

## Chapter 4

# INTEGRATING SUSTAINABILITY INTO TRADITIONAL FINANCIAL ANALYSIS

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**Abstract:** The management of environmental, social as well as economic issues has become a key element to guarantee the survival of a company in the medium to long term, and to contribute towards its ability to generate shareholder value. As a consequence, the economic theory of the firm has started to integrate sustainability issues into the accounting and finance areas and to develop new tools and instruments, as well as to adapt those that already exist, to permit the strategic management of sustainability by companies and the capital markets.

The translation of the environmental and social impacts of business activities into accounting and financial terms allows not only to manage these impacts, but also to reveal their effects over businesses risks, profitability and value creation ability to all the economic agents that interact with the firm. Management and information systems based on performance indicators, such as the Balanced Scorecard and other models trying to identify cause and effect relationships between indicators, seem particularly well suited to this process. In this paper we review some of the lacks of these performance measurement systems and propose the development of an integrated framework for the financial analysis of the creation of sustainability-oriented value in companies.

## 1. INTRODUCTION

In recent years, an increasing number of studies have tackled the analysis of the link between the financial performance of a company and its environmental and social performance, attempting to find a correlation or a conceptual link between them (see, e.g., Griffin and Mahon 1997, Pava and Krausz

1996, Salama 2003, Schaltegger and Figge 1997, 2000, Schaltegger and Synnestvedt 2002, Wagner 2001, 2003). But, as Zadek (2000) argues, some studies linking sustainable development with improved financial performance are not sufficiently conclusive. Furthermore, one question remains unanswered: which comes first - corporate social performance or financial performance?

Despite the appeal and interest in seeking a connection between social and environmental responsiveness and financial performance, we may question whether this is the most correct or suitable direction for research. As Reed (1998:6) suggests, regarding the environmental perspective of sustainability, "The appropriate question for mainstream investors is not: (1) do investors care about critical environmental events? Clearly they do. Nor is it (2) do investors have to sacrifice returns in order to limit the universe of possible companies in which to invest to those with decent environmental records? They do not. Nor is it (3) is there a statistical relationship between environmental and financial performance? There appears to be a positive one, but the vast majority of equity money is managed using investment styles that are not built primarily around statistical relationships. The meaningful question today is (4) does an understanding of a company's environmental and social strategies and positioning add a useful insight to what investors already know about selecting stocks?"

Furthermore, there are many factors that, combined, determine the environmental performance of the company (Wagner and Schaltegger 2003), and it would be difficult to prove that a single factor as environmental performance can be the only driver of its financial outcomes or the only driver of the financial markets valuation of those outcomes (Case 1999). Therefore, it is maybe premature to claim on a scientific prove about the relationship between a good environmental performance and a better profitability, although few business people would deny today that environmental issues have a significant impact over a firm's success.

Schaltegger and Synnestvedt (2002:341) recognize that it "is reasonable to assume that the relation between environmental and economic performance depends on the kind of management activities, strategies and concepts and whether they are applied correctly in the right situations (...) rather than on any mechanistic causal link". Reinhardt (1998, 1999) argues that, instead of questioning if environmental management is a profitable activity, more attention needs to be paid to when environmental management is profitable for the firm, this is, under what circumstances environmental strategies contribute to competitiveness. Wagner and Schaltegger (2004) analyse the influence of corporate strategy choice on the relationship between environmental and financial performance. This view is related to some recent work that applies resource-based strategy perspectives to the analysis of environmental

strategies (Aragon-Correa 1998, Christmann 2000, Hart 1995, Russo and Fouts 1997, Sharma and Vredenburg 1998), arguing that some companies may possess unique resources or capabilities that are difficult to imitate and make environmental strategies profitable.

So perhaps the most appropriate questions today should be: What does environmental performance tell us that we still do not know about financial performance? And what kind of sustainability strategies contributes to the shareholder value creation? And perhaps the most appropriate direction for research should be to adapt existing tools and models of financial analysis in order to incorporate the impact of sustainability issues on the company's economic and financial performance.

One particularly significant aspect in this regard is the absence of fundamental approaches to the incorporation of sustainable development approaches into the traditional financial analysis of companies. This is not only an instrument to assess a company's financial performance in the past, but also its strengths and weaknesses for the future. The information that such analysis provides is critical for all of the company's stakeholders in order to identify the kind of sustainability management implemented by the firm, evaluate its contribution to financial performance and develop their decision-making processes.

Financial analysis, traditionally considered as a suitable tool to assess a company's financial and economic situation and guide the decision-making processes of companies and financial markets, should embrace sustainability issues within its logic, under some kind of scheme or framework that permits the evaluation of a company's sustainable management system and the impact of sustainability issues on financial performance. An integrated model is needed that takes into account the social, environmental and economic performances of a company, and their expression using data that is both quantitative and qualitative, accounting and non-accounting, physical and monetary.

The aim of this paper is to provide companies with a methodology that allows them to focus on the environmental and social activities that create significant financial and/or non-financial benefits, and to integrate financial considerations into every major decision regarding sustainable development, as well as to provide the financial community with the appropriate decision-making tools and rules in order to be able to assess a company's sustainable management system and support its sustainability objectives, as well as its financial objectives. We will propose a conceptual and a performance measurement framework for the integration of sustainability into the analysis of the shareholder value creation and a three-dimensional framework for the financial analysis of sustainability, encompassing accounting, market and cash flow indicators. The empirical validation of the model is currently

limited due to the lack of information and the existence of asymmetric information about the environmental and social performances of a company, so we only present the theoretical foundations of the model.

The paper is organised as follows: the second section insists on the importance of integrating sustainability into traditional financial analysis. Section 3 describes the general methodologies of financial analysis, performance measurement and ratio analysis. Section 4 presents the conceptual framework for the integration of sustainability into the analysis of the shareholder value creation and proposes a performance measurement framework based on the fundamental principles of cause-and-effect and the decomposition of ratios. Section 5 explains the development of a three-dimensional model for the financial analysis of sustainability and section 6 focus on the construction of its accounting perspective. Finally, section 7 summarizes the most relevant questions and draws some conclusions.

## **2. IMPORTANCE AND BARRIERS TO THE INTEGRATION OF SUSTAINABILITY INTO TRADITIONAL FINANCIAL ANALYSIS**

As we have already mentioned, lack of information and the existence of asymmetric information are some of the pitfalls that we identify in the process of integrating the management of sustainability into the decisions made by companies and financial markets, and so it is in this field where most efforts have been made to promote this process and contribute towards linking environmental, social and financial objectives; the Eco-Management and Audit Scheme (EMAS) and ISO 14001 are just two examples. Significant efforts have also been made to integrate sustainability issues into the reporting schemes of firms to all their stakeholders; the Global Reporting Initiative is probably the most widely extended proposal.

One of the main hurdles in this process has been the absence of an adequate approach that links both financial and sustainability objectives in terms of profitability and risk, which are the terms best understood by firms and financial markets, as it is their own 'language'. It is essential to support the application of the language, knowledge and tools of financial theory towards orienting the decision-making processes of the different economic agents when incorporating these sustainability objectives. Once the market has incorporated sustainability into its strategies a "sustainability circle" will have been closed, within which the market requires environmentally and socially responsible behaviour from companies that limits their risk and ensures a sustainable creation of value, while on the other hand, companies will need the support of the market to face up to the financial requirements derived

from their commitment to sustainable development, support that should take the form of a lower cost of capital for those firms willing to assume the sustainability challenge. The recent development of Socially Responsible Investment is an example: greater investor activity fuels greater corporate activity, which itself adds to growing interest from investors (ABI 2001).

Some important advances have been already made towards integrating sustainability aspects into the strategic and financial management of companies (for a revision of concepts and instruments, see German Federal Ministry for the Environment and Federation of German Industries 2002), mainly focused on the environmental perspective, as this was the first sustainable development dimension to attract the attention of governments and business. Advances in the field of environmental and ecological accounting (Bartolomeo et al. 2000, Bennett and James 1998, 1999, Burritt 1997, Burritt et al. 2002, EPA 1995, Gray et al. 1993, Schaltegger 1996, Schaltegger and Burritt 2000, Schaltegger et al. 2000) and the design of various instruments and tools of environmental and/or sustainability management have only partially considered the financial implications of incorporating sustainability objectives into the decision-making processes of the different economic agents.

EPA (2000) has identified some barriers that explain why the financial implications of environmental strategies are not better reflected in financial analysis. Three of them are worth of mention for the purpose of this paper:

- An imprecise terminology for describing environmental performance
- Lack of information exchange and a common language for describing environmental strategies
- Lack of technical skills to understand how environmental strategies affect financial outcomes

Repetto and Austin (2000:73) point out that “Yet, firms and analysts find it difficult to translate the potential impacts and risks of environmental issues into the financial terms required for business planning and valuation”. Without doubt, in order for environmental and social considerations to play a role in financial analysis, companies must increase the rigor with which they measure their results in ways that are meaningful to the financial analysts. Although many companies are producing sustainability reports and have made a significant effort to discuss publicly and start to quantify their sustainability performance, many reports are rather anecdotal or include little information on financial impacts (The Aspen Institute 1998).

Furthermore, one of the main problems for sustainable development has also been that the information provided to financial markets about sustainability issues can rarely be relied upon to improve decisions. This is partly because this data is usually appropriated from other areas, such as regulatory compliance, and has not been designed for use by financial markets, and

partly because it is not comparable or verified and may be costly and time-consuming to make useable. Concise and strictly applicable data is needed, of a sort that can be put to use by analysts and provided to investors as a part of the corporate evaluation process. In the case of company analysis, figures need to relate either directly or indirectly to a company's management, earnings, balance sheet or potential growth. It is also necessary to recognise that without the involvement of financial and accounting sectors in the creation of improved reporting standards, whatever is created runs the risk of continuing to be financially irrelevant (Commission for Environmental Cooperation 2003).

Systems for budgeting, investment appraisal, performance measurement, financial analysis, etc., should integrate environmental impacts, costs and benefits (Epstein 1996), but have not yet been adapted to the environmental agenda and until they do develop in this way, companies will face conflicts between the environmental and social perspectives and the traditional financial perspective (Skillius and Wennberg 1998). It is therefore necessary to develop tools that allow evaluating the business performance and value related to the 'triple-bottom-line' concept and "recognize that there is not necessarily a trade-off between environmental responsibility and corporate profitability" (Epstein 1996:5).

The standardization and generalisation of sustainability reporting and the translation of its impacts into financial terms are a critical precondition for the integration of sustainability into the decision-making processes of companies and financial markets, as well as towards the development of a model for the financial analysis of sustainability that helps to uncover the true financial, environmental and social situation of the company and therefore leads to better decisions being made, and contributes towards the simultaneous attainment of financial and sustainability objectives.

### **3. FINANCIAL ANALYSIS, PERFORMANCE MEASUREMENT AND RATIO ANALYSIS**

Financial analysis is the assessment of a company's past, present and future financial conditions in order to detect its financial strengths and weaknesses. Although it has been argued that it is past-focused, and its reliance on accounting measures has been criticized (Cohen 1994, Mattessich 1995), financial analysis provides the context for the current performance of the company by showing where it is now, and has an influence on its expectations by showing developments that will change future performance.

The aim of financial analysis varies according to the strategic objective pursued:

- When the aim is to bring about a change in the company in order to develop a project, the purpose of financial analysis is to detect strategies and possibilities for internal development, i.e. the creation of value
- When the aim is to solve problems within the company, the primary objective of the diagnosis will be to clarify the causes of the symptoms that are destroying value

Financial performance measurement is a well-established process in business management, although a continually evolving one and with no universally accepted measurement framework (Ranganathan 1998). Sustainability performance measurement is a relatively new area of research that has fundamentally experienced important advances in the measurement of the environmental perspective of sustainability, while the social perspective has been comparatively underdeveloped, resulting in a measurement debate about social performance “in an early conceptual level” (Wagner and Schaltegger 2003:10).

Environmental performance measurement has been mainly developed under the framework provided by environmental accounting and reporting. James (1994) suggests that six distinct frameworks for environmental performance measurement can be identified – production, auditing, eco-logical, accounting, economic and quality – and identifies six types of environmental performance indicators (EPIs) that are suited for some or all of the frameworks – resource use, efficiency, emissions/waste, risk, impact and monetary indicators.

Bartolomeo (1995) defines EPIs as the quantitative and qualitative information that allow the evaluation, from an environmental point of view, of company effectiveness and efficiency in the consumption of resources. EPIs thus have the aim of evaluating company efficiency (economical and environmental) and effectiveness in achieving environmental objectives and allowing (Skillius and Wennberg 1998):

- The adoption of the most appropriate measures of environmental protection in terms of effectiveness and efficiency
- The empowerment of environmental policy by a better definition and monitoring of environmental objectives
- An effective definition of responsibilities and an aid for the implementation of the environmental management systems
- The improvement of external and internal communication on environmental achievements and programs

EPIs can be absolute or relative measures, physical or monetary, quantitative or qualitative. While absolute measures describe the level of pollution, relative measures show whether the environmental actions undertaken by a

company improve its efficiency. Physical EPIs are concerned with the quantities of materials and energy inputs and outputs from production process, while monetary EPIs refer to the costs and benefits associated to the environmental impacts and the environmental management of the firm (actually this measures should be integrated into the accounting system of the firm). Finally, apart from quantitative EPIs, qualitative EPIs should add valuable information to the environmental and economic evaluation of a company.

Relative indicators or 'ratios' are particularly important in both financial and environmental analysis. As it is well known, the concept of eco-efficiency (Schaltegger and Sturm 1990, 1992:4, 1995:6, Schaltegger and Burritt 2000) is based on the construction of ratios that bring together the economic and environmental dimensions of sustainability. In order to analyse a company's sustainability performance, relative indicators seem suitable methods for capturing the environmental and social stewardship provided by the firm. For instance, a company with high absolute emissions and high levels of production may still be more environmentally friendly than a company with lower absolute emissions but very low levels of production. On the other hand, absolute emissions are the correct way to measure the results of environmental protection, since environmental degradation depends on the mass of pollutants rather than their ratio in terms of production (Earnhart and Lízal 2002).

The ratio or mathematical relationship between two quantities is of paramount importance in financial analysis as it injects a qualitative measurement, precisely demonstrating the adequacy of one key financial statement item as compared against another and providing comparisons between companies in the same industry as well as year-to-year comparisons within a single company. In this sense, it is generally assumed that financial ratio analysis can be developed from two perspectives (Marion 1999):

- A diachronic perspective (trend analysis): where it is necessary to gather information on the temporal evolution of the essential variables of the diagnosis
- A synchronic perspective (benchmarking): where the value of the company's ratios is compared against the equivalent figures for the sector to which it belongs in order to draw conclusions on each individual ratio, and to determine whether the company's situation is good, regular or bad. Pyle and White (1974) argue that sector membership is the best base for comparisons.

Unfortunately, earlier attempts to relate important elements of financial statements through key financial ratios have suffered from a lack of systematic application, due to a lack of awareness of the main principle of cause-and-effect. Essentially, most analysts have given equal weight and value to



all ratios, simply creating a “laundry list” of calculations with no indication of which ratios may be the most important (Miller and Miller 1991).

The cause-effect financial ratio analysis is derived from the following assumptions:

- Not all ratios have the same importance for analysis. Even disregarding the factor of sector membership, some key ratios are primary and drive changes in the other relevant measures of the economic performance and financial structure of the company. Identifying the former as causes and the latter as effects proves to be the best way of reflecting the different relative weight of each ratio.
- The analysis acts inductively: The immediately visible situation is the effect; the cause or causes must be sought out.
- Understanding the meaning and significance of each individual ratio is not sufficient to ensure appropriate use of the ratio analysis, nor simply developing it through diachronic and synchronic comparisons. The ratio analysis potential and its strategic value for financial analysis are based on two basic methodological principles: the breakdown of each ratio into its main components (ratio decomposition), and the definition of relationships between the different ratios.

GEMI (1998) distinguish two types of EPIs: Lagging indicators and leading indicators. Lagging indicators “measure the results of environmental practices or operations currently in place” (GEMI 1998:4), while leading indicators “measure the implementation of practices or measures which are expected to lead to improved environmental performance” (GEMI 1998:6). It seems that environmental ratio and financial ratio analysis are quite easy to integrate. In fact, White and Wagner (1996) talk about an environmental ratio analysis that is “akin to financial ratio analysis”.

#### **4. CONCEPTUAL AND PERFORMANCE MEASUREMENT FRAMEWORKS FOR THE FINANCIAL ANALYSIS OF SUSTAINABILITY**

As already explained, the proposal of this paper is based on the belief that it is necessary to adapt the existing tools and models of financial analysis in two directions:

1. To incorporate the impact of environmental and social issues on economic and financial performance
2. To implement the cause-and-effect rationale

The three-dimensional framework for the financial analysis of sustainability presented in this paper is embedded in a conceptual framework that links some key drivers of sustainability with the shareholder value concept and in a performance measurement framework that applies the fundamental principles of cause-and-effect and ratio decomposition.

#### **4.1 Conceptual Framework for the Financial Analysis of Sustainability**

In order to link sustainability issues to shareholder value through their integration into traditional financial analysis, we need to define some kind of theoretical or conceptual framework that guides the process. Schaltegger and Synnøstvedt (2002:340) stress “the lack of a clear theoretical framework within which to investigate the links between environmental performance and economic performance”. A more causal model should be used to explain how the relationship between sustainability performance and economic success is brought about through a firm’s environmental and social management (Wagner and Schaltegger 2003:12).

The concept of ‘shareholder value’ coined by Rappaport (1986) was applied for the first time to the environmental field by Schaltegger and Figge (1997), who considered which types of corporate environmental management are able to help improve shareholder value, and which are capable of destroying it. Later on, these authors proposed a complementary concept, that of ‘stakeholder value’ (Figge and Schaltegger 2000), focusing on who creates added value, how it is distributed, and to whom. Although the concept of stakeholder value is not a method for evaluation, the authors propose a methodology to measure it, in an attempt to incorporate a perspective other than that of the shareholder in the value-oriented management of a company, according to the principles of sustainability.

Figge and Hahn (2002, 2004) propose an integrated measure of sustainability, the ‘sustainable value added’, based on a monetary assessment of how much the change of social and environmental performance of a company between two periods has contributed to making a national economy more sustainable. This measure is based on an assessment of a firm’s efficiency relative to that of the total national economy as a benchmark.

Without rejecting the addition of a new perspective focused on other stakeholders or the development of a new measure of value, the conceptual framework for the financial analysis of sustainability is based on the incorporation of sustainability issues into the traditional shareholder perspective. SustainAbility (2001) has identified six financial drivers of sustainable value creation: Customer Attraction, Brand Value and Reputation, Licence to Operate, Human and Intellectual Capital, Innovation and Risk Profile. These six

value drivers can be integrated into Rappaport’s Model of Shareholder Added Value (Figure 4-1) as further evidence of the link between the environmental management of a company and its ability to create value. This makes it possible to define the framework through which the model of financial analysis of sustainability through cause-and-effect ratios will be developed.

The six financial value drivers of sustainability may be considered as catalysts in the sustainability decision-making processes of the company’s management, aimed at creating sustainable shareholder value. These six indicators should drive its operating, investment and financing decisions which will ultimately result in a specific value of all the measures (ratios, in the model) that explain the company’s financial, environmental and social performance, with the final result being some type of measurement of the value created (shareholder value, share price, etc.). The six drivers do not influence decisions only individually, but also as a result of their interrelationships.

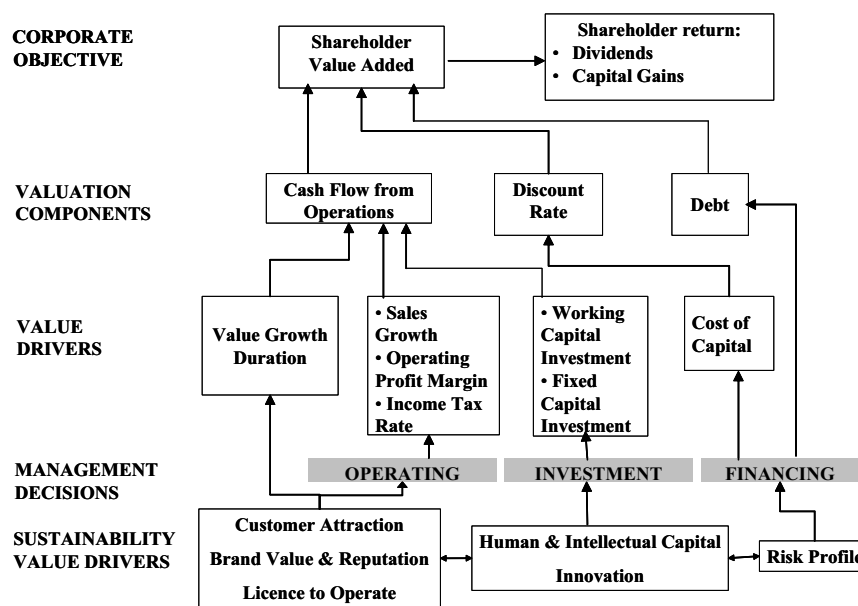


Figure 4-1. Conceptual model of the financial analysis of sustainability.

## 4.2 Performance Measurement Framework for the Financial Analysis of Sustainability

The design of performance measurement systems appropriate for modern businesses has been a topic of increasing interest in late years (Neely 1998, Neely et al. 2000). Between the shortcomings of traditional performance measurements systems is their narrow or uni-dimensional focus (Neely et al. 2000). Various authors have proposed alternative performance measurement frameworks (Brown 1996, Fitzgerald et al. 1991, Kaplan and Norton 1992, Keegan et al. 1989, Lynch and Cross 1991) but few provide any insight into how these frameworks can be populated (Neely et al. 2000).

One of the most widely recognised performance measurement frameworks is Kaplan and Norton's Balanced Scorecard (BSC, Kaplan and Norton 1992, 1996, 2001) that is based on the establishment of cause-effect relationships between key strategic indicators through four managerial perspectives within companies (financial, customer, learning and growth and internal business processes), with the financial perspective as the end point. It is aimed at making explicit, and therefore controllable, the contribution and the transformation of 'soft factors' and intangible assets into long-term financial success.

Brignall (2002) indicates that in the BSC specification there are two notable omissions: environmental and social issues. As sustainability issues often fall into this category of 'soft factors' and intangible assets (Senn (1986) cited by Figge et al. 2002), several authors have suggested the application of the Balanced Scorecard approach to sustainability (Elkington 1997, Figge et al. 2002, Hahn and Wagner 2001, Johnson 1998, Schaltegger and Dyllick 2002) in order to select and develop environmental and social performance indicators. These could be considered in the balanced scorecard by being integrated within the four standard perspectives, or through the creation of an additional perspective (Brignall 2002, Figge et al. 2002). A third possibility would be to formulate a specific environmental and/or social scorecard, but this should be done only after the development of one (or both) of the former variants (Figge et al. 2002).

At a later date, Kaplan and Norton (2000) introduced the concept of *strategy mapping* to give a visual form to the chains of cause-and-effect, linking actions through learning and growth, internal processes and customer perspectives to financial results. Brignall (2002) argues that the linear causal chain that is claimed to link the four perspectives of the BSC through the strategic maps is an over-simplification of reality, as "the population of all possible relationships among performance-related phenomena could not be represented by a universal, linear one-way chain" (Brignall 2002:90).

Furthermore, the definition of a hierarchical chain of cause-and-effect relationships proposed in the BSC methodology lacks a systematic procedure for the construction of the leading and lagging indicators defined throughout the perspectives. It provides little guidance on how the appropriate measures may be identified, introduced and ultimately used to manage business (Neely et al. 2000). This is where financial analysis using cause-and-effect ratios, as defined above, provides the most valuable contribution to the management and assessment of the impact of sustainability issues on shareholder value.

The performance measurement framework for the financial analysis of sustainability proposed in this paper is based on the principle of ratio decomposition that has been widely applied to financial analysis, and that is also known as the DuPont system (Chandler 1977). This is used to dissect the financial statements of a company and to assess its financial condition, decomposing certain key ratios into successively more detailed ones. It merges the income statement and the balance sheet into two summary measures of profitability, ROA (Return on Assets) and ROE (Return on Equity), which are broken down into other ratio figures:

$$ROE = \frac{\text{Net Income}}{\text{Total Assets}} \times \frac{\text{Total Assets}}{\text{Common Equity}} \quad (1)$$

$$ROA = \frac{\text{Net Income}}{\text{Sales}} \times \frac{\text{Sales}}{\text{Total Assets}} \quad (2)$$

$$ROE = \frac{\text{Net Income}}{\text{Sales}} \times \frac{\text{Sales}}{\text{Total Assets}} \times \frac{\text{Total Assets}}{\text{Common Equity}} \quad (3)$$

This process is used to build a pyramid of financial ratios (Curtis 1978, Bayldon et al. 1984) that has an explicit hierarchical structure and links measures at different organisational levels (Figure 4-2).

Two of the main contributions of this approach towards financial analysis are that it helps to identify the sources of strength and weakness in current performance, and to focus attention on 'value drivers'. However, its critics have claimed that its focus on costs provides a historical view, giving little indication of future performance and encouraging 'short-termism' (Bruns 1998).

Under a conceptual framework that links management decision-making with the simultaneous achievement of financial and sustainability objectives through six financial value drivers of sustainability, and under a performance

measurement framework based on the definition of cause-effect relationships between a series of relevant ratios that reflect the financial, environmental and social performance of the company, a model of financial analysis is developed in next section.

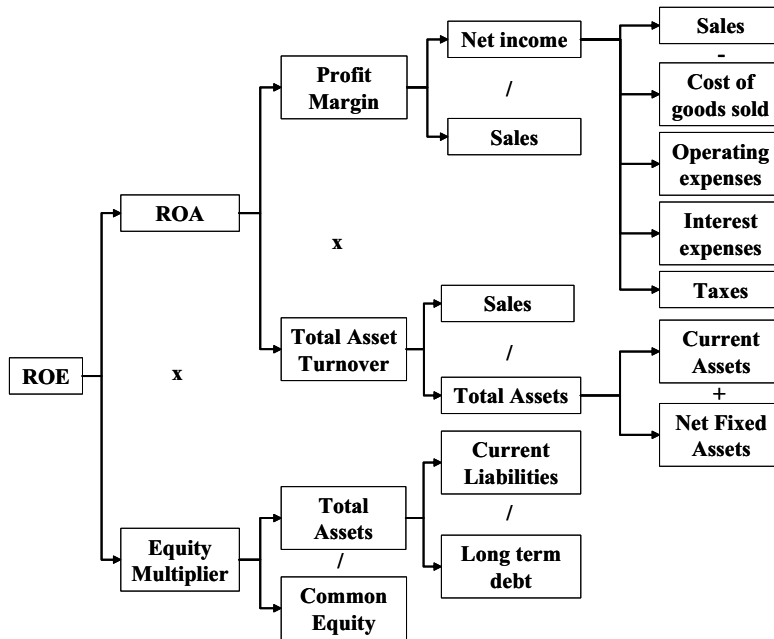


Figure 4-2. DuPont ratios pyramid.

## 5. A THREE-DIMENSIONAL MODEL FOR THE FINANCIAL ANALYSIS OF SUSTAINABILITY

The model (though in an early stage of development) proposed in this section suggests a number of conceptual relationships between some significant ratios reflecting the financial as well as the environmental and social performances of a company, linked by mathematical expressions (multiplicative or dividing ratios), so that the relationships defined are far from subjective (which is a clear advantage over the BSC approach).

There is little consensus about the best way to evaluate a company's financial performance. The choice between using an accounting rate of return or a share market return is not without controversy, and the two sets of measures represent different perspectives on how best to assess performance.

Accounting measures capture past performance and therefore indicate how that historical record has been influenced by, or has gone on to influence, social and environmental performance (there is no strong agreement about the direction which causality between sustainability and financial performance takes). On the contrary, market measures are forward-looking, and are considered to reflect estimates about the net present value of expected future earnings. Share market returns are considered a better measure of firm performance, as they represent true gains to shareholders (both through dividends paid out and appreciated stock prices), are more directly comparable across firms (they are not subject to accounting manipulation), and are a good measure of future profits (in the context of the efficient market theory). Some examples of market value ratios are Price to Earnings Ratio (P/E), Price to Sales, Price to Free Cash Flow, Price to Book Value, Beta and Dividend Yield.

Furthermore, between accounting and market-based measures there is another type of performance measure based on the fundamental concept of cash flow, which has been widely recognized as a key element in value creation analysis that makes it possible to overcome some of the handicaps attributable to accounting measures (Cohen 1994, Mattessich 1995). Any cash flow figure (operating cash flow, equity cash flow, free cash flow, etc.) is calculated through a number of adjustments to accounting measures, and building upon them a number of ratios can be proposed that improve the financial analysis of the firm, such as the Cash Flow from operations to Current Liabilities Ratio or the Cash Flow Return on Investment (CFROI). These ratios can also be organized following a pyramid of cause-and-effect relationships that would be linked to the accounting and market perspective as well. Furthermore, the future/estimated values of cash flows are discounted to provide analysts with different measures of a company's shareholder value creation (many different metrics exist based on the discounting of cash flows, such as Economic Value Added (EVA), Market Value Added (MVA) and the general concept of Shareholder Value Added) and are therefore the basis for analysing its market value.

As Brealey and Myers (1996) suggest, share value can be seen as the present value of all expected future dividends (market perspective), as the present value of the free cash flows (cash flow perspective) and as the present value of the future benefits under a non-growth policy *plus* the present value of the growth opportunities of the company (accounting perspective). Therefore, a three-dimensional model for financial diagnosis is proposed, based on three perspectives (Figure 4-3):

1. The accounting perspective, based on the analysis of ratios defined from the information contained in financial statements and subject to

- the shortcomings of accounting methods and conventions (i.e., depreciation schedules, accrual based numbers or inventory valuation)
2. The cash-flow perspective, where the cash-flow reflects the “real cash” flowing in and out due to operations, investing, and financing activities
  3. The market perspective, that takes into account investor expectations about the company’s value and risk.

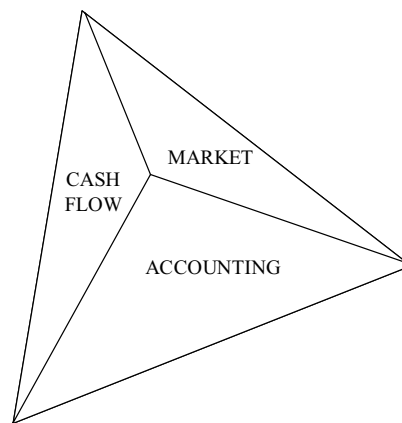


Figure 4-3. An integrated model of the financial analysis of sustainability.

The three perspectives complement each other and contribute to the comprehensive analysis of the shareholder value creation process. The accounting perspective is the more important one, as it will contain the most part of information and, particularly, the information on the environmental and social performances of the company. The cash flow perspective provides a “real cash” measure of shareholder value (built on both past and future/estimated information) and the market perspective provides a future-oriented measure of shareholder value.

The upper ratio selected for the top of the pyramid as a measure of shareholder value is an alternative measure of the Price to Earnings Ratio (Fernández 2002), which is essentially a combination of a market measure (share price) and an accounting measure (earnings per share).

The integration of these three perspectives is not difficult to define. In fact, cash flow is no more than a measure which is constructed on the basis of accounting information:

$$\text{Free Cash Flow} = \text{Profit after tax} \textit{ plus} \textit{ Depreciation} \textit{ plus} \textit{ Increase in debt} \textit{ less} \textit{ Increase in working capital requirements} \textit{ less} \textit{ Investment in fixed assets}$$



From the market perspective, the value of a share for an investor who requires a return of  $r$  is the present value of dividends which is expected to be paid on that stock:

$$P_0 = \sum_{t=1}^{\infty} \frac{DIV_t}{(1+r)^t} \quad (4)$$

In this equation, in efficient markets the expected dividend (DIV) will be the result of the company's dividends policy:

$$DIV = ROE \times d \quad (5)$$

Finally, the creation of sustainable shareholder value requires active managerial control over different sustainability issues, meaning the optimal exercise of sustainability real options. A further extension of the model of financial analysis of sustainability, once this three-sided integrated model has been developed, will borrow a methodology from real option theory to obtain a measure of sustainable shareholder value that takes into account the value that sustainability can add to traditional shareholder value (SV), as long as sustainability is considered to be an important source of strategic value and its active management is considered to encompass different real options (sustainability investment projects can present options such as to defer, expand, stage, alter the project scale, abandon, switch outputs or inputs, etc.). Following Trigeorgis (1995) this Sustainable Shareholder Value could be calculated as:

$$\text{Sustainable SV} = \text{Traditional SV} \textit{ plus Sustainability option premium} \\ \text{(value of operating and strategic options from active management)}$$

In order to show how the model is constructed, and for the sake of clarity, next section will focus on the accounting perspective, which is also the one that will contain the measures related to the environmental and social performances of the firm.

## 6. THE ACCOUNTING PERSPECTIVE

This section shows an example of how the model is constructed with a focus on the analysis of financial and environmental performances, which are the most easily quantifiable as for many years they have been a topic of research in the field of (environmental) management accounting, whereas the assessment of social added value is quite a new field (Maas and Bouma 2004).

The importance of taking social issues into account cannot be denied. Social measures can be divided into two groups (Maas and Bouma 2004): Internal measures such as education and training, safety and health care, employee retention and job satisfaction levels; and external measurements such as sponsoring, volunteer work, investment in society, and the involvement of stakeholders. Both measures, internal and external, influence the financial performance of the company. However, social performance measurements are often not easily quantifiable, if at all, and to attach a separate financial or monetary value to the social performance of companies is highly questionable.

The inclusion of qualitative measures proves difficult in the model as it is defined (based on mathematical relationships between the ratios), although it is important to recognise that these qualitative factors should be considered, as many exert a significant influence over these mathematical relationships. Nevertheless, the final aim of the model is to translate all these factors into quantitative measures. For example, the value growth duration of the company, which is subjective and qualitative to some degree, is transformed into a quantitative measure by making it dependent on the rate of growth of the sector, the company's market share goals, and its growth capacity, which is measured by the profit that has not been distributed as dividends to its shareholders. It is worth noting that in this way the model makes it possible to consider actions and interactions among competitors, which is one of the main objections raised against the BSC model (Brignall 2002).

Following the claims that indicate the importance of using both monetary and physical information (Burrill et al. 2002), embraced under the concept of eco-efficiency, some ratios are created based on the data that can be obtained from sources as an eco-balance, an environmental profit and loss account, and internal/cost/environmental accounting systems. Eco-efficiency ratios may be defined as value per environmental influence (with an increasing efficiency ratio reflecting an improvement in positive performance) or as environmental influence per unit of value (with a declining intensity ratio reflecting an improvement in positive performance). Measuring eco-efficiency performance makes it possible to identify and prioritize opportunities for improvement, and to identify potential cost savings and other benefits related to improving eco-efficiency.

Obviously, the list of ratios that could be created breaking down ratios by defining mathematical relationships is almost infinite. It is necessary to identify in each particular case which are the most relevant, depending on variables such as sector/sub-sector membership, company size, etc. Obviously, not all the ratios will be "business specific", but many will have a "generally applicable" character. Both the ratio selection and the relationships

identification should be articulated through a doubled-sided process combining both a deductive and an inductive approach:

- A deductive approach based on the derivation of rules from theoretical considerations and conclusions of financial ratio analysis. It is important that this is done as the ratios are often used intuitively, without sufficient consideration of their theoretical meaning. The ‘classic’ method for deductive approaches goes as far back as 1919, with the DuPont Pyramid system. This approach requires the cause-and-effect rationale to be applied, in order to derive rules that explain how changes in specific cause ratios will affect, *ceteris paribus*, the effect ratios.
- An inductive approach, characterized by an emphasis on data and statistical methods. The empirical rather than theoretical foundations for grouping financial ratios are central to this approach. This approach could be articulated through the use of some instrument from the field of artificial intelligence and machine learning, applied to a properly constructed database with financial and sustainability information for a number of companies. Although it is usual to assume that the learning system is able to acquire all necessary knowledge from the relationship with its environment, the system generally starts out from an initial knowledge that is sufficiently evolved to permit it to develop correctly. The framework for the financial analysis of sustainability resulting from the deductive approach would lead the learning process through the database, searching for relevant connections and identifying the more significant ratios. In this way it may be observed that both approaches are interdependent and mutually reinforcing. For more information on machine learning, see Quinlan (1993).

The result of the identification of the relevant ratios and the definition of relationships between them can be modelled in the form of a pyramid, similar to that of the DuPont methodology, in which the main causes that deliver the results shown at the top can be found at the base, with the final effect ratio being the relative price per share (which is considered to be a measure of shareholder value), which is directly dependent on the ROE, the cost of equity capital, and the rate of future growth. Some ratios or measures come from or go to other perspectives of the three-dimensional pyramid: for example, the systematic risk measured by the Beta should come from the market perspective, while the Value Growth Duration will be an input data for the analysis inside the cash-flow perspective. Note that Figure 4-4 is only an extract of the model.

Once the relevant ratios and relationships have been identified, the next step is to formulate the rules or heuristics that explain the company’s strengths and weaknesses and guide its strategic decision-making processes.

These rules will be based on the synchronic and diachronic analysis of the relevant ratios, and the analysis of the cause-effect chains that link them, also taking into account conclusions from conventional financial theory and general environmental and social knowledge.

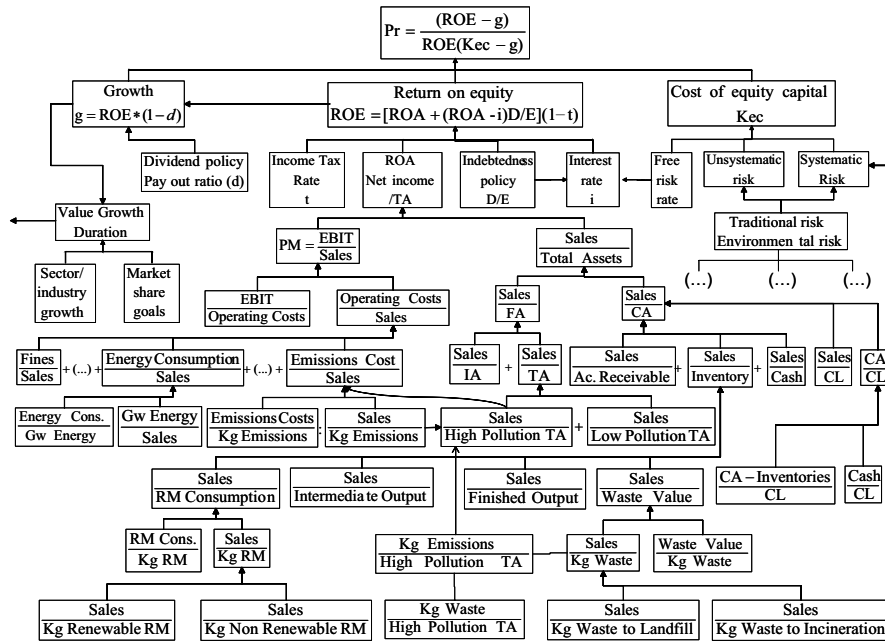


Figure 4-4. Model for the financial analysis of sustainability.

In order to clarify how this methodology of financial ratio analysis based on cause-and-effect relationships may improve financial analysis by taking environmental issues into account, as well as how it contributes to the analysis of the relationship between the environmental and financial performances, allowing to consider what kind of environmental management is being implemented at the firm, let us think about a company that has been investing in ‘end-off-pipe’ processes for the control of emissions (e.g., a scrubber) and that has experienced a decrease of its ROE. If the financial analyst only focus his evaluation on this effect ratio, it is likely that he will conclude that the improvement of the environmental performance is worsening the financial performance of the firm. But a look into the bottom part of the pyramid could show a picture similar to this:

- Trend analysis could reveal an increasing value of the ratio *sales/tons of emissions* (with constant sales), that reflects the reduction of emissions, and also an increasing value of the ratio *operating costs/sale* (as well as of some of its components).

- Benchmarking analysis could reveal a low value of the ratio *sales/kg emissions* (reflecting higher emissions than the sector average) a low *sales/high pollution assets* (reflecting a dirtier technology or a higher investment in it) a high *emissions costs/kg emissions* (reflecting the higher costs of the emissions control) and even a low *sales/chemical substances* and high *m3 of water/sales* (because of the use of water and chemical substances to spray the gases when they are inside the scrubber).

This analysis should suggest that the firm is implementing measures for the control of emissions that are neither environmentally effective nor cost efficient when compared with the sector, and should make the analyst conclude that is not environmental management, but the kind of environmental management what is damaging the financial performance of the firm.

The analysis of ratios is useful only when all influencing factors are interpreted skilfully and intelligently. This is, by far, the most difficult aspect of ratio analysis. Through the application of artificial intelligence tools it would be possible to validate empirically the results of the deductive analysis through the model, this is, to test the soundness of the relationships found between the ratios as well as identify the more relevant ones in order to refine the model and contribute to a better understanding of the financial implications of sustainability.

## 7. SUMMARY AND CONCLUSIONS

Once it has become evident that the financial objective of maximizing shareholder value cannot be considered on its own, and that companies and financial markets need to embrace sustainability principles in order to achieve this objective, managerial theory will start to integrate sustainability issues into its different areas (accounting, finance, marketing, etc.) and to develop new tools and instruments, as well as to adapt those already existing, to permit the strategic management of sustainability by companies and the capital markets.

Financial analysis, despite the criticism that it has frequently received for its reliance on past and accounting information, has traditionally been considered a suitable tool for assessing a company's financial and economic situation, and so could also provide valuable information when analysing the company's environmental and social performance and its relationship with financial performance. Ratio analysis and the cause-and-effect rationale are valid alternatives for developing the financial analysis of sustainability, as they make it possible to identify those sustainability activities that generate significant financial and/or non-financial benefits, and provide the financial

community with an appropriate decision-making tool for evaluating a company's sustainable management system and the impact of sustainability issues on financial performance.

In order to develop this model for the financial analysis of sustainability a double-sided process has been defined: on the one hand, a deductive process deriving relevant relationships between ratios following the cause-and-effect rationale; on the other, an inductive process of learning from real data using artificial intelligence. After integrating the accounting, market and cash flow perspectives, the model will be extended to introduce a measure for sustainable shareholder value by applying real options theory. Finally, through constant testing and refinement in the real world, the critical relationships between the key factors of financial, environmental and social performance will be identified, organized, and explained for immediate use.

Providing that environmental reporting becomes the rule and not the exception, and that the availability of information is no longer an obstacle for the strategic management of sustainability and its integration into the decision-making processes of companies and financial markets, the model for the financial analysis of sustainability depicted above will help to uncover the true financial, environmental and social situation of the company and therefore lead to better decisions being made, and contribute towards the simultaneous attainment of financial and sustainability objectives.

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