economic crisis is not observed in these results. In addition, it is also concluded that the original and bias-corrected efficiency scores of the last period between 2008 and 2012 are relatively larger than the efficiency scores obtained from the period 1993-1997. Based on the bias-corrected efficiency scores, it is concluded that the input supply cooperatives have performed best compared to the cooperatives from the other categories, while the hortibusiness cooperatives have performed worst during the first two periods, i.e. 1993-1997 and 1998-2002, and the last period, i.e. 2008-2012. The dairy cooperatives have performed worst in comparison to the cooperatives from the other categories during the period 2003-2007.

The performance scores presented in table 5.2 have again converged what is clearly shown in the bias-corrected efficiency scores. In the first period, the difference between the best performing cooperatives, i.e. the input supply cooperatives, and the worst performing ones, i.e. the hortibusiness cooperatives, is .190 in the first period, while this difference is reduced to .132 in the last period.

Again, the confidence intervals are used to see whether a group of cooperatives is performing significantly better than another group of cooperatives. Based on the absence of an overlap between the confidence intervals during the first period between 1993 and 1997, it is concluded that the input supply cooperatives significantly outperform the dairy cooperatives, the hortibusiness cooperatives and the other cooperatives. In the subsequent periods, the input supply cooperatives significantly outperform the dairy cooperatives and the hortibusiness cooperatives.

Table 5.2.

Original and bootstrapped results for cooperatives by taking into account the cooperative objectives, with three financial ratios as underlying set of outputs.

Period	Type of cooperative	No. of obs.	Original eff. score	Bias-corr. eff. score	Bias	St. dev.	Lower bound	Upper bound
1993-1997	Dairy	39	0.639	0.567	0.072	0.002	0.533	0.630
	Hortibusiness	58	0.606	0.517	0.088	0.003	0.485	0.597
	Input supply	56	0.816	0.707	0.109	0.005	0.667	0.803
	Others	25	0.630	0.543	0.087	0.003	0.513	0.620
	Total	178	0.682	0.591	0.091	0.004	0.556	0.672
1998-2002	Dairy	25	0.618	0.548	0.069	0.002	0.512	0.609
	Hortibusiness	33	0.613	0.501	0.111	0.006	0.474	0.604
	Input supply	52	0.802	0.688	0.115	0.006	0.648	0.789
	Others	30	0.660	0.576	0.084	0.003	0.536	0.651
	Total	140	0.694	0.595	0.099	0.005	0.559	0.684
2003-2007	Dairy	25	0.571	0.509	0.062	0.001	0.476	0.563
	Hortibusiness	29	0.644	0.528	0.116	0.006	0.500	0.635
	Input supply	45	0.826	0.703	0.123	0.008	0.667	0.813
	Others	30	0.688	0.601	0.087	0.003	0.561	0.679
	Total	129	0.703	0.602	0.101	0.005	0.567	0.693
2008-2012	Dairy	20	0.622	0.546	0.076	0.002	0.508	0.614
	Hortibusiness	25	0.640	0.542	0.098	0.004	0.508	0.632
	Input supply	36	0.797	0.674	0.124	0.007	0.639	0.786
	Others	30	0.723	0.644	0.079	0.003	0.597	0.716
	Total	111	0.711	0.613	0.097	0.004	0.575	0.702

Table 5.3 shows the original and bootstrapped results by taking into account the cooperative objective and by adding one of the observed member benefits, i.e. the price guarantee. It is concluded

that the original and bias-corrected efficiency scores of the period 2008-2012 are larger than the efficiency scores of the period 1993-1997. Again, no impact of the economic crisis has been observed. Based on the bias-corrected efficiency scores, it is concluded that the hortibusiness cooperatives have performed best in comparison to the cooperatives from the other categories, while the dairy cooperatives have performed worst during all periods of time considered. Again, the performance scores have converged as indicated by the difference between the bias-corrected efficiency scores of the best and worst performing cooperatives of .310 in the first period and .196 in the last period. Based on the absence of an overlap between the confidence intervals during the periods 1993-1997 and 2008-2012, it is concluded that the hortibusiness cooperatives significantly outperform all other categories. The input supply cooperatives significantly outperform the dairy cooperatives and the other cooperatives during the period 1993-1997. Over the periods 1998-2002 and 2003-2007, it is concluded that the hortibusiness cooperatives significantly outperformed the dairy cooperatives and the other cooperatives, while input supply cooperatives significantly outperform the dairy cooperatives.

Table 5.3.

Original and bootstrapped results by taking the cooperative objective into consideration with three financial ratios and the presence of a member benefit as underlying set of outputs.

Period	Type of cooperative	No. of obs.	Original eff. score	Bias-corr. eff. score	Bias	St. dev.	Lower bound	Upper bound
1993-1997	Dairy	39	0.639	0.584	0.054	0.001	0.547	0.633
	Hortibusiness	58	1.000	0.894	0.106	0.009	0.835	0.995
	Input supply	56	0.816	0.745	0.070	0.003	0.702	0.809
	Others	25	0.686	0.605	0.081	0.004	0.569	0.680
	Total	178	0.818	0.739	0.078	0.004	0.694	0.812
1998-2002	Dairy	25	0.618	0.559	0.059	0.002	0.517	0.612
	Hortibusiness	33	1.000	0.838	0.162	0.019	0.782	0.992
	Input supply	52	0.802	0.719	0.084	0.003	0.674	0.794
	Others	30	0.718	0.642	0.075	0.003	0.598	0.713
	Total	140	0.798	0.702	0.096	0.007	0.656	0.791
2003-2007	Dairy	25	0.571	0.517	0.054	0.001	0.484	0.565
	Hortibusiness	29	1.000	0.834	0.166	0.020	0.772	0.993
	Input supply	45	0.826	0.729	0.097	0.007	0.690	0.817
	Others	30	0.718	0.629	0.089	0.006	0.589	0.711
	Total	129	0.790	0.688	0.102	0.008	0.645	0.783
2008-2012	Dairy	20	0.745	0.677	0.068	0.003	0.624	0.741
	Hortibusiness	25	1.000	0.873	0.127	0.012	0.799	0.995
	Input supply	36	0.797	0.704	0.093	0.005	0.659	0.791
	Others	30	0.755	0.687	0.068	0.004	0.639	0.751
	Total	111	0.823	0.733	0.089	0.006	0.680	0.818

Based on the results, presented in table 5.1 – 5.3, it is concluded that there are differences in the performance efficiency scores of the cooperatives. Observed is that the efficiency scores presented in table 5.2 are higher compared to the efficiency scores presented in table 5.1. These differences are explained by taking into account two important and well-known limitations of the DEA method. The first limitation states that the number of DMUs has to be relatively large in comparison to the number of inputs and outputs, i.e. all DMUs are assumed to be as efficient as possible if the difference between the number of DMUs and the number of inputs and outputs is relatively small. The second limitation states that negative outcomes of the output indicators have to be disregarded. Due to this last limitation, the results presented in table 5.1 are obtained from fewer observations compared to the results presented in table 5.2 causing that the results in table 5.1 are assumed to be more efficient despite the fact that one additional indicator is used in comparison to the results from table 5.2.

The results obtained from a set of four outputs that consists of three financial ratios and one member benefit show that the cooperatives with that benefit are assumed to be as efficient as possible. This is explained by the use of discrete data. Charnes et al. (1994) argued that the use of dummy variables in DEA requires more care than the variables in traditional parametric analysis, because categorical variables in DEA calculations function as further constraints on establishing subsets of comparable DMUs and on determining the direction of comparisons between subsets. Banker & Morey (1986) propose an extension of the DEA method that incorporates the use of dummy variables. The essence of this extension is that a DMU is only compared with other DMUs in the same category, based on the different levels of the dummy variables. In concrete terms, this means that only cooperatives from the same category can be compared, i.e. cooperatives where the member benefit is present versus cooperatives where the member benefit is not present. However, within this research, it is not possible to compare the cooperatives within separate categories due to the relatively small number of incorporated cooperatives. Otherwise, all cooperatives would be assumed to be as efficient as possible. The results obtained from an output set with just financial ratios represent therefore more value compared to the results obtained from the output set that includes a member benefit.

Based on the financial and economic performance, it is concluded that the input supply cooperatives have performed best in comparison with the cooperatives from the other categories, while the hortibusiness cooperatives have generally performed worst. After, adding a member benefit, it is concluded that the hortibusiness cooperatives have performed best in comparison to the cooperatives from the other categories, while the dairy cooperatives have performed worst during all periods considered. Despite these differences, it is concluded that there remains a considerable scope of improvement for the performance efficiency scores of all categories included. In addition, the differences between the performance scores of the different cooperatives are clearly converged. This development is the result of a relatively large number of mergers and acquisitions that have taken place between considered cooperatives. As a result of these mergers and acquisitions, the worst performing cooperatives have gradually been disappeared, while the remaining cooperatives are relatively

large in terms of size and their performance is better in proportion to preceding cooperatives. The difference between the performances is therefore reduced.

5.4. TRUNCATED REGRESSION

The last part of this chapter discusses the truncated regression that is performed in order to examine the hypothesis that states that there exist a relationship between the performance of the cooperatives and the variables that reflecting the capital structure. The dependent variable consist of the bias-corrected efficiency scores, summarized in table 5.1, and the explanatory variables are the total assets, the allocated debt capital, the unallocated debt capital, the allocated equity capital, and the unallocated equity capital. The total assets are expressed in billions of euros, while the other explanatory variables are expressed in proportion to the total assets as a result of the large differences between the values of the variables.

The results of the regression analysis are presented in table 5.4. Based on these results, it is concluded that all explanatory variables included are statistically significant at a 5% level. It is concluded that an increase in the value of the total assets, measured in billions of euros, and both the allocated debt capital/total assets and the unallocated debt capital/total assets have a negative effect on the performance efficiency scores, while an increase in both the allocated equity capital/total assets and the unallocated equity capital/total assets have a positive effect on the performance efficiency scores. In short, the results presented in table 5.4 confirm the hypothesis that there exist a statistical relationship between the performance efficiency scores and the considered variables that reflecting the capital structure. Therefore, it is concluded that the capital structure is an important driver of the performance efficiency scores.

Table 5.4.

Results of the truncated regression

	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	0.679	0.085	7.948	0.000
Total assets	-0.039	0.007	-5.548	0.000
Allocated equity capital/total assets	0.616	0.124	4.959	0.000
Unallocated equity capital/total assets	0.350	0.096	3.637	0.000
Allocated debt capital/total assets	-0.371	0.123	-3.026	0.002
Unallocated debt capital/total assets	-0.329	0.090	-3.657	0.000
Sigma	0.106	0.003	32.086	< 0.000

6. DISCUSSION

This research had a fourfold objective with as main aim to assess the performance of the Dutch agricultural and horticultural cooperatives and to examine the link between the performance and the variables that reflecting the capital structure of the corresponding cooperatives. Therefore, a combination of financial ratio analysis and DEA is used. Based on the financial and economic results, it is concluded that the input supply cooperatives have performed best in comparison to cooperatives from other categories, while the hortibusiness cooperatives have generally performed worst. After adding the presence of a member benefit, it is concluded that hortibusiness cooperatives have performed best in comparison to the cooperatives from the other categories, while the dairy cooperatives have performed worst. However, there remains a considerable scope for improvement of all categories of cooperatives. In addition, it is concluded that the performance scores of the different categories has converged which indicates that the difference between the scores of the best and worst performing cooperatives has decreased. An explanation for the converging development in the performance efficiency scores is the relatively large number of mergers and acquisitions that have occurred. On the one hand, these mergers and acquisitions ensured that the relatively better performing cooperatives remained. On the other hand, these mergers and acquisitions have caused that the number of observations per year declined which causes less variation among the cooperatives and the DEA method provides therefore higher efficiency scores. It is also shown that there exist a significant relationship between the performance scores and the variables that reflecting the capital structure.

The results obtained from this research have to be interpreted with care due to three limitations. The first limitation is that inflation is ignored. However, like explained by Lesáková (2007), inflation can badly distort balance sheet elements like depreciation and inventory costs, while profits could be affected as well. The second limitation relates to the results that are obtained from a set of outputs where a member benefit is included. Use has been made of the annual reports, statutes, and websites of the corresponding cooperatives to assess whether the defined member benefits are presented or not. However, cooperatives can state that they provide benefits, although in practice it may turns out that these benefits are not provided. In addition, it is also possible that it works the other way around. In that case, the cooperative does not mention anything about the existence of member benefits although in practice in turns out that these benefits are presented. Because of these uncertainties, the question arises whether the presence of the member benefits is measured correctly and therefore the internal validity could be endangered. More value should therefore be attached to the results presented in table 5.1 and table 5.2 that are obtained from output sets that consist solely of financial ratios. Third limitation concerns the difficulty to translate the results of this research to an international perspective due to the difference in governance structures and institutional environments between countries since the focus in this research was on Dutch agricultural and horticultural cooperatives (Hendrikse & Veerman, 2001).

Soboh et al. (2009a) have provided an overview of other empirical studies that used DEA to evaluate and compare the performance of cooperatives to those of IOFs, like for example: Doucouliagos & Hone (2000), who used DEA to assess the technical efficiency of dairy processing firms in Australia, Singh et al. (2001), who applied DEA to compare the performance of dairy cooperatives to the performance of IOFs in India and Boyle (2004), who investigated the economic efficiency of Irish dairy cooperatives. DEA is also used for inter-cooperative comparisons, like for example Ariyaratne et al. (2000), who have investigated efficiency measurements for U.S. grain marketing and farm supply cooperatives and Sueyoshi et al. (1998), who used DEA for a bilateral performance comparison of Japanese agricultural cooperatives. Despite the large number of authors that have used the DEA method, this research is unique since it combines financial ratio analysis and DEA by applying inter-cooperative comparisons to assess the performance of Dutch agricultural and horticultural cooperatives while other researches focus on comparisons between the performance of cooperatives and other firms, or focus on inter-cooperative comparisons of cooperatives in different countries like the Netherlands.

Most existing empirical studies view cooperatives as profit maximizing firms and do not explicitly address members' objectives. This research has attempted to address a member benefit in the performance assessment. However, as discussed in the previous chapter, including dummy variables forces researchers to only compare cooperatives from the same category, i.e. cooperatives where the member benefit is present versus cooperatives where the benefit is not present, and unfortunately this was not possible due to the relative small number of cooperatives included. The key recommendation for future research is therefore to develop a measurement tool that addresses members' objectives and/or member benefits and that provide continuous outcomes instead of discrete, dummy variables like in this study. Since this kind of measurement tool will incorporate the special characteristics of a cooperative, the use of a particular tool will make it possible to make better and fairer inter-cooperative comparisons and comparisons between cooperatives and IOFs.

7. CONCLUSIONS

This study used the DEA method with bootstrapping to examine the performance of Dutch agricultural and horticultural cooperatives in the nearly past, between 1993 and 2012. In addition, the relationship between the obtained performance efficiency scores and the variables that reflecting the capital structure is examined by applying truncated regression. The main conclusions are:

- In general, it is concluded that the input supply cooperatives have performed best in comparison to the cooperatives from other categories with respect to their financial and economic performance, while the hortibusiness cooperatives have performed worst.
- The hortibusiness cooperatives have performed best, after including the presence of a member benefit, in comparison to the cooperatives from the other categories, while the dairy cooperatives have performed worst over all periods of time considered.
- There remains considerable scope of improvement for all categories of cooperatives, i.e. dairy cooperatives, hortibusiness cooperatives, input supply cooperatives and other cooperatives. For example, the results obtained from the output set that consists of four financial ratios indicate that the dairy cooperatives could have improved their performance scores over the period 2008-2012 with 38.1 percent, while the scope of improvement for the hortibusiness cooperatives was 44.3 percent over the same period of time. The input supply cooperatives could have improved their performance over 2008-2012 with 32.2 percent, while the scope of improvement for the other cooperatives was 36.2 percent over the same period of time.
- Mergers and acquisitions between cooperatives have caused that the performance of cooperatives from different categories have converged over time, i.e. the difference between the best and the worst performing cooperatives have decreased.
- Based on the results obtained from the truncated regression, it is concluded that both the total assets, measured in billions of euros, and both the ratios of the allocated debt capital/total assets and the unallocated debt capital/total assets have a significant negative effect on the performance efficiency scores, while both the ratios of the allocated equity capital/total assets and the unallocated equity capital/total assets have significant positive effect on the performance efficiency scores.

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