

PERFORMANCE 21 HANDBOOK OF BUSINESS PERFORMANCE AND VALUE CREATION IN THE 21ST CENTURY

Challenging traditional paradigms in light of the
digital economy and millennial values

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Partie 1

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FOREWORD

Social and societal change, environmental challenges, digitalisation, artificial intelligence, pivoting business models, the usage economy, the hyper-accessibility of information, increasing uncertainty in a globalised world, the demand for instantaneous satisfaction ... all of these are **factors that can challenge the dominant paradigms of performance measurement and business valuation.**

The EDHEC Value Creation Research Centre has been solicited by senior management from a wide range of firms – and across all generations – to help them adapt their strategy to a constantly shifting competitive environment. It has successfully facilitated the implementation of a holistic and dynamic performance management initiative which, in just one year, has integrated the financial innovations of the last 40 years. **A clear paradigm shift has emerged: pivoting from a management approach focused on margins to a culture of 3-dimensional performance (margins–capital–risk).**

In the era of Trump's tweets, all decisions made, whether in market finance or corporate finance, are based on the Modern Portfolio Theory of the 1950s and 1960s, whose proponents went on to win several Nobel prizes. It is interesting to note that today everyone has an opinion on this issue, finance experts and non-experts alike. The debates have been numerous, often contradictory, and have generated a cornucopia of viewpoints through which **professional decision-makers** often struggle to find their way. They find themselves **caught between the traditional practices of a 60-year-old financial culture and its detractors**, who believe that the digitalisation of the economy and its consequences render this financial theory outdated.

The ambition of the EDHEC Value Creation Research Centre is to participate in this controversial debate by providing the fundamentals needed for effective reflection. Our objectives are to **accompany businesses by highlighting the specificities of this new environment.**

To do this, we propose a handbook comprising 5 sections which will feed into the debate, offering both critiques and solutions to the problem of **“performance measurement and business valuation in the digital era against the backdrop of contemporary social, societal and environmental changes”**. We will analyse the pertinence of challenging traditional measures and consider the new alternatives being proposed by increasingly creative players. We will conclude which approaches we believe are most appropriate, whether developed in the past or contemporary. We will also issue proposals, presenting a threefold approach based on margins, capital and risk, the valuation of intangible assets and a financial index that includes environmental, social and societal dimensions.

The first section addresses the question: “do the new business models of the digital economy challenge traditional performance and value creation measures, and are new paradigms needed?” **We tackle this debate from a fresh analytical angle, providing a classification of performance measures based on their number of dimensions:** one-dimensional (margins), two-dimensional (margins–capital), and three-dimensional (margins–capital–risk) measures. This section analyses the strengths and weaknesses of the current set of measures applied to businesses. We note that these display highly heterogeneous degrees of sophistication. Specifically, **when it comes to measuring performance, the vast majority of non-listed firms continue to use the reasoning adopted by listed firms 40 years ago!**

We endeavour to understand the benefits of the **threefold margins–capital–risk approach**, which has been adopted for several decades by the financial markets, whereas the strategic, commercial and financial decisions made by most firms are based **solely on the notion of margins**. By offering a holistic view of performance measurement, this first section can serve as a **source of inspiration** to our readers so they can **adapt their balanced scorecards and performance management tools** in a way that benefits from the wealth of this threefold approach.

Section 2, building on the first, aims to demonstrate the benefits of a shift from a **one-dimensional (margins) to a three-dimensional (margins–capital–risk) measure** in the case of **mutual insurance firms**. We chose this category because adopting this threefold approach, so far chosen only by insurance firms with shareholder structures, may at first seem completely counterintuitive for firms without shareholders that focus on the well-being of their members.

This section was developed following requests issued to the EDHEC Value Creation Research Centre by senior management from mutual insurance firms. We implemented the threefold margins–capital–risk approach using RORAC (Return on Risk-Adjusted Capital), while at the same time respecting mutualist values (solidarity between members, absence of shareholders, long-term vision, humanism, etc. whereby the end aim is not profit but rather the satisfaction of members).

We will show how moving from a financial margin or combined ratio (one-dimensional measure) to the threefold margins–capital–risk approach (RORAC) can **offer members a much more realistic vision of value creation** than traditional approaches. Based on a holistic and dynamic approach to risk, **RORAC addresses the (non-exhaustive) problems** of capital allocation based on activities, products, clients, distribution channels and associated performances; the impact of strategic decisions (including new product creation) on the performance of business units and therefore of members; identifying operating leverage and its impact; setting out asset management, asset-liability, reinsurance and external growth policies; creating a shared language within the firm,

etc. With the take-up of the RORAC approach, we are on the cusp of a **veritable metamorphosis of performance management tools** among senior management and operational heads of mutual insurance firms across Europe, although the primary obstacle is a cultural one. This trend is extending to other sectors, which have also called on our research centre to help them integrate RORAC into these tools.

The aim of **Section 3** is to explore whether the transformation of our economy being led by generations Y and Z “from CAPEX to OPEX” (i.e. “from the possession of assets” to a “usage economy”) justifies the way investors, business accelerators and incubators are challenging the traditional performance measurement and valuation paradigms.

To address this controversial question, we produce a **classification of the business models in the new economy** in order to analyse the relevance of new performance and valuation indicators (in particular for start-ups). Innovation is often no more than apparent and in fact linked only to a name change or new presentation. Some stakeholders – perhaps without realising it – reuse concepts developed as part of Modern Financial Theory. For example, the notion of Lifetime Value so dear to the digital economy has been around for 40 years.

We will conclude the first three sections by looking at the problem of intangible asset valuation, which carries such weight in the digital economy that many critics of traditional approaches have resorted to this argument to reject **Modern Financial Theory**.

Against the backdrop of an economy in which social, societal and environmental concerns, data, employer branding and human capital have become key issues, **Section 4** explores the valuation of intangible assets. We produce a **classification of these assets** based on studies from both the academic and professional spheres. Once again, we **issue proposals** in relation to the controversies surrounding intangible asset valuation (traditional methods vs new approaches developed under the digital economy). We apply the different measures to real-world cases of globally established firms in order to contribute to the ongoing debate.

Lastly, the purpose of **Section 5** is to create a **new index** reflecting the fourfold **financial–environmental–social–societal perspective**, which builds on the proposals and reflections offered in the previous four sections.

The different forms of capital are the environment (it provides), humans (they produce) and currency (it enables trade). Economics can be defined as the efficient management of scarce resources. In the 1970s, financial capital was a scarce resource. In his seminal New York Times article representing the Chicago School of Economics,

Milton Friedman (1970) summarised the situation as follows: the only responsibility of businesses is to generate profits for their stockholders, who alone own the firm.

Nowadays, financial capital is less scarce, given its abundance and its low cost (negative interest rates). In contrast, environmental and human capital are forms that now appear to be becoming scarce. They have gradually come to be at the heart of the debate surrounding the responsibility of businesses. Where once “green” concerns and “social impact” were often used as no more than marketing tools, now there is an increasing awareness among top managers that financial performance is essential but it must accommodate the environmental, social and societal impact of business. The EDHEC Value Creation Research Centre therefore aims to help firms measure their performance with the creation of a new index that can account for this fourfold perspective.

To do this, we will analyse the different ideologies, both professional (extra-financial analysis and performance, liberated companies, 3-component accounting, B Corp certification, socially responsible investment, corporate social responsibility, etc.) and academic (in market finance and corporate finance). The aim is to create a four-dimensional index (financial–environmental–social–societal) that can satisfy the ambitions and demands of businesses, while at the same time offering a fresh perspective and new measures of performance and business valuation.

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Part 1

What if the digital transformation offered an opportunity to change financial performance paradigms?

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INTRODUCTION

Performance measurement and value creation are age-old topics, but they are once again the focus of attention in both the academic and professional spheres, in the face of the expansion of the digital economy and the values of millennials. The **EDHEC Value Creation Research Centre** is increasingly solicited by **decision-makers caught between:**

- Modern Portfolio Theory which dates from the 1950s and 1960s and whose proponents went on to secure several Nobel prizes. This theory continues to provide the fundamentals underpinning all strategic, operational and financial decisions, whether in the context of market finance or corporate finance;
- and its detractors, who argue that the **digital transformation and the values of millennials** (environmental impact, usage economy, preponderance of intangibles, etc.) have made this **financial theory outdated**.

Part 1 of this handbook stems from **our discussions with top managers** looking for research that investigates and analyses the **fundamentals of financial performance measurement**. Our objectives are to highlight the specific features of today's new digital environment and analyse the pertinence of the challenges being made against traditional **performance measurement paradigms**. Many different measures are used in firms, depending on their financial culture and level of sophistication, the stakeholder concerned (internal, investors, creditors, etc.), the decision-making timeframe, available information, objective (measuring field operations, overall performance management, profitability for investors), etc.

Drawing on financial theory (financial markets) and business management (corporate finance and management control) as well as approaches adopted in the political (European Central Bank) and professional worlds, the **ambition of this study** is to analyse performance measures in order to **offer firms the tools they need to make accurate interpretations and the right decisions in the contemporary jungle of performance measurement**.

Using these various information sources, we **offer a new analytical angle through which to analyse the debate**, producing a **classification of performance measures** based on their **number of dimensions**:

- one-dimensional measures focusing on margins,
- two-dimensional measures focusing on margins and capital,
- three-dimensional measures focusing on margins, capital and risk.

We use this analysis to address the following questions: **Are the different measures converging towards one another? Which measure for which objective? Which measure are used for which stakeholder? Which measure are considered for which level of complexity? What makes the threefold margins–capital–risk perspective the most**

appropriate? To what extent do the expansion of the digital economy and millennials' values (which encourage companies to review their existing financial culture) constitute an opportunity to adopt this perspective?

The first chapter in Part 1 presents the methodology chosen to produce a taxonomy of business performance measures and categorises them according to their number of dimensions. The second focuses on one-dimensional measures that mainly consider margins. We also present the benefits of management control through cost–value optimisation and analytical accounting. This chapter also studies the strengths and weaknesses of one-dimensional performance measures, which, despite everything, continue to be the favoured approach of most non-listed firms (while listed firms abandoned the approach based solely on margins more than 40 years ago!).

The third chapter considers the strengths and weaknesses of two-dimensional measures based on margins and capital. We will also show how, by breaking down profitability into an indicator of margins and asset turnover (the opposite of capital intensity), it is possible to develop a performance management tool that is much more effective than the traditional one-dimensional measure (margins).

The final chapter looks at the most modern performance measure, which adopts a **threefold perspective (margins–capital–risk)**. Built on the Modern Portfolio Theory of the 1950s and 1960s (Capital Asset Pricing Model), and made popular in the 1980s through the concept of Economic Value Added, **this approach is enjoying a new lease of life** thanks to the EU insurance directive Solvency II, which was **implemented in 2016** and applied to insurance companies, the sector's equivalent of Basel III (banks). The notion of the profitability of risk-weighted capital (**RORAC** – Return on Risk-Adjusted Capital) appears to be revolutionising the insurance and banking sectors. This trend is extending to other sectors, which have contacted our research centre in the hope of integrating RORAC into their performance management tools.

We conclude this analysis with a case study, to which we apply the one-, two- and three-dimensional measures, revealing the **superiority of the threefold (margins–capital–risk) perspective** that is used by all listed firms but enjoys only marginal use in the world of non-listed firms.

Part 1 of this handbook therefore seeks to understand the **benefits for firms across all sectors, and in all four corners of the globe, of this threefold approach** that is so well established in financial markets, while the strategic, commercial and financial decisions made by most firms (especially non-listed) continue to be determined using an approach focused only on their income statement (by looking at various margins). We hope that this **classification** of measures based on the **number of their dimensions** will offer an **overview of performance measurement** and serve as a **source of inspiration**

to our readers for the evolution of their balanced scorecards and decision-making tools towards the **threefold perspective**. As we reveal in this study, the problem is not linked to technical difficulties of implementation but simply the inertia of today's corporate cultures. From this perspective, digital transformation and the values of millennials, which challenge the existing corporate culture, provide an opportunity for more sophisticated measurement of performance and value creation.

I. CHOSEN METHODOLOGY TO ANALYSE PERFORMANCE MEASURES

For an objective analysis of performance measures, we choose an approach based on a systematic literature review. This methodology was first introduced in medical science and later extended to many other areas of research (e.g. Cook, Mulrow & Haynes, 1997; Tranfield, Denyer & Smart, 2003). Klassen, Jahad and Moher (1998) define a systematic literature review as one “in which there is a comprehensive search for relevant studies on a specific topic, and those identified are then appraised and synthesized according to a predetermined and explicit method.” This therefore required us to put in place a protocol beforehand with explicit search criteria. The first filter is based on summaries and introductions and on keywords in research articles published in top peer-reviewed finance and accounting journals according to international rankings.

The sample formed was taken from electronic databases, in particular EBSCO, Science Direct, National Bureau for Economic Research (NBER), JSTOR, Social Science Research Network and RePEC. We first focused our search on peer-reviewed journal articles using keywords, and later added articles, reports and books written by professionals and practitioners to make the sample more comprehensive.

Specifically, to be chosen for our sample, each article must have been published in one of the top international peer-reviewed journals in finance or accounting and contain at least one of the predetermined keywords¹, with no restriction on the year of publication (so as to include seminal and historical articles on performance measurement). Based on this initial sample, we further refine our selection based on the relevance of the chosen articles to the issue being discussed, and we later expand this database drawing on the bibliographies of the initially selected articles (published academic articles, discussion papers on regulations, professional press articles, reports by practitioners, books, etc.).

Based on these inclusion and exclusion criteria, the final sample contains 130 articles published between 1952 and 2017, 23 of which are literature reviews. More than half of these articles were taken from the 10 finance and accounting journals considered in the academic world to be the most prestigious, the details of which appear in the table below:

1 - In order to search for relevant peer-reviewed articles, we identified a series of keywords relating to the measurement of returns or performance generally (performance measurement, financial return, performance evaluation, financial performance, etc.), performance measurement based on accounting (Return on Assets, Return on Equity, Return on Capital Employed, Economic Value Added, etc.), performance measurement used in the financial markets (capital asset pricing model, Sharpe, Treynor and Sortino ratios, Jensen's alpha, etc.) and those derived from VaR (VaR, CVaR, MVaR, etc.) and RORAC (Return on Risk-Adjusted Capital).

Half of our sample was taken from the top-ranked academic journals in the field

Source	Number of articles
Journal of Financial and Quantitative Analysis	12
The Journal of Finance	11
Journal of Banking & Finance	7
The Review of Financial Studies	7
Journal of Portfolio Management	6
Journal of Accounting and Economics	6
Journal of Performance Measurement	5
Financial Analysts Journal	4
Journal of Accounting Research	3
Journal of Risk	3

Source : EDHEC Value Creation Research Centre

Based on a detailed analysis of all of these articles, several classifications of performance measures emerge. The one we consider most apposite is the classification based on the number of dimensions used, particularly in relation to problems encountered by professionals.

In many firms, especially non-listed firms, **performance is measured one-dimensionally, based on margins**. Depending on their business model, financial culture and level of sophistication, a large number of businesses take their sales and subtract some or all of their operational and financial expenses to concentrate on their gross margin, EBITDA (earnings before interest, taxes, depreciation and amortisation), EBIT (earnings before interest and taxes), and net income margin (net income divided by sales). Under this approach, the notions of capital and risk are overlooked, which is why we describe this **performance measure as one-dimensional**.

Listed firms in particular (due to the influence of investors in the decisions they make), and non-listed firms with a more sophisticated financial culture, also measure their performance based on the margins criterion, but add another dimension – capital – so as to measure profitability. This approach provides an answer to the question: “How much has the firm generated compared to what it invested?” The notion of capital intensity can be found in this approach, which **looks at two dimensions when measuring performance: margins and capital**.

The last approach is to **add a third dimension: risk**. The historic method uses Economic Value Added (EVA) and became popular in the mid-1990s. It **integrates the notion of risk into the approach based on margins and capital**. Here, risk is measured using the cost of capital. The more a firm’s projects or environment are risky, the higher the cost of its capital and the higher its profitability should be to compensate for that risk. Value creation is thereby measured using the difference between profitability (generally Return on Equity – ROE – or Return on Capital Employed –ROCE) and the cost of resources (cost of equity capital or capital respectively).

We will see that firms operating in the world of finance (insurance and banking) simultaneously integrated the notion of risk to their performance measurement approaches using a series of measures such as RORAC (Return on Risk-Adjusted Capital) and RAROC (Risk-Adjusted Return on Capital) which we will later look at in detail. These measures are becoming more widespread through changes in the regulatory framework (Basel III and Solvency II).

We will now offer a **critical analysis** of these performance measures (with one, two and three dimensions) with a view to **facilitating the decision-making process in firms**.

II. ONE-DIMENSIONAL PERFORMANCE MEASUREMENT: MARGINS

One-dimensional performance measurement is based on an analysis of the income statement, sometimes combined with an analysis of the cash flow statement. This is the approach most commonly used by firms, as it enables oversight of their operational dimensions. However, as we will see, only considering income statement information is insufficient to effectively account for a firm's performance.

This one-dimensional measure involves taking sales figures and, depending on the chosen economic model and objectives, subtracting some or all of the firm's operational, financial and/or fiscal expenses. The income statement can be analysed in four parts: operations, investments, finance and taxation.

II.1. Gross, commercial, manufacturing and contribution margins

When measuring a firm's operating performance, it is possible to focus on different aspects depending on its chosen economic model and therefore its objectives. One can look at the gross, commercial, manufacturing or contribution margins depending on the chosen model. The gross margin reflects the profit generated through sales revenue once the cost of sales has been deducted (Stolowy & Ding, 2017; Subramanyam, 2014).

$$\text{Gross margin} = \frac{\text{sales} - \text{cost of sales}}{\text{sales}}$$

This ratio captures the performance of commercial operations (revenue generated) in relation to the costs incurred as part of those operations, i.e. the costs the firm incurred to manufacture the goods it sold in this period. In the context of the sale of unprocessed products (trading firms), the cost of sales corresponds to the money spent on commercial operations to generate sales revenue. The gross margin is often referred to in this context as the commercial margin.

Some businesses prefer to break down the cost of sales into variable costs (e.g. energy consumption, packing, raw materials) and fixed costs (salaries of commercial staff

responsible for generating sales revenue) to increase awareness among key decision-makers. The sales figure calculated after deducting variable costs is often called the contribution margin. This contribution margin minus the fixed costs incurred to generate the sales revenue is then the gross margin. Of course, it is possible to create as many intermediate figures between sales revenue and the gross margin as there are sources of costs in the firm.

Businesses whose operations include processing (manufacturing firms) often refer to this gross margin as their manufacturing margin. It is defined using the production figures for the accounting period (production sold, stored or immobilised) from which the cost of purchasing raw materials consumed (purchase of materials +/- variation in stock of raw materials) is then deducted.

The gross margin can therefore be easily “personalised” depending on the firm’s analytical objectives (internal decision making purposes). This makes it particularly useful to measure performance on the ground, i.e. the performance of operations closely linked to the generation of sales revenue.

However, although it is an attractive indicator at the outset, it carries the disadvantage that it does not cover all operational expenses (R&D, marketing, sales, administration (selling, general and administrative expenses – SG&A), restructuring expenses, etc.).

II.2. EBITDA margin

Here we are looking at all operational aspects of the income statement. To determine the EBITDA margin, all operational expenses (Stolowy & Ding, 2017; Subramanyam, 2014) are subtracted from the sales figure. The balance corresponds to earnings before interest, taxes, depreciation and amortisation, or EBITDA. As when establishing any margin, the scalar is revenue or sales:

$$EBITDA \text{ margin} = \frac{\text{Earnings Before Interest, Taxes, Depreciation and Amortization}}{\text{Sales}}$$

The concept of EBITDA therefore covers more than the concept of the gross margin, which is more focused on on-the-ground operations, by considering all operational expenses. It enables businesses to establish balanced scorecards with which to measure performance, and in particular to control their costs according to type (personnel, marketing, etc.). It reflects the core of the business, and so it is easy to understand why some professionals use a multiple of EBITDA to value a firm.

However, on its own this indicator is insufficient, as it can lead to errors in assessing performance. The EBITDA margin can be very high but be affected by the depreciation and amortisation of fixed assets. This means that a firm with a high capital intensity ratio could have a very high EBITDA margin compared to a trading firm, but in reality

its performance will be lower once the “investment” dimension has been included. Capital intensity is accounted for in the income statement using the concept of EBIT (Earnings Before Interest and Taxes), as we will see in the next section.

Moreover, the use of EBITDA is contested and is attracting more and more scrutiny from regulators. In 2016 both the SEC (March 2016) and the IASB (July 2016) raised objections against firms presenting EBITDA numbers in their financial statements. It seems that 2016 marks a turning point in the positions of these two organizations regarding their tolerance of firms reporting EBITDA and EBITDA-like numbers. Following up on his speech “Performance reporting and the pitfalls of non-GAAP metrics” at the Annual Conference of the European Accounting Association (FT, 11 May 2016 and Hoogervorst, 2016), IASB Chairman Hans Hoogervorst rejected outright the use of EBITDA in financial statements (WSJ, July, 2016): “however, not all non-standard accounting terms deserve to be rigorously defined.” EBITDA is an inherently misleading measure and one that Mr. Hoogervorst said he would not wish to define. “Depreciation and amortization are very real costs and I don’t think they should be left out of the analysis,” he added.

Furthermore, academic work by Bouwens, De Kok and Verriest (2019) outlines some of the dangers involved with EBITDA: first, there is no uniform definition of EBITDA and managers have a lot of leeway in how they calculate it for their firm. Second, EBITDA is a bad proxy for cash flow, contrary to what some proponents argue, as it does not take investments in working capital into account. Third, as a measure of profitability (potential to generate earnings), EBITDA excludes depreciation and amortization thereby ignoring the costs involved in renewing operating assets.

Finally, the use of EBITDA and its adjusted variants have also attracted criticism from the business press. Very recently, the Financial Times also took issue with the lack of uniformity in how these metrics come about and are communicated between managers and their shareholders. They support the stance of the regulators to push for further transparency and standardization of operating profit measures, and they urge investors to support this policy as well (FT, Oct 7 2019).

II.3. EBIT and NOPAT margins

These margins reflect all operational dimensions, but also the investment section of the income statement. The EBIT margin is expressed as follows:

$$EBIT \text{ margin} = \frac{\text{Earnings Before Interest and Taxes}}{\text{Sales}}$$

The translation of investments found in fixed assets in the balance sheet is materialised in the depreciation and amortisation expenses, which separate EBIT from EBITDA. So, all else being equal, a company with higher capital intensity will have lower EBIT. It is

by assessing changes in the margin between EBITDA and EBIT that one can appreciate the consequences of the chosen economic model and identify the levers that can be used to improve it. In other words, improving the EBIT margin requires growth in sales, better management of operational costs and greater efficiency of fixed assets, often measured by the following asset turnover ratio:

$$\text{Fixed asset turnover ratio} = \frac{\text{Sales}}{\text{Fixed assets}}$$

Given the components of EBITDA and EBIT, it is easy to see why an analysis of both margins is highly complementary and can be used to identify the different operating and investment leverage effects.

Using EBIT, it is also possible to determine net operating profit after taxes (NOPAT margin), also called the net EBIT margin. It offers a performance measure based on operational and investment dimensions after taxes. In other words, we are talking about net operational performance prior to the impact of the firm's financial structure (debt levels). It should be pointed out that taxes are calculated in a way that excludes tax savings made through the payment of interest on debts (tax shield).

$$\text{NOPAT margin} = \frac{\text{Net Operating Profit after Taxes}}{\text{Sales}}$$

II.4. EBT margin

This performance measure is less widely used since it combines operating (e.g. cost of sales) and non-operating items (e.g. interest expense). The two previous measures focus on operations and any after-tax investments but overlook the financial dimension. It may be naturally appropriate for a shareholder, acquiring company, senior management, financial director or other to measure the impact of the firm's financial structure (weighting of equity capital and financial debt) on its profit margin.

This financial dimension therefore includes financial earnings, defined as financial income (investment income, subsidiary dividends, etc.) minus financial expenses (interest on financial debts). If financial earnings are subtracted from EBIT, one obtains the figure for earnings before taxes, or EBT.

$$\text{EBT margin} = \frac{\text{Earnings before taxes}}{\text{Sales}}$$

This ratio is also very useful for comparing the before-tax performances of individual firms or subsidiaries within a group.

II.5. Net margin and EPS

If we remove the fiscal section (corporate tax) from the earnings before taxes already found in the operations, investments and finance sections, we obtain net earnings. Using the same methodology, dividing it by sales, we obtain the net margin:

$$\text{Net margin} = \frac{\text{Net earnings}}{\text{Sales}}$$

Net earnings is an operational concept that is probably less useful for firms than the EBITDA or EBIT margins. However, for shareholders, net income is essential because it is the income (or earnings) that belongs entirely to them: some of it will be allocated in the form of dividends, the amount of which is determined by a vote at the annual general meeting, and the rest will be designated as retained earnings (or reserves) and included in the firm's equity capital and also therefore belongs to shareholders. It is easy to understand why net earnings is an essential figure for shareholders, and we will see in Section 4 that its volatility is an indicator of how risky they perceive a firm to be.

This notion also reflects a tangible reality in financial markets, particularly through diluted earnings per share (EPS), which is defined as net earnings divided by the total number of shares (both existing and potential, i.e. linked to financial instruments such as convertible bonds, stock options, etc.).

$$\text{EPS} = \frac{\text{Net earnings}}{\text{Total number of existing and potential shares}}$$

According to Maditinos, Sevic & Theriou (2009), EPS has predictive power when it comes to stock prices, more so notably than the other accounting measures mentioned above. However, like Stewart (2009), we argue this measure may be fragile because it can be easily skewed by the accounting norms taken into consideration, share redemptions, off-balance sheet financing, operational or restructuring expenses carried over, etc.

II.6. Operating cash flow margin

Some firms look beyond the income statement and, partly to overcome accounting biases, consider operating cash flow (Subramanyam, 2004). This measure offers three advantages compared to the approaches presented above:

- It reintegrates amortisation expenses, depreciation and provisions as these are purely accounting figures and do not translate into outbound cash flow,
- It reintegrates the variations in working capital requirements, as this is not presented in the income statement even though it is an entry linked to operations. Working capital requirement is defined as the sum of stock and trade receivables minus trade payables. Any variation from one accounting period to another, particularly linked to changes in sales revenue, clearly translates into an additional capital need or resource which it is important to take into account when measuring a firm's performance,
- Lastly, it identifies the amount of cash actually generated by the firm's operations which can then be reallocated either to investments or to financial transactions (dividends, debts, etc.).

Operating cash flow = net earnings + amortisation expenses and provisions
– reversal of amortisation and provisions – capital gains from the sale of assets
+ capital losses from the sale of assets – variation in working capital requirement.

One can also create a performance measure using the following ratio:

$$\text{Operating cash flow margin} = \frac{\text{Operating cash flow}}{\text{Sales}}$$

II.7. Cost–value optimisation and analytical accounting

For the purposes of measuring performance, the approaches presented above are underpinned by accounting frameworks (International Financial Reporting Standards – IFRS, United States Generally Accepted Accounting Principles – US GAAP, and local GAAP). The objective of management control is to escape dependency on accounting rules and put in place a bookkeeping system that more closely reflects reality: analytical accounting.

It focuses on cost–value optimisation, which must sometimes accommodate objectives and/or constraints relating to the environment, society, quality of services, etc. The understanding of performance in management control is naturally linked more closely to the type of stakeholder concerned (shareholders, customers, employees, suppliers, etc.).

This means that performance as measured from a management control perspective has two primary components:

- Value creation for the customer. This means production that is valued by its end user; it can be material (products) or immaterial (services), intended for external or internal customers,
- Control over consumption of the resources needed for the business. These resources can be financial, human, material (facilities, rent, etc.) or immaterial (patents, brands, etc.). Defining costs is one of the original missions of analytical accounting and of management control.²

These two components are not necessarily aligned and can even in some cases conflict with one another. For example, the addition of services or functions to improve value creation for the client can result in additional costs. In the world of management control, measuring and overseeing performance must therefore account for this duality.

However, it should be pointed out that while in industrial sectors it is more straightforward to determine the unit cost of products sold and the unit margin, this task is more difficult when some value indicators (e.g. punctuality of deliveries) cannot be related directly to costs. Therefore, it is often a good idea to establish a balanced

2 - Anthony and Dearden (1984) point out that one of the most common definitions of management control in the 1960s was «the process by which management assures that resources are obtained and used effectively and efficiently in the accomplishment of the organisation's objectives».

scorecard with separate indicators for value creation and costs in order to have an accurate overview of performance.

While defining the first component (value creation for customers) is generally not problematic, the second (measuring production costs), in contrast, has been the subject of many different approaches in an attempt to link expenses to their cost object depending on the type of performance being studied. In other words, the **objective here is to model performance measurement based on a measure of costs determined within the analytical accounting framework.**

To measure its performance, a firm must first define:

- cost object (product, distribution channel, customer, business unit, brand, etc.),
- scope of costs (all relevant costs),
- classification of expenses as direct costs (those that can be unambiguously attributed to their cost object) and indirect costs (those that generally relate to several different cost objects and which can become direct costs if the firm establishes a cost allocation base³),
- classification of expenses as fixed costs and variable costs (in the short term, since fixed costs can become variable as the business expands), particularly with a view to modelling cost behaviour patterns.

Based on these definitions, various approaches to costs have been developed to reflect different performance measurement objectives.

The first series of performance measures in management control is based on **partial costs**. As the name indicates, this involves only considering some of the costs linked to the object in order to establish a performance measure that is consistent with the operating leverage at the disposal of the segment in question (factory, project, product, client, zone, etc.). To measure its performance, it can be useful to exclude indirect or fixed costs that cannot be directly controlled by the segment manager, at least in the short run.

Using this cost filter, it is then possible to establish different performance measures:

- **Direct cost margin**, which measures the capacity to cover indirect costs. It is defined as sales minus direct costs. The analytical profit is therefore equal to the direct cost margin minus indirect costs. This approach is very well suited to independent businesses. For example, in the case of a hotel, the analytical result can be analysed as the sum of the direct cost margin relating to the hotel, restaurant, seminar facilities and bar, from which overall indirect costs are then subtracted (management, overheads, marketing). However, the indirect costs of the hotel chain (promotions, central booking system, etc.) are excluded.

³ - For example, the salary of an employee working on several different cost objects or the telephone expenses relating to all customers can become direct costs if a system is put in place to identify time spent on each cost object. It is of course important to define direct costs as much as possible, but sometimes one must choose between precision and the cost of collecting the information.

- **Unit contribution margin**, which measures the capacity to cover fixed costs. This is defined as the difference between the sale price and the variable unit cost. The overall contribution margin can also be calculated by subtracting all variable costs from sales. The analytical statement is therefore equal to the overall contribution margin minus fixed costs.
- Using this unit contribution margin, it is easy to find the right volume for which the analytical result will equal zero. This threshold, known as the **breakeven point** and measured in volume of sales, is equal to the ratio of fixed costs to the unit contribution margin.⁴ This breakdown of performance measurement makes it possible to determine the impact of operating leverage (increasing sale price, lowering fixed costs and/or variable unit costs) on performance.
- **Evolved contribution** is a concept that enables an intermediary measure to be used within the analytical statement whereby, rather than all fixed costs, only direct fixed costs are taken into consideration. It can be defined as the unit contribution minus direct fixed costs. This gives us an additional anchor point and therefore a more refined cost analysis. It is an approach that combines variable/fixed costs and direct/indirect costs.

While these approaches have the advantage of being simple, since they only consider partial costs, they can only be used for short-termist and local analyses and decisions. For example, they are not suited to determining tariff policy for a product or service, since price must cover all of a firm's costs if the profit generated is to be measured correctly.

To remedy these limitations, there is a **second series of performance measures** in management control based on **overall costs**. One of the most widely used approaches based directly on all of the firm's costs is **Activity-Based Costing (ABC)**, which is the cornerstone of the **Activity-Based Management (ABM)** approach.

First let's look at the general approach involving overall costs. This involves attributing all costs to all cost objects. It means that the analytical result of a cost object is the difference between sales and overall costs, which are defined as the sum of the direct costs relating to the object, in addition to the share of indirect costs attributed to the cost object. The first difficulty is that the overall unit cost is dependent on volumes.

The second difficulty is to find the cost allocation base for indirect costs between the different cost objects. This base is generally simple and in most cases is determined using either the coefficient method (where the allocation base is linked to indirect expenses incurred such as a percentage of sales, hourly wage, direct object cost, etc.), the equivalence method (a given object is said to equate to a multiple of expenses incurred for another object; the aim is to bring everything back to a reference object and deduct a multiple for all other objects) or the cost centre method, whereby

4 - Let USP be the unit sale price, I the level of business, FC the amount of fixed costs, and VUC the variable unit cost. This gives us analytical result $R = (USP \times I) - FC - (VUC \times I)$. The breakeven point is defined by the amount of I such that $R = 0$, which gives us $I = FC / (USP - VUC) = FC / \text{Unit contribution margin}$.

these “centres” play an intermediary attribution role between indirect costs and cost objects (a building could be considered as a cost centre and the overall operating cost could be divided between objects in the form of an internal rent).

The ABC method is based on the assumption that resources are consumed by activities which in turn are consumed by cost objects. The aim is therefore to break the business down into different activities, allocate resources to these activities based on resource drivers (for example a building’s occupied surface area), identify the resources consumed, define the cost objects and deduct the cost for each object. The aim is to be less dependent on volumes, which has been harshly criticized: a business activity with high volumes ends up sponsoring the one with lower volumes, because most of the indirect costs will be attributed to it, and often this does not reflect the economic reality. **The ABM approach**, building on the ABC method, seeks to optimise the efficiency and effectiveness of business activities by focusing on the cause-and-effect relationships that link them to one another. This makes it possible to measure the performance of each activity based on cost reduction and an increase in value.

Although the financial model for performance measurement we have just outlined remains largely dominant, it should be noted that increasing importance is being given to the “real” integration of social, societal and environmental performance.

Organizational performance in management control is therefore about measuring the relationship between value production and the consumption of resources (costs) by integrating increasingly global performance criteria (financial, social, societal and environmental performance), the nature of organizations (private or public) and the different management levels (top managers, middle managers, other employees, etc.).

II.8. Conclusion on one-dimensional performance measurement indicators

The one-dimensional performance measurement approach is very widely used, particularly by non-listed firms (listed firms tend to use two- or three-dimensional measures more closely linked to the approach adopted by investors, as we will see in the following two sections), as it offers several advantages.

First, one-dimensional measures are simple and generally respect the required characteristics of performance measures: they must be timely, precise, objective, congruent, understandable and lasting (Merchant & Van der Stede, 2017). They are primarily based on an accounting approach to the income statement, which is closely aligned with the financial culture and traditions of many non-listed firms, generally unaware (or not sufficiently aware) of the wealth of information to be found in balance sheets. Furthermore, due to regulatory obligations on ruling off accounts, these performance measures are regularly and foreseeably available.

Finally, their simplicity is such that they can be monitored by a large proportion of the firm's staff and offer a framework to enable its decision-makers to measure the sensitivity and impact of the choices they make on these performance measures.

It is interesting to refer to certain academic studies conducted on financial markets, and in particular on the predictability of stock prices in correlation with these one-dimensional performance measures. For example, Maditinos et al. (2009) demonstrate that stock yields are more closely correlated with earnings per share (EPS) than other measures with two or three dimensions such as ROE (Return on Equity), ROI (Return on Investment) or EVA (Economic Value Added), which we will be looking at in the next two sections. From the same perspective, Alwathainani (2009) and Garvey and Milbourn (2000) respectively show that the growth and volatility of past operating profits are indicators of future stock yields. Lastly, Dechow (1994) sets out how performance measures based on earnings are more closely correlated with stock returns than cash flow, as they display forward-looking information not captured by current cash flows.

However, when a one-dimensional performance measure is based on accounting principles, it may be disconnected from reality and difficult to compare against other firms, especially competitors. The European Central Bank (2010) highlighted this second point in a report, in which it pointed out that comparisons between firms and between countries based on accounting ratios are not satisfactory due to the biases resulting from different local accounting standards.

Boussard (1997) presents accounting as a common way to represent the life of an economic entity. Like any model or language, it serves as a filter that enables a reality to be understood through the communication of signs. Swieringa and Weick (1987) see accounting as a language, a social practice that is accompanied by values insofar as its objective is to guide actions and promote values of efficiency, effectiveness and economy. And so, like any language targeting an audience, accounting adapts to the questions it faces and the objectives sought in each specific context.

This brings us to the traditional debates that have surfaced in the field of accounting: how can accounting be sufficiently simple and inexpensive, but at the same time consider complex operations? How can accounting constitute a single language yet address different stakeholders with different interests and objectives? How to develop a common source of information that is relevant for the performance management needs of a firm while at the same time enabling control with the possibility of sanctions? Should accounting be reliable and faithful or facilitate comparisons between firms?

Venanzi (2012) emphasises the subjectivity of published accounting figures, which can be calculated based on different financial reporting frameworks and still be admissible,

thus making it impossible to draw comparisons between firms that use different standards.

Several academic studies have also shown that accounting favours “optimisation” in order to present more attractive accounts, both internally and externally. Dechow (1994) reveals how the discretionary powers of top managers can be used to overestimate the profits generated by monitoring the bookkeeping of doubtful receivables, inventories, goodwill value etc. The IFRS also offer room for interpretation, for example by transforming expenses into R&D or distribution network expenses (acquisition costs) into assets in the balance sheet (deferred acquisition costs). Similarly, Rappaport (2006) demonstrates that with an approach focused solely on the income statement, management can develop projects that destroy value: generating profits that are actually lower than the cost of capital (see three-dimensional performance measures).

Merchant & Van der Stede (2017) show how performance measures based on margins can in some cases be unusable. For example, what is the point in measuring the performance of a start-up based on margins that are often negative in the first few years? Furthermore, depending on the firm’s maturity, bookkeeping can require the use of less relevant indicators, as can be seen in the context of today’s digital economy. Anthony & Ramesh (1992) note that growth in sales or investments are second-tier indicators for mature businesses, whereas they are essential for start-ups, since they are not yet posting any margins. And so, in the absence of other indicators, investors must often base their decisions on less relevant or even irrelevant indicators. Readers will recall that in the late 1990s the number of mouse clicks was used as a measure to value online start-ups. Their response was swift: they put in place systems to automatically generate clicks.

Finally, and we feel this is the most important limitation of one-dimensional performance measures, they fail to integrate two key dimensions: capital and risk. When comparing two firms with the same margins (gross, operating, net, etc.), it is clear that an investor or contributor will be sensitive to each one’s consumption of capital in generating those profits.

Measuring performance, even for an individual without any financial knowledge, is very often based on an intuitive and pertinent question: “how much have I earned compared to what I invested?” And firms should also consider this question by looking at one-dimensional performance measures (margins), but also by comparing them with the investments made to generate those profits or to the capital contributed by financial providers (shareholders equity, bank credit and bonds). This intuitive reasoning leads us to the following section, which looks at two-dimensional performance measures.

III. TWO-DIMENSIONAL PERFORMANCE MEASUREMENT: MARGINS AND CAPITAL

As explained in the previous section, one-dimensional performance measurement (margins) is very useful in operational terms, but overlooks balance sheet considerations, which are essential when it comes to managing fixed assets and working capital requirements. The two-dimensional approach therefore integrates both margins and capital.

This measure is particularly intuitive both in the context of corporate finance and market finance. A firm's management has resources at its disposal (equity capital and credit) provided by financial backers (shareholders, banks, bondholders), and these are invested in medium- and long-term assets (intangible, tangible and financial assets) and used to finance the firm's working capital requirement (WCR) that stems from delayed payments as part of business operations (trade receivables, inventories and trade payables). The sum of fixed assets and WCR is, in accounting terms, equal to the sum of equity capital and net cash debts, which also equals capital employed.

It is worth pointing out at this stage that we can intuitively understand that while it is important to generate the highest possible profit margin, it is also essential to optimise the use of fixed assets, tangible assets in particular (equipment, machinery, land, real estate, etc.), as well as the WCR (recover trade receivables as quickly as possible, optimise inventory management and negotiate the longest possible payment timeframes with suppliers). This can also be achieved by changing one's economic model. Firms operating under the digital economy have often chosen highly effective business models when it comes to consuming capital employed (low levels of tangible assets and in some cases low WCR).

All savings made on fixed assets and/or WCR represent a reduction in the financing required from shareholders or the bank and/or money that is freed up to finance growth, development projects, etc. This makes it clear how important it is to consider the balance sheet as carefully as the income statement, although this is often far from being the case in many non-listed firms.

In the world of market finance, the appeal of the two-dimensional approach is also intuitive. Investors measure the performance of their investment based on "what they have earned compared to what they invested." This approach clearly points to earnings as the numerator and capital as the denominator. Every time a saving is made on capital employed, it means less money required from financial backers, all else being equal.

III.1. Different concepts of profitability

Two-dimensional performance measurement is based on the concept of profitability defined as the ratio of earnings to capital employed. This profitability ratio can be adapted to the objective of the firm or its investors by maintaining consistency between the numerator and the denominator.

It is therefore possible to determine financial profitability (ROE) from the shareholder's perspective; economic profitability (ROCE) from the firm's perspective; profitability of assets (ROA) from a balance sheet perspective; and return on investment (ROI). Other profitability indicators can also be analysed or created according to the specific needs of the stakeholder.

For example, shareholders consider financial profitability by looking at what they have earned (net earnings – we saw this in the previous section) divided by what they invested or what belongs to them (equity capital). We can therefore apply the same logic to all profitability ratios:

$$\begin{aligned}
 ROE &= \frac{\textit{Net earnings}}{\textit{Mean equity capital}} & ROCE &= \frac{\textit{EBIT}}{\textit{Mean capital employed}} \\
 ROA &= \frac{\textit{EBIT}}{\textit{Mean total assets}} & ROI &= \frac{\textit{Net earnings}}{\textit{Mean capital invested}}
 \end{aligned}$$

III.2. Breaking down profitability into a performance management tool

Beyond simply calculating profitability, the two-dimensional performance measurement approach can serve as an excellent performance management tool. Profitability can be broken down into different ratios that can be used to identify the levers with which to improve performance management and the firm's economic model.

One illustration of this approach is the Du Pont de Nemours model, which emerged from the process of reflection among management at the firm of the same name in the 1960s. Their objective was to find a way to formalise the firm's profitability by identifying all measures of operating leverage, using both the balance sheet and income statement.

Their idea was to consider economic profitability as the product of the operating margin and asset turnover:

$$\begin{aligned}
 ROCE &= \frac{\textit{EBIT}}{\textit{Mean capital employed}} \\
 &= \frac{\textit{Net EBIT}}{\textit{Sales}} \times \frac{\textit{Sales}}{\textit{Mean capital employed}}
 \end{aligned}$$

The first term here is the operating margin, whose operational levers are sales and operating expenses (cost of sales, personnel, R&D, marketing, administrative expenses, etc.).

The second is asset turnover, which equals the reverse of capital intensity. This involves measuring the efficiency of fixed assets and WCR. It is interesting to note that this ratio can be erratic since growth in sales is more or less a continuous variable, whereas fixed assets before amortisation is a discrete variable. Investments, particularly those designed to avoid the obsolescence of fixed assets, are not an annual expense. Furthermore, some firms smooth out this erratic quality by taking into account gross rather than net fixed assets, which means they must consider net EBITDA rather than EBIT.

$$\begin{aligned} ROCE &= \frac{Net\ EBITDA}{Mean\ gross\ capital\ employed} \\ &= \frac{Net\ EBITDA}{Sales} \times \frac{Sales}{Mean\ gross\ capital\ employed} \end{aligned}$$

As with the operating margin, the aim with the asset turnover figure is to identify all forms of operating leverage that can increase it as much as possible. This involves achieving a given level of sales with the minimum amount of capital employed, i.e. the minimum amount of fixed assets and WCR.

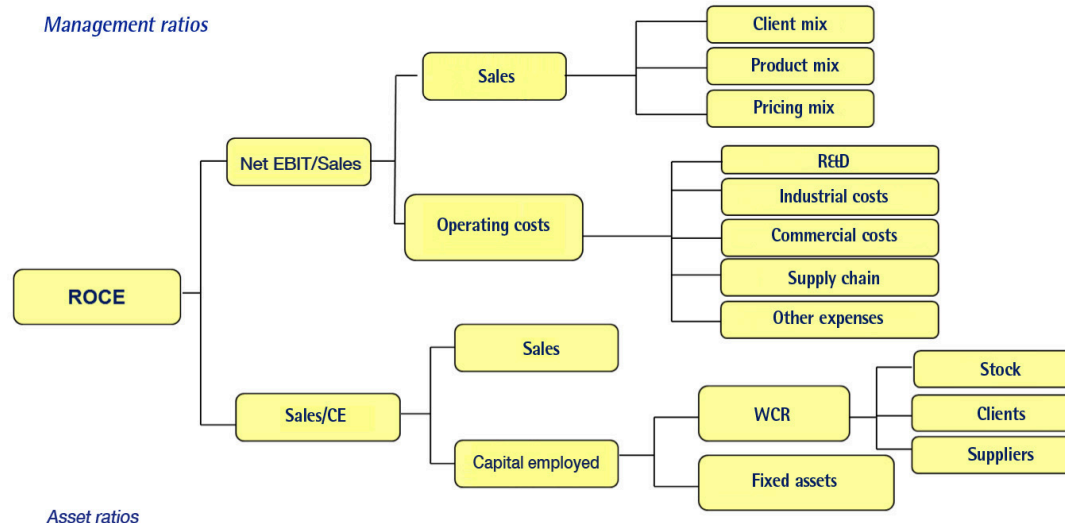
Analysis of non-current assets involves the following:

- studying the condition of fixed assets, in particular tangible assets (equipment, machinery, factories), which can be determined using the ratio net fixed assets/gross fixed assets,
- studying the firm's investment policy, for which the ratio investments/amortisation can be used. A ratio of less than 1 means that the business is investing less than the depreciation (in accounting terms) of its fixed assets. In a firm where this depreciation is not disconnected from economic depreciation, this means that the company does not believe in its own future or has liquidity problems and can no longer invest sufficiently to replace its fixed assets, or it could also mean the firm is shrinking (which may be a good thing if for instance its market is too). In contrast, when the ratio is very high, this may be an indicator of over-optimism and therefore over-investment which will have to be managed, particularly its negative impact on profitability,
- studying productivity using a ratio for fixed asset turnover (sales/fixed assets).

Analysing a firm's WCR, as explained in the previous section, involves looking at trade receivables (recovery, factoring, managing payment delays, etc.), inventories (just-in-time management, lean management), and trade payables (longest possible payment timeframes).

This approach breaks down economic profitability using all the variables on which it depends. Completing the economic schema below offers an overview of the current situation and identifies operating leverage, particularly in the context of a comparison with peers. It is also possible to use this schema to simulate the impact of a new strategic or operational decision and gain an objective view of it in relation to ROCE.

Du Pont de Nemours economic tree



Breaking down economic profitability in this way into margins and asset turnover also makes it possible to better identify leverage effects. For example, two firms from different sectors can have the same level of economic profitability but with very different margins and asset turnover figures. Economic profitability of 12% can be achieved with margins of 1%, 2%, 3%, 4%, 6% and 12% combined respectively with asset turnover figures of 12, 6, 4, 3, 2 and 1. This means a hypermarket can have the same profitability as a cement factory.

The supermarket sector is highly competitive and its margins are very low. Naturally, players on this sector target sales volumes and cost reduction, but after a series of restructuring operations and on a mature market (limiting their capacity to increase their market share), it is essential for businesses to reduce capital employed by optimising fixed assets (in particular sales per m²) and WCR, even if the latter is negative and therefore constitutes a resource. Thanks to this negative WCR (which accordingly reduces the amount of capital employed), some mass retailers achieve economic profitability of as much as 12%, despite very low net margins (2-3%).

In contrast, it is difficult to produce cement without investing substantial resources in a factory. The economic model in this sector is therefore very capital intensive (low asset turnover). To achieve profitability of 12%, the cement manufacturer will of course have to optimise the productivity of capital employed but above all generate a sufficient margin to reach this figure.

In conclusion, breaking down economic profitability in this way makes it clear that any firm, depending on its sector, benefits from specific conditions in terms of asset turnover (linked to its economic model) or operating margins (linked to the level of competition and barriers to entry, which are determined by asset turnover).

To achieve satisfactory levels of profitability, they have three levers at their disposal:

- margin (management of sales and operating expenses)
- fixed assets (managing productivity of tangible assets in particular)
- WCR (taking action on trade receivables, stock and trade payables)

Like this breakdown of economic profitability in terms of ROCE, it is interesting to note that financial profitability for the shareholder, ROE, can also be broken down into three ratios: net margin, asset turnover and leverage effect:

$$ROE = \frac{\text{Net earnings}}{\text{Mean equity capital}}$$

$$= \frac{\text{Net earnings}}{\text{Sales}} \times \frac{\text{Sales}}{\text{Mean capital employed}} \times \frac{\text{Mean capital employed}}{\text{Mean equity capital}}$$

As above, it is useful for a firm to identify operating leverage on margins and asset turnover. Financial leverage effects involve studying the fact that because debt is cheaper to finance than equity capital and is tax-deductible, it can be beneficial for shareholders when the firm takes on debt (as long as ROCE remains above the cost of debt after corporate tax). In this case, the shareholder's financial profitability can be greater than the firm's economic profitability. This is expressed using the following equation:

$$ROE = ROCE + (ROCE - \text{cost of debt after corporate tax}) \frac{\text{Net cash debts}}{\text{Equity capital}}$$

It is important to note that as debt increases, so does perceived risk among investors (debt is a fixed cost and increases the volatility of earnings).

So if the financial profitability of a firm increases year on year, it is important to understand whether that is due to an improvement in margins, an improvement in asset turnover or simply additional risk-taking by the financial director through an increase in debt.

The breakdown of financial profitability can of course be as refined as one wishes, since each entry in the income statement and balance sheet can be broken down. For example, a firm could decide to calculate the following equation:

$$ROE = \frac{\text{Net earnings}}{\text{Mean equity capital}}$$

$$= \frac{\text{Net earnings}}{\text{EBT}} \times \frac{\text{EBT}}{\text{EBIT}} \times \frac{\text{EBIT}}{\text{Sales}} \times \frac{\text{Sales}}{\text{Mean capital employed}} \times \frac{\text{Mean capital employed}}{\text{Mean equity capital}}$$

III.3. Conclusion on two-dimensional performance measurement indicators

We have seen that combining a balance sheet approach with one-dimensional performance measurement indicators provides a wealth of additional information and measures (De Wet & Du Toit, 2007), and so it is surprising that two-dimensional performance measures are not used in all firms.

Once again, the reasons for this are more cultural than technical, as these measures are simple and generally respect the required characteristics of performance measures: they must be timely, precise, objective, congruent, understandable and lasting (Merchant & Van der Stede, 2017).

As explained above, due to regulatory obligations on ruling off accounts, these performance measures are regularly and foreseeably available and their simplicity is such that they can be monitored by a large proportion of the firm's staff and offer a framework to enable its decision-makers to measure the sensitivity and impact of the choices they make on these two-dimensional performance measures.

We have shown that the Du Pont de Nemours model based on the firm's economic profitability (ROCE) or the shareholder's financial profitability (ROE) offers multiple and highly operational uses. In particular, it allows profitability to be broken down into data taken from the income statement (margin) and data from the balance sheet (asset turnover). So, depending on the market's maturity, level of competition and capital intensity, firms can choose to prioritise measures based on one component and/or the other. This model makes it possible to dissect the firm's economic model, identify sources of operating leverage (margin, WCR, fixed assets), break them down into different sub-ratios and analyse the firm's past and current financial positions. It can also be used to simulate different decision-making and choice scenarios and directly measure their impact on profitability. We have also shown that it is possible to integrate the weight of financial leverage (of debt in particular) into financial profitability for the shareholder.

However, because these are accounting constructs, two-dimensional performance measures can of course be more "optimised" than one-dimensional measures, since they are disconnected from reality and not conducive to comparisons with other firms, competitors in particular. And so all of the limitations set out above in relation to the subjectivity of accounting and the possibility for managers to optimise their accounting ratios are made all the more applicable by the fact that these two-dimensional measures are based on two accounting aggregates, one taken from the income statement and one from the balance sheet.

Several academic studies have shown that when it comes to profitability ratios bookkeeping favours "manipulations" so that accounts can be made more attractive both internally and externally. We will not return to the above-mentioned studies on margins but instead focus here on the denominator. Bhimani, Horngren, Datar and Foster (2015) and Merchant & Van de Stede (2017), for example, show that it is easy to optimise the WCR (lower inventory investments, delay payment to suppliers), the value of fixed assets (owner-lessor arbitrage, amortisation method, evaluation method, temporary transfer of financial assets as fixed assets, etc.), the amount of

equity capital (buyback of securities or payout of exceptional dividends). Du Jardin et al. (2019) also demonstrated how bookkeeping manipulations could be used by firms in difficulty to change their financial profile and the extent to which such manipulations could predict bankruptcy. The European Central Bank (2010) also emphasises the complexity of inter-firm comparisons, particularly in relation to adapting or optimising investment policies, for which bookkeeping can ultimately lead to problems of under-investment.

As in the case of one-dimensional measures, it is also important to manage the atemporal dimension of these ratios and to project them forward several years in order to avoid myopia or biases in the choices made by the firm's decision-makers.

Lastly, and we believe this is the most significant limitation of two-dimensional performance measures, they fail to integrate the “risk” dimension. When comparing two firms with the same margins (gross, operating, net, etc.) and the same levels of profitability (ROE, ROCE, ROA, etc.), it is clear that investors or capital contributors will be sensitive to the risk exposure of each firm in generating its profits. For example, it would be easy to choose between the two if one operated in an emerging economy with high levels of political and social risk and the other in a more mature country with no political or social risk.

This performance measure, even for an individual without any financial knowledge, is very often based on an intuitive and pertinent question: “how much have I earned compared to what I invested and the risks incurred?” Firms should also therefore consider this question by looking at margins and capital, but also by comparing these against the risks incurred and therefore the volatility of their earnings. This reasoning leads us to the next section, which explores three-dimensional performance measures.

IV. THREE-DIMENSIONAL PERFORMANCE MEASUREMENT: MARGINS, CAPITAL AND RISK

The threefold performance measurement approach (margins–capital–risk) is highly intuitive. Choosing an investment or project or measuring a firm's financial performance is based on margin and capital, but also the level of risk incurred. This adds a stochastic dimension to the deterministic approach based on one- and two-dimensional measures. In other words, as explained in the conclusion of the previous section, the question being asked is: “how much have I earned compared to the capital invested and risks incurred?” Every strategic, commercial, operational or financial decision is made in light of the risks taken. One must therefore measure whether the anticipated return reflects the level of risk, and compare the different returns linked to different levels of risk.

For nearly 70 years, risk modelling and risk-adjusted performance measurement have been the subject of extensive debate and controversy, both in the academic literature and the professional sphere. To integrate the notion of risk into the measurement of a firm's performance, we propose first of all to consider the modern financial theory of financial markets, recognised by three Nobel prizes, particularly in relation to the cost of capital. For it is this concept, developed in the 1950s and 1960s, that is at the heart of all decisions made on financial markets and in corporate finance.

We will then integrate this concept into the field of corporate finance, primarily drawing on the concept of Economic Value Added and its extensions. The final section will look at modern approaches to the integration of risk in financial institutions in relation to the concepts of RORAC (Return on Risk-Adjusted Capital). In practical terms, we will demonstrate the contributions of these three-dimensional performance measures when it comes to performance management.

IV.1. Introducing risk to financial market performance measures

While the academic literature contains an abundance of articles on risk management, it should be pointed out that there are few definitions of the notion of risk (Holton, 2004). In 1921, in an analysis of the origin of profits, Frank Knight offers the first definition of risk in which he distinguished between the statistical (or objective) probabilities that reflect measurable uncertainty and subjective probabilities (or opinions). Knight argued that risk corresponds to future events whose probability can be measured, whereas uncertainty is marked by an indefinite and incalculable probability of future events occurring.

IV.1.1. Concept of risk

Nowadays, when applied to the context of businesses, risk tends to be defined as the “possibility of events, or combinations of events, occurring which have an adverse impact on the economic value of an enterprise as well as the uncertainty over the outcome of past events” (Kelliher et al., 2012). This means that risk management corresponds to the ability to identify risks, measure them and determine their consequences in order to take relevant steps such as the conservation, transfer or reduction of those risks based on the firm's objectives. Risk management therefore involves implementing mechanisms, rules and procedures designed to limit uncertainty, as well as the analysis and quantification of potential losses linked to a given event occurring.

According to D'Arcy (2001), the first formalisation of risk management can be traced back to the 1950s and the topic was first approached in detail by Mehr and Hedges in 1963. According to these authors, the objective of risk management is to maximize the firm's productive efficiency. Risks must not only be assumed; they must be managed as

a whole. To achieve this, Mehr and Hedges define four stages in the risk management process:

- identification and measurement of losses linked to exposure,
- evaluation of the different risk management methods (assume, transfer or reduce risks),
- selection of one of these methods,
- and monitoring of the outcomes.

This definition comes closest to the more contemporary Enterprise Risk Management (ERM), which is defined as a holistic approach that can be used to structure risk management so as to better understand risk exposure and determine the most appropriate strategy to achieve one's objectives. All risks to which a firm is exposed, regardless of their nature, are evaluated, compared and aggregated to determine their impact on the firm's risk profile and objectives. Central to this is the notion of appetite for risk, which constitutes the key element and the first stage in a firm's ERM approach (Foulquier, Arias, 2016).

The theoretical fundamentals governing the contemporary world of risk management are based on modern portfolio theory (Markowitz, 1952). This heuristic model is positioned in an environment in which markets are assumed to be perfect.⁵

IV.1.2. The CAPM at the heart of all financial market and business decisions

Markowitz (1952) argues that a firm's total risk can be broken down into idiosyncratic and systematic risk. The former is specific to each firm and linked to its operations and its intrinsic management approach. The risk incurred by an investor can therefore be reduced by diversifying the investment portfolio with businesses that are perfectly and not positively correlated. In contrast, systematic risk is one that cannot be compressed or diversified; it is linked to market volatility, and investors are only rewarded in relation to this risk. So in the context of perfect markets, a firm's value does not depend on its total risk but only on the systematic risk to which it is exposed. Nocco and Stulz (2006) explain that when markets are perfect, risk management within the firm itself is futile and can even be considered as a loss of resources.

As indicated in the introduction to this section, for almost 70 years risk modelling and risk-adjusted performance measurement have been the subject of extensive debate and controversy, both in the academic literature and in the professional sphere. Debates have focused on the construction and ease of implementation of performance measures (Crouhy, Turnbull & Wakeman, 1999; Shadwick & Keating, 2002; Kim, 2006; Stewart, 2009; Trudgen & Freeman, 2014), the capacity to be "optimised" and therefore skewed by internal decision-makers (Young, 1997; Ingersoll, Spiegel,

⁵ - A perfect market satisfies the following four assumptions, which are highly restrictive and therefore very rarely all verified:

- Atomistic market. All agents are small in size compared to the market as a whole and are unable to affect prices. There is only one price, which everyone accepts,
- The products traded are all identical and homogenous. Since there is also only one price, competition is reduced to its most simple manifestation,
- Transaction costs are nil,
- Information is perfect and circulates with complete transparency.

Although these assumptions are very rarely verified, this model represented a major step forward in the world of risk management as it allowed for a better understanding of reality, even though it is in fact much more complex. And so all strategic, operational and financial decisions made by firms or financial markets are generally based on this model.

Goetzmann & Welch, 2007; European Central Bank, 2010; Simpson, 2015; Cogneau & Hubner, 2009).

To consider whether it is useful for firms to adopt the approach of the financial markets (corporate finance), we propose to return to the measures of risk initially developed in the context of financial asset portfolio management by investors on these markets.

The first fundamental measure of markets is **mean-variance**, first formalized by Markowitz (1952). This approach views risk as a deviation from the mean expected return or that of a benchmark or financial market. It is a measure based on financial market risk, both systematic and idiosyncratic.

It remains the simplest to implement (Simons, 1998; Caporin, Jannin, Lisi & Maillet, 2014; Berk & DeMarzo, 2007; Cogneau & Hubner, 2009), so much so that it is the reference for most alternative financial market measures (Sortino & Forsey, 1996; Sortino & Van der Meer, 1991; Dowd, 1999, 2000).

This is the measure that led to the famous CAPM (Capital Asset Pricing Model) on which all market finance and corporate finance decisions are based today, particularly choices relating to investments (using the discount rate) or acquisitions (business valuation).

The CAPM, which was developed by Markowitz (1952), Sharpe (1964) and Lintner (1965), describes the return on assets re based on a risk-free rate r_f , market yield r_M , sensitivity to systematic market risk β and abnormal returns measured using the mean-variance approach:

$$r_e = r_f + \beta(r_m - r_f)$$

Beta is defined as the relationship between on the one hand the covariance of historic profitability r_i of asset i (or of a portfolio) with historic profitability of market r_m and on the other the variance of the market's implicit profitability. It compares the historical volatility of a security to that of a market index. If β equals 1, the security has the same level of sensitivity as the market. If it is lower than 1 (respectively greater than 1), the security's yield is a function of that of the market index being considered, but it will amplify to a lesser (greater) extent the fluctuations of the market (it is less (more) volatile than the market). We can also understand why it is a useful measure when putting in place a risk diversification strategy. In the CAPM, the returns on an asset and mean-variance volatility are directly linked.

IV.1.3. Some measures taken from the CAPM (Jensen's α , Treynor, Sharpe, APT, Fama & French)

The CAPM gave rise to a few famous measures:

- Jensen's alpha (Jensen, 1968) α_p measures the abnormal performance of a portfolio compared to its theoretical performance as determined using the CAPM. It is sometimes used to determine a manager's remuneration: $\alpha_p = E[r_p] - (r_f + \beta(r_m - r_f))$ where $E[r_p]$ is the portfolio's expected return according to the CAPM. When α is greater (respectively lower) than 0, the portfolio has performed better (worse) than its reference market.

- Treynor's ratio (Treynor, 1965) measures the excess returns of portfolio r_p compared to those of risk-free asset r_f per unit of market risk β : $(r_p - r_f) / \beta$

- Sharpe ratio (Sharpe, 1966) measures the excess returns of portfolio r_p compared to risk-free rate r_f after adjusting for its risk σ_p , which makes it possible to consider more than the mean returns of the CAPM: $(r_p - r_f) / \sigma_p$. In the case of two portfolios with the same level of volatility, this measure can therefore be used to identify the one with the best returns, or in the case of two portfolios with the same returns, to identify the one with the least volatility. If this ratio is negative, it underperforms the risk-free asset. If it has a value of between 0 and 1, the excess returns compared to the risk-free rate are insufficient for the level of risk incurred. A value of 1 indicates outperformance for the level of risk incurred.

As explained earlier, the CAPM created more than 60 years ago is the reference model for all market finance and corporate finance decisions (investment choices, measuring risk, discount rates, business valuation, etc.), despite the fact that it offers no more than a sometimes unreliable approximation insofar as it does not always reflect reality.

The assumptions underpinning the CAPM are as follows:

- there are no transaction costs or taxes,
- the short sale or purchase of a security has no impact on its price,
- investors are risk-averse and rational,
- all investors have the same investment horizon,
- investors control their portfolio risk through diversification,
- the market is completely free and all assets can be traded on it, investors can borrow and lend unlimited sums at the risk-free rate,
- all information about the market is available to all investors,
- competition on the market is perfect and fair,
- all financial assets can be divided into smaller assets.

In practice, furthermore, as pointed out by Cogneau & Hubner (2009), the result is sensitive to the chosen risk-free rate. This raises the following questions: which horizon, which reference date, which rate (lending or borrowing rate, given that the CAPM assumes them to be equal), which market (particularly in the event that a business has operations in the four corners of the globe), and which substitute is used in countries where there is no risk-free rate?

The same applies when choosing the reference market index (Roll, 1978; Eun, 1994). Which investment horizon, which frequency, which reference financial market (particularly in the case of business operations in several different geographic zones)? Calculating the beta also raises the same questions. It is common for the linear correlation coefficient to be very far from a value of 1, which leads the CAPM to be rejected.

The limitations of the CAPM for family businesses were highlighted by Foulquier & Herbin (2015) – particularly showing that the long-term survival of the estate and retention of control dominate the mean-variance criterion – and Wong Cam & Chirinos Grados (2016).

Ultimately, it is not very intuitive to believe that the returns on an asset or portfolio depend on just one variable: market yield. And so many researchers have looked for other explanatory variables. Two approaches are recognised in the academic sphere and, to a lesser extent, the financial markets (where the CAPM continues to dominate).

The first is **Arbitrage Pricing Theory** (Ross, 1976). This model, based on the absence of long-term arbitrage opportunities, proposes an extension of the CAPM by considering that the returns of asset $E(r_i)$ can be modelled using a linear function of different macroeconomic factors (commodity prices such as oil, a country's GDP, currencies, etc.) that are intrinsic to the sector concerned, weighted according to their impact on the asset through a specific coefficient β_i . It therefore offers a very high level of flexibility (Berk & DeMarzo, 2007) when it comes to choosing explanatory variables for the yield of an asset:

$$E(r_i) = r_f + \beta_{1i}(RP_1) + \beta_{2i}(RP_2) + \dots + \beta_{ni}(RP_n)$$

Where RP is the risk premium associated with each systemic risk factor.

These risk premia must be zero mean. When the factor taken into consideration is market yield alone, this is the specific scenario of the CAPM. According to APT, three of the CAPM's assumptions are not necessary: yields with normal distributions, optimal risk-return (the portfolio contains all risky assets and is efficient), the Markowitz assumption that investors seek to optimise their yield at all levels of risk.

However, the primary disadvantage of this theory, which has never really challenged the dominance of the CAPM, is that Ross's theory does not determine the risk factors. In other words, one must empirically identify the risk factors for each security, and what is more these must be non-diversifiable (global influence and not limited to just one firm), measure the impact of each factor on returns (linear regression), and estimate the risk premium associated with these factors (difference between yield in the presence of the risk factor and the risk-free rate).

Another weakness of this model is that the variation in the number and types of risk factors will have an impact on the beta values. Chen and Knez (1996) emphasise that any measure based on the APT will depend on the exactitude of the presumed factorial structure of the asset returns.

The second approach recognised in the academic world and to a lesser extent by the financial markets (where the CAPM continues to dominate) is the factor model, specifically the Fama and French three-factor model (1993, 1996). Ross (1976) established a theory but did not really look at risk factors. Fama and French adopted the reverse approach and set about empirically looking for models with several factors in order to identify the best explanatory non-diversifiable factors. This led them to the three-factor model:

- market risk premium like the CAPM,
- size measured by the difference between the returns on small and large market capitalisations, or SMB (small minus big),
- measure of the difference between yields of "value" stocks (high book-to-market value) and those of "growth" stocks, or HML (high minus low book-to-market ratio)

The model is as follows:

$$r_i = (r_f) + \beta_1(r_M - r_f) + \beta_2(\text{SMB}) + \beta_3(\text{HML})$$

Even though the explanatory power of the Fama and French model is greater than that of the CAPM and compatible with APT, it is not often used by the markets in practice due to the volatility of the HML coefficient (book-to-market) which can be linked to economic or speculative moves by investors (Lakonishok, Shleifer & Vishny, 1994). Furthermore, it is not always easy to associate securities with each of the groups specified by Fama and French (Ferson, Sakissian & Simin, 1999).

IV.1.4. Challenging the CAPM mean-variance criterion: downside risk, semi-variance, Value at Risk and its extensions

Although mean-variance is recognised as a fundamental measure in market finance and corporate finance, it nonetheless carries several disadvantages as it is based on a normal distribution and fails to account for:

- 3rd-order moments, i.e. asymmetry in the distribution of financial asset returns (Ang & Chua, 1979),

- 4th-order moments, i.e. kurtosis, which reflects the coefficient that flattens the distribution curve. The law of financial returns generally produces thicker distribution tails than those of normal laws,
- the non-normality of certain financial markets. Ang & Chua (1979) point out that borrowing and lending rates are unequal. Wong Cam & Chirinos Grados (2016) emphasise the fact that some discount rates and country risk premia lead to contradictions that highlight the existence of returns which do not follow a normal distribution. Harvey (1995) studied 20 emerging markets and concluded that 14 of them did not follow a normal distribution,
- the fact that by applying the same weightings to positive and negative returns (identical sensitivity to gains and losses), the mean-variance criterion does not always reflect actual perceptions of risk among investors, whose objective is to detect and even protect themselves against losses (Prokopczuk, Rachev, Schindlmayr & Trück, 2007). Dowd (1999) showed that because of this, the mean-variance measure tends to result in investors over-protecting themselves against risks.

To remedy this last point in particular, new concepts were developed:

- downside risk
- semi-variance
- Value at Risk and its extensions

Downside risk

First expressed by Roy in 1952, downside risk is a reflection of the fact that an investor can legitimately believe that the actively managed excess returns of a portfolio are not measured by the difference between its total returns and the risk-free rate (Sharpe ratio) but instead by another benchmark measure which Roy calls the Minimum Acceptable Return (MAR). This involves generalising the Sharpe formula using the so-called Safety First ratio:

$$SF\ Ratio = \frac{(r_p - MAR)}{\sigma}$$

This Sharpe-type performance measure is similar to the mean-variance criterion but substitutes the MAR for the risk-free rate in order to integrate downside risk below the MAR rather than the deviations from the expected mean returns under the mean-variance approach (Sortino & Van der Meer, 1991; Chaudhry & Johnson, 2008; Simons, 1998). Dowd (1999) later demonstrates the importance of the downside risk approach given the asymmetry in investor perceptions of downside risk compared to upside risk, and therefore that the downside deviation is the specific portion of the risk to which risk management resources must be allocated.

In the event that the MAR value is zero, the portfolio's excess returns will mechanically be the gross yield. Naturally, a risk-averse investor will retain an MAR value that is higher than the risk-free rate.

This measure can lead to changes in investment decisions based on the Sharpe ratio (Sortino & Forsey, 1996; Leon & Moreno, 2017), particularly where returns no longer consistently follow a normal distribution (skewness or kurtosis), leading to occasional underestimations of performance.

Consider two investments, A and B, with expected respective returns of 6% and 8% and standard deviations of 7% and 15%. If the risk-free rate is 3%, the Sharpe ratios will be respectively 0.43 $((6\%-3\%)/7\%)$ and 0.33 $((8\%-3\%)/15\%)$. If the MAR is 5%, the Roy ratios – inversely – result in B being preferred over A, with respective values of 0.14 $((6\%-5\%)/7\%)$ and 0.2 $((8\%-5\%)/15\%)$.

Measuring semi-variance and lower partial moments

Using Roy’s approach (1952), Markowitz (1959) determined the weighting of semi-variances in order to account for the asymmetric distribution of returns (Kaplan & Knowles, 2004; Farinelli & Tibilettin, 2008; Chen, He & Zhang, 2011). Depending on the variance, the positive variation from the mean is precisely compensated for by negative variation with the same probability. The choice of variance can be explained if the returns come from a normal distribution.

For a given distribution of returns, the lower partial moment expressed as nth-order LPM with respect to the MAR value is defined by the mean of positive difference between the critical MAR value and the return to the power of n:

$$LPM_n(MAR) = E[\max(MAR - r), 0]^n$$

For example, the semi-variance compared to risk-free rate r_f is the 2nd-order LPM for which $MAR = r_f$. This means calculating the variance of the investment’s excess returns compared to the risk-free rate provided these returns are negative.

$$SV(r_f) = LPM_2(r_f) = E[\max(r_f - r), 0]^2$$

Another specific approach that is commonly used because of its flexibility, according to Cogneau & Hubner (2009), is the Sortino ratio. This involves taking the Sharpe ratio and considering the returns of portfolio r_p above benchmark $r_{benchmark}$ which can be the risk-free rate, the MAR or any other relevant threshold, and replacing the Sharpe ratio standard deviation with the semi-variance:

$$Sortino\ Ratio = \frac{(r_p - r_{benchmark})}{\sqrt{LPM_2(benchmark)}}$$

It is possible to generalise this ratio to an nth-order partial moment to obtain the Kappa ratio (Kaplan & Knowles, 2004):

$$Kappa\ Ratio = \frac{(r_p - r_{benchmark})}{n\sqrt{LPM_n(benchmark)}}$$

Value at risk: VaR and CVaR

This measure is based on the principle of semi-variance and generates investment rankings like the Sharpe ratio in the case of normal returns (Alexander & Baptista, 2003). However, when the risks considered become more complex, the VaR results in different choices insofar as it concentrates more on extreme risks (tail of the distribution, events that occur rarely). Value at risk, expressed as $VaR_{1-\alpha}$, is determined by the maximum loss with respect to a critical MAR value such that there is a probability α that the observed loss will be higher. It can also be expressed as a monetary unit:

$$\Pr[MAR - R \leq VaR_{1-\alpha}] = \alpha$$

For example, in the case of a normal distribution of returns, a VaR of 95% corresponding to the maximum observed loss in 5% of cases, is equal to $VaR_{95\%} = MAR - E(R) + 1.645 \sigma(R)$, where 1.645 corresponds to the 95th percentile of the standard normal distribution.

However, a normal distribution scenario is of little interest since VaR is a monotonic increasing function of the variance of returns. It proves more useful when returns follow an asymmetric distribution (measured by skewness) or with fat-tailed distribution (measured by kurtosis), which also corresponds more closely to actual observations.

It is nonetheless important to note that VaR is not a measure of “coherent” risk (Foulquier & Le Maistre, 2012), and in particular it is not sub-additive, which means that the VaR of a portfolio is not necessarily lower than or equal to the weighted mean of the VaR values for its individual component parts, despite the benefits of diversification.

To correct this limitation, the CVaR (conditional Value at Risk) is defined as follows:

$$CVaR_{1-\alpha} = E[MAR - R \mid MAR - R > VaR_{1-\alpha}]$$

Here, we are no longer measuring a threshold beyond which it is a question of extreme losses, but instead assessing the scale of the anticipated loss (Artzner, Delbaen, Eber & Heath, 1999).

Prokopczuk et al. (2007), Cogneau & Hubner (2009) and Caporin et al. (2014) point out that these performance measures based on VaR or CVaR do not depend on the market portfolio's volatility, but only on the risk of loss as defined by the observer. In this respect, they offer considerable flexibility and are used both in portfolio management (financial markets) and to measure banking and insurance risk (Basel III and Solvency II regulations), as well as in the energy and other sectors (corporate finance), as we will see below.

IV.2. Introducing risk to business performance measures based on the advances made in the financial markets

As we have shown, albeit non-exhaustively, the performance measures applied to financial market portfolios have been the subject of countless academic studies, particularly with a view to improving on the CAPM approach developed in the 1950s and 1960s, which relied on assumptions often too far removed from reality. However, over the last 70 years of research, no model has managed to establish itself with sufficient force in the long term to replace the CAPM, which therefore remains the reference model in the worlds of both market finance and corporate finance.

When applied to corporate finance, the CAPM has led businesses to develop performance measures and investment choice criteria (net present value – NPV, internal rate of return – IRR, and discounted payback) as well as the notion of value creation, based on three factors (margins, profitability and risk), particularly in respect of EVA (Economic Value Added) and its extensions.

Another more sophisticated trend is currently being developed in firms with the increasingly widespread concept of return on risk-adjusted capital (RORAC and its variants) in the banking and insurance sectors, as seen in the Basel III and Solvency II regulations.

The next three sections explore these different concepts: NPV, IRR, EVA and RORAC.

IV.2.1. Measuring the performance of an investment using the CAPM

As we have already seen, the CAPM can be used to determine the cost of equity capital and more generally the weighted average cost of capital (WACC). Based on this measure, firms have developed three criteria to make their investment choices and thereby measure performance: net present value, internal rate of return and discounted payback.

All three use the discount rate, which is simply the WACC or cost of equity capital used in the CAPM, depending on the type of cash flows being considered (before or after the impact of financing).

The net present value (NPV) of a financial asset, project or investment is equal to the discounted positive or negative (investments) cash flows (F) it generates:

$$NPV = \sum_{t=0,n} F_t / (1+i)^t$$

If the NPV is positive, it means that the investment or project creates value and can be implemented.

The internal rate of return (IRR) is the second investment decision-making tool based on the CAPM. It corresponds to the discount rate that cancels out the net present value. So, by comparing this IRR to the rate demanded by a firm, one can decide whether or not to make the investment under consideration. Using the same cash flow schedule, determining the net present value based on a discount rate or determining the internal rate of return and comparing it with the discount rate both correspond to the same mathematical reality.

However, since the IRR involves finding the mathematical solution that cancels out the NPV (the return that cuts the axis of the NPV), it may be that, depending on the cash flows, there are several IRRs for a single investment, no IRR or, particularly in the case of choosing between several different investments, that the IRR will lead to a choice that contradicts the one based on the NPV. It is for this reason that we prefer to focus on net present value.

The third investment decision-making criteria based on the CAPM and used by firms is **discounted payback**. This method measures the period required to recover the sum invested. This means discounting future cash flows (cost of equity capital or WACC depending on the type of cash flow), adding them period after period and identifying the point in time when the discounted sum reaches zero. The disadvantage of this approach is that one only considers the point of inflection at which the sum of the cash flows becomes positive but without considering the NPV. This means that a project which burns through cash for one year more than another project but overall generates much more cash flow may be rejected.

In light of these limitations of the IRR and discounted payback, we favour net present value.

To measure a firm's financial performance, the decision-making criteria have been extended to the concept of Economic Value Added, which we develop in the next section.

IV.2.2. Value creation based on Economic Value Added

Firms applied modern financial theory and the CAPM to their own circumstances and came up with the concept of value creation, the cornerstone of economics.

Contrary to the traditional indicators used to measure value based on sales, net earnings, margins or return on capital, value creation includes the notion of performance by considering resources to have a cost. This cost naturally compels senior managers as well as operational staff to display a certain amount of discipline towards the firm's capital throughout the operating cycle, since the use of that capital does not come free of charge (Foulquier, 2009).

To determine the origins of value creation, one must look back to the classical economists, who made it one of the cornerstones of economics. The notion of value was originally associated with work: the value of a good is represented by the cost of the work needed to produce it. This idea was first introduced by Smith (1776), later developed by Ricardo (1817), and brought to its political paroxysm by Marx (1867). A parallel school of thought was developed by Say (1803), who argues that the value of a good is determined by its utility for its user.

Based on these two approaches, value can be defined first of all based on a transaction (trade or market value), a function of the cost of work for the vendor, and secondly based on its utility for the purchaser (utility value). This means it is possible to establish an objective value with immutable social meaning (cost of work and resources used, transaction value determined on a market) and a subjective value expressed through individual perceptions (utility value, individual value and circumstantial value attributed to a product or service).

Market value and utility value were reconciled through corporate finance theory (Caby & Hirigoyen, 2001). Given a risk-free asset and the opportunity cost that it represents for any investor, the trade value of a risky asset (market value) in a state of equilibrium should converge towards its utility value, as measured by the discounted cash flows it will generate.

When applied to corporate finance (theory of property rights, transaction costs, agency; see for example the overview provided by Coriat & Weinstein, 1995), the share of profits generated by a firm and allocated to shareholders is that which remains after all other stakeholders (employees, suppliers, banks, the State) have been paid. What is left for shareholders is the residual interest. To compensate for the risks incurred, they demand a utility value (and therefore a market value) for their investment (capital contribution) that is greater than the opportunity cost, further increased to reflect the specific risk the firm faces. As a result, the maximisation of the market value of equity capital, i.e. its utility value for shareholders to reflect the risks they have taken, should be the primary objective of any financial decision (Albouy, 2006).

In practice, a top manager with privileged information about each of the firm's stakeholders (clients, employees, suppliers, banks, the State) is often the primary decision-maker when it comes to distributing the surplus between these different parties. In an uncertain environment marked by the incompleteness of contracts, each stakeholder runs a risk in the relationship of information asymmetry that links them to the firm's top manager (Garvey & Swan 1994; Zingales, 2000). This means that the firm's objective is no longer reduced to maximising value creation for shareholders, but is extended to achieving this for all stakeholders. Charreaux & Desbrières (1998) remind us that for every strategic decision made in a firm, all of its partners are affected.

They refer to this as partnership value creation, which can be measured at each link in the chain by looking at the difference between the price paid by the stakeholder for whom the value is intended and the minimum price required (opportunity cost) by the party offering that value.

In this vein, studies by Rappaport (1987) and Slywotzky (1998) reveal that firms focusing on value creation for their customers ultimately create more value for their shareholders than those focusing exclusively on financial indicators of value creation for shareholders. Specifically, innovative products and services made available to customers allow a lasting competitive advantage to be built up and sustained, which is an additional source of value creation for shareholders. So the objective of value creation for shareholders is not incompatible with the aim of satisfying the firm's other stakeholders (Denglos, 2008). The value created for shareholders is the final link in a chain with the pre-requisite that the other stakeholders must first be satisfied. It nonetheless remains the ultimate objective.

It is not easy to determine the specific origin of value creation in a firm, but it would appear that this notion was already present at the beginning of the 20th century in major corporations with several different business activities (Johnson & Kaplan, 1987). In reference to traditional economic theory, value creation for the beneficiaries of residual interest was initially measured based on net earnings and earnings per share (EPS). This explains why, despite all the advances made since, the price-to-earnings ratio (share price/EPS) continues to be a widely used evaluation instrument even though it involves a lot of limitations.

Large firms have gradually refined the way they measure value creation, integrating the capital invested by each profit centre through the concept of return on investment (ROI: net earnings/capital invested), which remained key to strategic decisions up to the late 1980s, even though little by little it came to be challenged (Dearden, 1969) with the emergence of the concept of residual income, which is still the main reference. According to Solomons (1965, cited by Bromwich & Walker, 1998), the term residual income was used for the first time by General Electric, even though the CEO of General Motors (A. Sloan) is believed to have referred to it as early as the 1920s.

However, it wasn't until the 1990s that consultancy firm Stern, Stewart & Co brought the notion of residual income to the wider public with its concept EVA (Economic Value Added, registered as a trademark by Stern Stewart & Co), enabling this performance measure, adjusted to reflect the cost of economic capital, to really take off.

EVA is a three-dimensional measure that takes into account margins, capital and risk:

$$\text{EVA} = \text{net EBIT} - (\text{WACC} * \text{Capital employed})$$

Where:

- net EBIT is the operating income after taxes,
- capital employed corresponds to capital invested in the operating and investment cycle. It is financed by equity capital and debt and therefore, by construction, is equal to the sum of fixed assets and working capital requirements,
- WACC (Weighted Average Cost of Capital) is the weighted sum of the cost of equity capital as defined above in the CAPM, and the cost of debt following negotiations with banks and bondholders. It corresponds to the minimum rate of return demanded by financial backers, shareholders and creditors.

If the EVA is positive, this means the firm is creating value. Here, value creation therefore corresponds to the share of profits generated by the firm that is greater than the rate of return demanded by its financial backers (shareholders and creditors). As the first decentralized financial management tool, capable of measuring the performance of a given unit by applying an intrinsic required rate of return, EVA is often considered to be the ancestor of the balanced scorecards and value management tools (also known as an economic capital model) put in place by businesses.

EVA quickly extended beyond the world of consultancy firms and became an academic topic in its own right. Some researchers (Anctil, 1996; Reichelstein, 1997; Rogerson, 1997) analytically demonstrate the appeal of EVA and of residual income generally when it comes to coordinating a firm's objectives in the context of agency relationships. This paved the way for several variants.

IV.2.3. Value creation based on EVA extensions

The success of EVA stems from its utility as a performance measurement tool in respect of the three dimensions it considers and its consequences, in particular accounting for risk-taking in a way that more closely reflects the reality of businesses (Lehn & Makhija, 1996; Brewer et al., 1999; Sharma & Kumar, 2010). For example, the more investments in projects with positive net present value increase, the more EVA increases (Stewart, 2009; Badicore et al., 1997). Another of its highlighted qualities is that it is more economics-focused than most other measures developed so far (based more on accounting data and two-dimensional), thus reducing the extent to which the top managers responsible can “optimise” (Nagarajan, 2015; Kramer & Peters, 2001). It can also produce nuanced results in relation to the cost of capital (risk incurred) and financial structure (weight of debts in relation to equity capital).

EVA nonetheless has limitations and, as a result, several extensions have been developed. O'Byrne (1996) and Brewer et al. (1999) criticized the monetary-unit approach, which

they said prevented comparisons between sectors or firms, factories, divisions, etc. of different sizes. However it is possible to explain it as a percentage based on its original expression as presented in the previous section. Because economic profitability is equal to net operating income (net EBIT) divided by capital employed, EVA is measured as the difference between ROCE and the cost of resources used, i.e. WACC:

$$EVA (\%) = ROCE - WACC$$

Another approach can be developed by only considering the shareholder's perspective. In this case, $EVA = ROE - r_E$ where r_E represents the cost of shareholders capital from the CAPM as a function of the risk-free rate, the market risk premium and the specific risk the firm faces.

Another critique of EVA is the lack of explanatory power in relation to share prices, particularly compared to one- or two-dimensional performance measures based more on accounting figures (Biddle, Bowen & Wallace, 1997; Chen & Dodd, 2001; Kim, 2006). O'Byrne (1996) explains that financial and operating leverage tends to increase during periods of growth, which can increase the cost of capital and thus penalise EVA, even though such investments can be an indication of the firm's confidence in the future and future profits. In contrast, Matidinos et al. (2009) note that EVA provides additional information compared to empirical models based on earnings per share (EPS).

The third critique is the atemporal nature of this measure: top managers could be tempted to optimise amortisation, the timing of investments, the deferral of certain expenses, etc.

In response to these critiques from researchers, extensions and variations have been developed. Without listing each one, we will present the most significant of these developments both from the academic world (EVA Momentum and REVA) and consultancy firms (cash flow return on investment – CFROI, total shareholder return – TSR, Strategic Planning Associates – SPA, Marris's Q index, Marakon Associates model, Fruhan and McKinsey model).

One way of addressing the non-temporal nature of EVA is **EVA Momentum** (Steward, 2009), which involves considering the variation in EVA over a given period t in relation to sales generated during the previous period:

$$EVA \text{ Momentum} = \frac{\Delta EVA_t}{Sales_{t-1}}$$

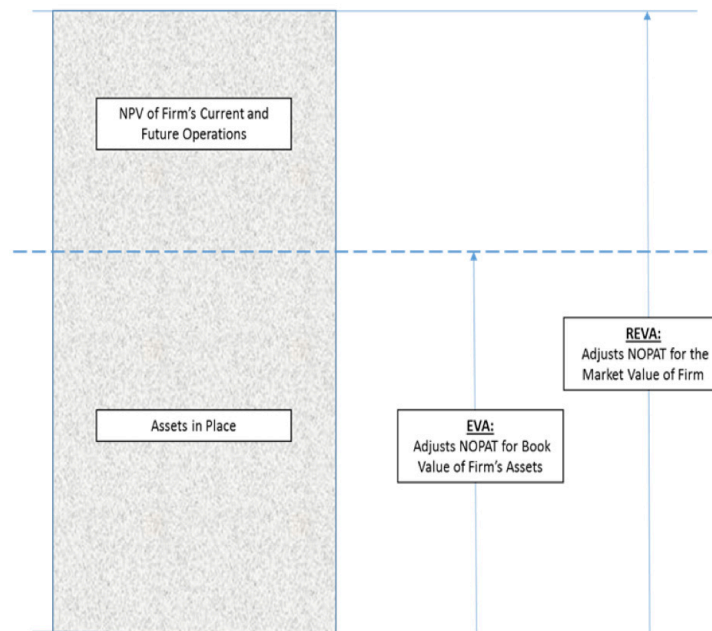
While this has the advantage of measuring performance independent of the firm's size or sector (neutralisation), it does not resolve the criticisms relating to net EBIT and WACC.

Badicore et al. (1997) suggest adapting the concept of EVA to account for risks associated with fluctuations in the market value of the firm's equity. They define this as the sum of interest-bearing liabilities and the market value of equity capital (including preferential shares). This is known as the **REVA (Refined Economic Value Added)** approach and is expressed as follows:

$$REVA = Net\ EBIT - [WACC * Market\ Value\ of\ Invested\ Capital]$$

EVA considers the value created by assets expressed in accounting terms, whereas REVA looks at the market value of these assets. It therefore accounts for economic goodwill, i.e. the net present value of both current and future operations.

Difference between EVA and REVA



Source: Badicore et al. (1997)

This approach also makes it possible to consider all the value created by all of a firm's capital at its market value (including goodwill). Badicore et al. (1997) and Lee & Kim (2009) further demonstrate that the explanatory power of REVA is superior to that of EVA when it comes to explaining share prices.

However, Ferguson & Leistikow (1998) point out that this measure is incompatible with modern financial theory, since it makes more sense to adjust net EBIT than the market value of shares. Furthermore, remunerating top managers (which was the original problem raised by Stern, Stewart & Co) based on REVA may lead to substantial bonuses linked only to abnormal stock market returns and therefore independent of any managerial decisions leading to value creation.

Alongside these two key endeavours in the academic world (EVA momentum and REVA), it is worth considering other adaptations of EVA in professional spheres, and consultancy firms in particular.

Holt Consulting developed the **CFROI (Cash Flow Return On Investment)** approach, later taken up by Boston Consulting Group. This approach takes the view that value creation and share prices are not indexed on profits but instead on the firm's cash flow. It involves determining value creation based on the difference between the internal rate of return (IRR) on economic assets and the weighted average cost of capital. This positive (respectively negative) difference multiplied by the amount of capital employed produces an estimation of the value created (destroyed). It is important to note that this approach looks at the returns generated by all of the firm's economic assets, seen here as a single investment when determining the IRR, which makes the gross value of this investment, before amortisation and inflation-adjusted, equal to the future after-tax operating cash flow it generates over its estimated life cycle. A simplified version of CFROI is to divide EBITDA (Earnings Before Interest, Taxes, Depreciation and Amortisation) by the amount of capital invested and compare this ratio to the weighted average cost of capital (WACC).

Boston Consulting Group (BCG) also developed the concept of **Total Shareholder Return (TSR)**. This cannot be calculated for non-listed firms. It is determined as the IRR on the purchase of one share where the returns correspond to the sum of the dividends and the resale price of the share at the end of the period, discounted by the cost of capital. BCG's indicator therefore involves comparing the provisional TSR and a TSR based on actual results. Although simplistic, this approach has the advantage that it favours comparisons between firms or between a firm and a market based on external data independent of the firm sizes involved.

Another very simple index to measure value creation based on market capitalisation is **Marris's Q** index, which is defined as the relationship between the market capitalisation of capital invested and the accounting value of the equity capital. It is therefore the reverse of the book-to-equity ratio.

$$Q = \frac{\text{Market capitalisation of capital invested}}{\text{Accounting value of equity capital}}$$

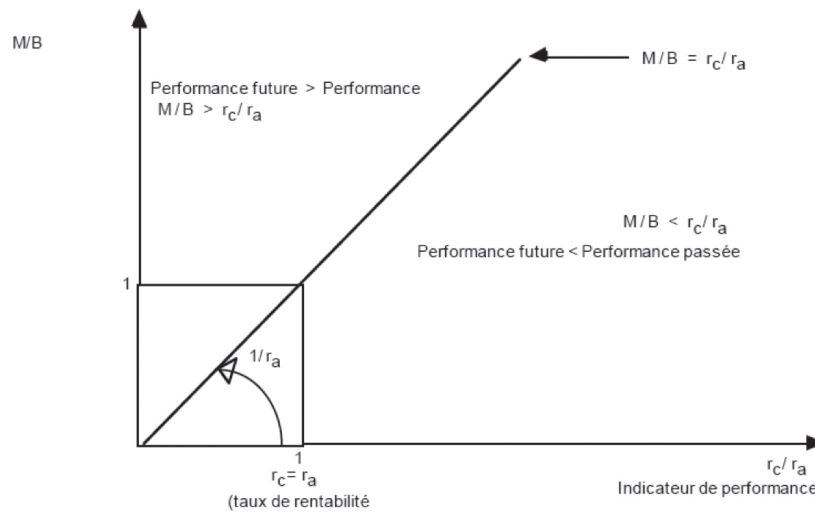
The Q index therefore reflects how the market sees a firm's future strategies that will lead to an increase (or decrease) in equity capital. When it is greater than 1, this is an indication of value creation: expected returns are greater than the returns demanded by capital contributors (measured as the average cost of capital). In this respect, it therefore accounts for risk since it implicitly assumes future cash flows will be discounted by the rate of returns required by investors.

By pursuing an approach that combines stock market performance (market finance) with operating performance (corporate finance), the **Strategic Planning Associates** model is another indicator of value creation. It involves comparing:

- the Market-to-Book ratio (M/B), i.e. between the firm's market capitalisation and the accounting value of its equity capital, which may be adjusted for fixed assets (adjusted net assets),
- with the outcomes of strategic decisions implemented in the past, assessed using the R_c / R_a ratio where R_c is the return on capital and R_a is the cost of capital, i.e. the minimum expected return.

When M/B is greater (respectively lower) than R_c / R_a , it can be anticipated that the firm will perform in a way that will create (destroy) value.

Measuring value creation using the Strategic Planning Associates model

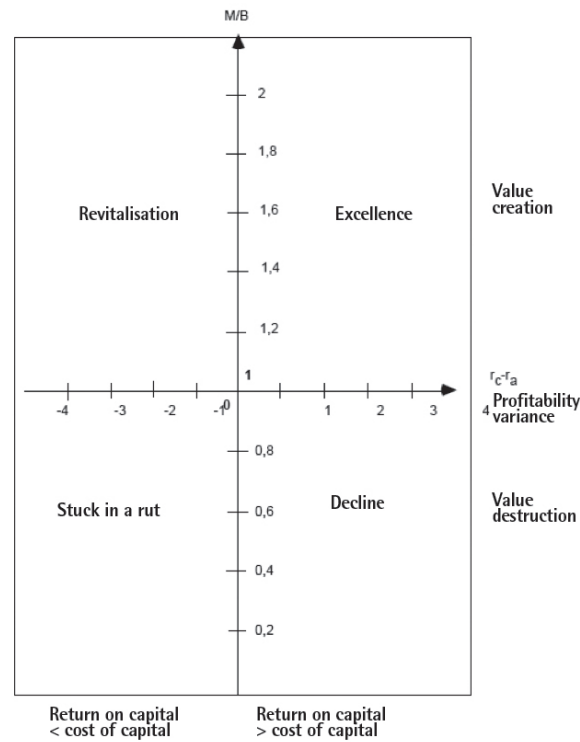


Source: Thiertart (1990)

Based on the above Strategic Planning Associates model, the **Marakon Associates** model links the M/B ratio and the variance between the return on capital (r_c) and the cost of capital (r_a) to identify four distinct performance scenarios.

In the excellence quadrant, the return on capital is greater than the cost of capital ($r_c > r_a$) and market capitalisation is greater than equity capital ($M/B > 1$). A firm that finds itself in this scenario is in a position to repeat its past positive performances. In the revitalisation quadrant, the market anticipates that future performances will be greater than past performances. Firms that are stuck in a rut are those that have posted mediocre performance in the past and will not be in a position to create value in the future (return on capital less than cost of capital). Finally, those in decline were able to create value in the past but are expected to move towards value destruction in the future.

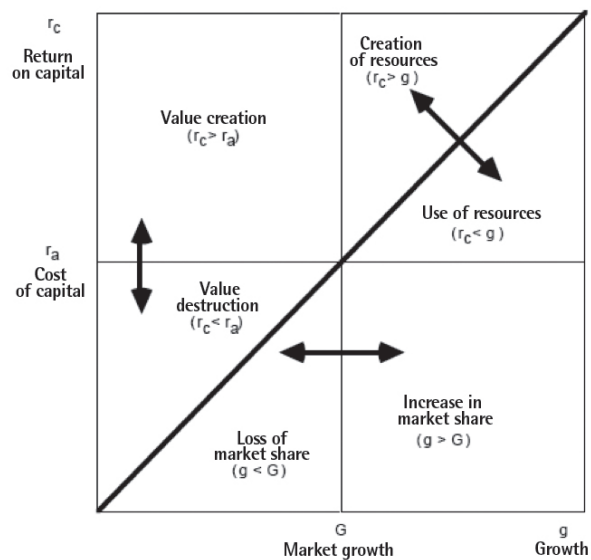
Marakon Associates valuation model



Source: Thiertart (1990)

In a similar vein, Marakon Associates developed a profitability model combining return on capital (r_c), cost of capital (r_a), firm growth (g) and market growth (G).

Profitability matrix based on the Marakon Associates model

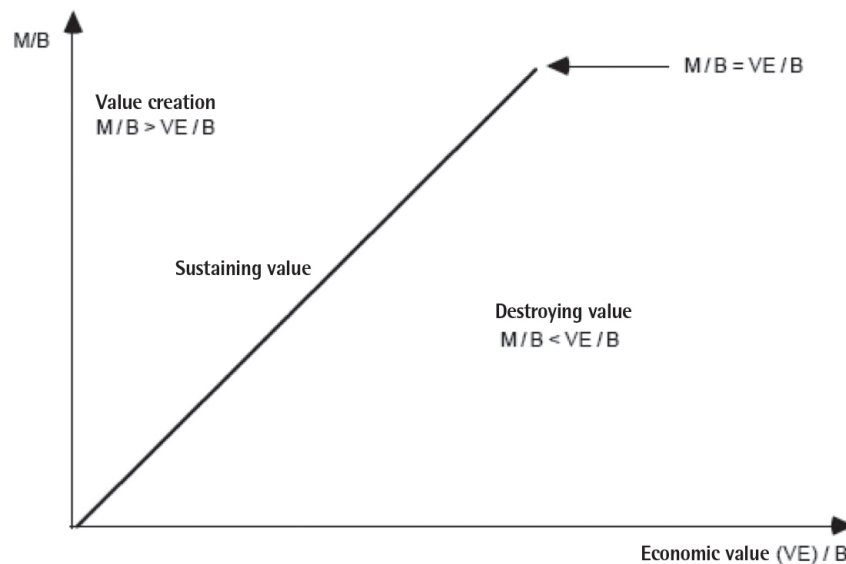


Source: Thiertart (1990)

The objective is always to assess the firm's value creation and competitive status. So when the growth of an activity (g) exceeds its profitability (rc), the resources associated with that activity will be unable to sustain that growth, even if the business creates value in the immediate future.

Lastly, Fruhan and Mckinsey created their own approach known as the **Fruhan and McKinsey model**. This approach studies the relationship between M/B and EV/B where EV is the firm's future economic value estimated using historic cash flows, and B is the accounting value of its equity capital. When $M/B > EV/B$, there is value creation.

Fruhan–McKinsey valuation model



Source: Lai L.K. cited by Hax and Majluf (1984)

Although these value creation indicators differ, they all present the same conceptual framework:

- at an operational level, firms create value using the resources at their disposal, i.e. their capital employed,
- in financial terms, value creation is discounted by the cost of capital, i.e. that of resources,
- the organizational dimension (dividing a group into different profit centres) is associated with a certain allocation of resources and has an impact on the cost of capital,
- at a managerial level, the search for efficiency in the use of resources translates into the need for every investment decision to generate profitability that exceeds the cost of capital.

The success of these value creation indicators lies in the ease of explaining them to

operational staff and making them more aware of the cost of financial resources. It is therefore not surprising that some firms have chosen them as a way to make their managers more responsible, putting in place a variable remuneration scheme indexed in relation to value creation indicators, in particular EVA. Stern, the joint founder of Stern Stewart & Co., even spoke of employee capitalism (Ehrbar, 1999). Value that is created is shared between shareholders, who see the value of their shares increase as managers receive bonuses.

We argue that economic capital models based on these notions of value creation, which for 30 years have been reserved for a few market-leading listed and non-listed firms, should over the next few years see rapid development alongside the development of management control and risk management. For not only do they give management an overview of the firm's performance and enable them to optimise the allocation of capital between each operating division to reflect their intrinsic profitability, they have also become reference indicators for investors, financial analysts and rating agencies.

Based on the concept of Economic Value Added (EVA), we see the development of a new three-dimensional performance measure which as yet is mainly reserved for banking and insurance firms but could be extended to other sectors: Return on Risk-Adjusted Capital (RORAC).

IV.2.4. Return on risk-weighted capital (RORAC and RAROC)

To understand how RORAC could come to be the natural approach for businesses, we need to look back to its origins. As explained above, in the early 1990s value creation and business performance more generally were primarily measured using operating margins, net margins and, in some capital-intensive sectors, balance sheet robustness, the primary indicator of which is net asset value (NAV). To determine this figure, one must find the fair value of each entry under assets and liabilities. The definition of fair value is generally (Escaffre, Foulquier & Tournon, 2008) that proposed in the IFRS (International Financial Reporting Standards): the price that would be received to sell an asset or paid to transfer a liability in an orderly transaction between market participants and under normal conditions of competition. This means testing the value of intangible assets in the balance sheet, including goodwill, revaluing all intangible assets, and verifying the level of provisions for assets and liabilities (pensions, etc.).

However, while it is relatively straightforward to measure the performance of a firm using the asset-based approach, it carries the disadvantage of not accounting for the value generated by future cash flows. The subtlety of combined approaches (balance sheet and cash flows) is that the same value is not counted twice: once in the balance sheet and again as part of future cash flows.

The original method is the goodwill valuation or “super profit” method, which combines the balance sheet approach with the discounted cash flow valuation method. Here, the firm’s value is determined by its adjusted net assets from which intangible assets are subtracted and to which economic goodwill (a measure of the firm’s future profitability) is added. This involves replacing accounting goodwill, which is the product of the bookkeeping calculation required to balance the balance sheet, by economic goodwill. Economic goodwill is calculated as the net present value of future cash flows generated by using adjusted net assets. In contrast to the balance sheet approach, goodwill (GW) can be used to account for the firm’s future operations and therefore includes prospective profitability. It can be written as the discounted sum of super profits, i.e. net earnings NP_t in year t minus the cost of resources ($NAV * r_E$ where r_E is the cost of capital):

$$GW = \sum_{t=1,n} (NP_t - [NAV * r_E]) / (1 + r_E)^t$$

This brings us back to the formulation of Economic Value Added (EVA). Here, goodwill can be analysed in respect of the value created by the firm, i.e. in respect of the return on its adjusted net assets (RoNAV) and the cost of capital (r_E). This means that the valuation (V) of a firm, based on certain simplistic assumptions about the growth of future cash flows, can be written as a multiple of NAV:

$$V = NAV + GW = NAV * RoNAV / r_E$$

If $RoNAV > r_E$, the firm is creating value and investors agree to value it beyond its adjusted net assets so as to include future value creation. Reciprocally, if $RoNAV < r_E$, the firm is destroying value and is deemed to have a value lower than its adjusted net assets (NAV).

With the growing awareness that the consumption of capital, profitability and risk exposure are heterogeneous across products, customers, activities, geographic zones, etc., which we will refer to generically as a firm’s “segments,” the late 1990s saw improvements in the approach to value creation based on this segmentation.

Some firms began to define risk based on a beta figure (as defined in the context of the CAPM above) for each segment, which enabled them to refine their value creation analysis for each segment in respect of its capital consumption, margins and specific risks. Others went even further, combining the notions of risk and capital consumption through the concept of risk-weighted capital. As seen in the previous sections, this involves choosing a measure of risk (e.g. VaR), the distribution of that risk and associating it with capital consumption (Risk-Adjusted Capital – RAC).

Under this approach, one replaces adjusted net assets with the sum of risk-adjusted capital RAC_j , for each segment j ; and capital surplus or deficit (non-allocated capital).

For each allocated capital per segment RAC_j , it is possible to calculate the return on risk-adjusted capital $RORAC_j$, the cost of capital CoC , an infinite growth rate g_j and thereby determine the firm's valuation (V) and its value creation:

$$V = NAV + GW = NAV + \sum_{j=1,m} \sum_{t=0,n} [RAC_{jt} [RORAC_j - CoC]] / (1 + CoC)^t$$

$$V = (NAV - \sum_{j=1,m} RAC_j) + \sum_{j=1,m} RAC_j * (RORAC_j - g_j) / (CoC - g_j)$$

The first term is the capital surplus. Because the risk-adjusted capital (RAC) is constructed to include a safety margin to cover any risk (or a significant proportion thereof, for example any event that occurs less than once every 200 years with $VaR_{99,5}$), the nature of the capital surplus is such that it destroys value and must therefore be actively managed (internal growth, restructuring, external growth, equity capital buyback, exceptional dividends).

The second term measures value creation. We obtain a multiple of allocated capital greater or less than 1 depending whether the firm creates ($RORAC > r_E$) or does not create value.

It is important to highlight the ongoing debate about the cost of capital among professionals. Given that risk is usually integrated in full into the figure for RAC, one might expect in this equation that CoC will be equal to the risk-free rate so as not to count risk twice (Amenc & Foulquier, 2006). However, in practice, most listed firms continue out of “prudence” to define the cost of capital as in the CAPM, i.e. the cost of equity capital.

Based on the results of each element in the sum of the parts, it is possible to provide an overview of performance management but also to carry out a valuation of the business, as illustrated below.

First, it should be pointed out that banks have chosen a different approach: **RAROC** (Risk-Adjusted Return on Capital). Instead of considering a risk premium as the denominator in terms of capital requirement, the idea here is to take it as the numerator in terms of net earnings. RAROC is therefore defined using the ratio of net earnings adjusted for provisions (these correspond to expected losses) to the equity capital allocated to cover unexpected losses.

IV.3. Case study: comparing performance measures with one, two and three dimensions

In this section we use a real-life case study (but with altered figures so the firm cannot be identified, at its request) to demonstrate the advantages of the three-dimensional performance measurement over the one- and two-dimensional approaches.

A mutual insurance firm with sales of €1bn has four distinct general insurance operations: motor insurance (as understood in Solvency II), property damage, liability and individual health. Its characteristics are as follows:

Case study: characteristics of mutual insurance firm

EURm**	Motor	Property damage	Liability	Individual health
Breakdown of earned premiums	45%	40%	7.5%	7.5%
Claims / Earned premiums	75%	60%	75%	75%
Costs (*) / Earned premiums	27%	35%	27%	20%
Normalised financial earnings as % of premiums	3.5%	2.2%	12.0%	0.30%
Tax rate	33%	33%	33%	33%
Solvency margin requirement	20%	30%	80%	10%
Cost of equity	10%			
Shareholders' equity	350			

(*) Overheads, reinsurance costs, rewards and penalties, technical provisions change, etc.

(**) numbers that are not in % are in EURm

Source: Philippe Foulquier, EDHEC Value Creation Research Centre

Using a **one-dimensional performance measure**, it is possible to produce the following table based on operational, financial and net margins.

One-dimensional performance measure

	Motor	Property damage	Liability	Ind. health	Total
Earned premiums	450	400	75	75	1000
Breakdown	45.0%	40.0%	7.5%	7.5%	100%
Claims	338	240	56	56	690
Claims/P	75%	60%	75%	75%	69.0%
Total of other costs (*)	122	140	20	15	297
Costs/P	27%	35%	27%	20%	29.7%
Combined ratio	102%	95%	102%	95%	98.7%
Technical margin	-9	20	-1.5	3.75	13
as % of earned premiums	-2.0%	5.0%	-2.0%	5.0%	1.3%
Financial earnings as % of premiums	3.5%	2.2%	12.0%	0.30%	3.4%
Financial earnings	16	9	9	0.2	34
Before-tax margin	6.7	28.8	7.5	4.0	47.0
Taxes (33%)	-2.2	-9.5	-2.5	-1.3	-15.5
Net earnings	4.5	19.3	5.0	2.7	31.5
Margin as %	1.0%	4.8%	6.7%	3.6%	3.2%

(*) Overheads, reinsurance costs, rewards and penalties, technical provisions change, etc.

Source: Philippe Foulquier, EDHEC Value Creation Research Centre

Using a **one-dimensional performance measure**, the firm will analyse its performance based on its operating (or technical in the case of insurance), financial and net margins, and its risk exposure based on the relative weight of its sales. This mutual insurance firm primarily conducts business exposed to frequency risk, and just 7.5%

of its sales is exposed to very high risk. Its management may therefore believe that the firm's risk exposure is low. Furthermore, because it involves long-term business operations, liability generates sufficiently high financial earnings to compensate for its negative technical margin and actually ends up being the group's activity with the highest margin (net margin of 6.7% compared to 3.15% for the group as a whole). It is interesting to note that individual health insurance represents the same percentage of sales but its contribution to net earnings is just 2.7, compared to 5 for liability. To conclude, this insurance firm displays low levels of risk: 7.5% of its overall business is risky, but it posts a margin that is twice as high as the group's average.

Using a **two-dimensional performance measure**, management is in a position to compare this net margin of 3.15%, which in relative terms is very low, to the accounting value for the firm's equity capital. This shows that profitability stands at 9% (31.5/350), which is already an improvement. This additional dimension therefore provides a response to the question: "how much has this insurance firm generated compared to the equity capital owned by its members?"

Finally, using a **three-dimensional performance measure**, management can go even further and draw on the concepts of EVA or RORAC. In this example, we did not look at beta figures for each business operation and provided only one figure for the cost of equity capital, at 10%. Looking at EVA puts the two previous dimensions into perspective, indicating that even though a return on equity capital of 9% is satisfactory, the level of risk incurred by the firm translates into a cost of equity capital of 10%. It is therefore destroying value. Based on the data at our disposal, calculating the RORAC for each business segment allows the analysis to be developed further.

Insurance firm performance analysis based on RORAC per business operation

	Motor	Property Damage	Liability	Individual health	Total
Earned premiums	450	400	75	75	1000
Breakdown	45.0%	40.0%	7.5%	7.5%	100%
Claims	338	240	56	56	690
Claims/P	75%	60%	75%	75%	69.0%
Total of other costs(*)	122	140	20	15	297
Costs/P	27%	35%	27%	20%	29.7%
Combined ratio	102%	95%	102%	95%	98.7%
Technical margin	-9	20	-1.5	3.75	13
as % of earned premiums	-2.0%	5.0%	-2.0%	5.0%	1.3%
Financial earnings as % of premiums	3.5%	2.2%	12.0%	0.30%	3.4%
Financial earnings	16	9	9	0.2	34
Before-tax margin	6.7	28.8	7.5	4.0	47.0
Taxes (33%)	-2.2	-9.5	-2.5	-1.3	-15.5
Net earnings	4.5	19.3	5.0	2.7	31.5

Margin as %	1.0%	4.8%	6.7%	3.6%	3.2%
Breakdown of net earnings	14.4%	61.2%	15.9%	8.5%	100.0%
Solvency margin requirement	20%	30%	80%	10%	27.8%
Capital requirement in €m	90	120	60	8	278
Breakdown	32.4%	43.2%	21.6%	2.7%	100%
RORAC	5.0%	16.1%	8.4%	35.5%	11.4%
Eligible capital in €m	350				

(* Overheads, reinsurance costs, rewards and penalties, technical provisions change, etc.)

Source: EDHEC Business School – EDHEC Value Creation Centre

We now see that liability, which in the one-dimensional measure represented 7.5% of overall risk (7.5% of sales), actually represents capital consumption of 21.6% (1/5 of the group is therefore exposed to liability risk, 3 times higher than in the initial analysis!). This segment posts the group's highest margin (more than twice the average). This means 7.5% of premiums generate 15.9% of the contribution to net earnings.

In fact, **based on the threefold margins–capital–risk perspective**, liability insurance is the group's least profitable business with a RORAC of 8.4%, because it requires 80 cents of risk-adjusted capital for every euro of sales generated. Its high margin is not sufficient to compensate for its high level of capital consumption. Owing to the lack of the risk dimension, the one- and two-dimensional measures failed to perceive this risk exposure of liability, which posts the lowest profitability in the group. **The conclusions reached using the measurement approaches with one and two dimensions versus the conclusion stemming from the three-dimensional model are therefore opposed.**

Similarly, individual health insurance, which is a very short-term business operation, also represents 7.5% of sales but posts the group's second worst margin (3.6% vs 6.7% for CL). However, its low capital consumption (10 cents of capital required for every euro of sales) makes it the group's most profitable segment (35.5% vs 8.4% for CL). Health insurance represents only 2.7% of the total amount of capital consumed (compared to 21.6% for liability), but the volume of sales it generates is equal to that of liability.

This type of information is liable to lead to an overhaul of strategy along various non-exclusive lines: reallocation of capital between business operations, transfer or strengthening of liability business to achieve critical mass, restructuring of reinsurance policies or liability coverage to reduce risk exposure and therefore capital allocation, etc.

How can the traditional approach, which remains the reference for most firms, lead to such a different conclusion than that based on the economic capital model?

As seen in the previous sections, the difference lies in the view that equity capital is a resource that has a cost. For listed firms, this is nothing new and it is an issue to which their investors regularly return. For other businesses (mutual insurance firms in particular), it is clear that even though they do not always face the same problems in terms of pressure from investors (for example, they have much more distant decision-making horizons since there is no share price), it would be in their interest to adopt an economic capital model.

Such a model can serve as a **performance management tool** to determine the impact on stakeholder satisfaction (members in the case of mutual firms, particularly by looking at pricing-services) in relation to various operational decisions (price, launch of a new product or business, evaluating the impact of including an option in a commercial offer, new management process, acquisition, etc.).

Away from this case study, it is also interesting to note the change in banks' acquisition policies since the implementation of Basel II in favour of retail banks (at the same time as the refinement of capital allocation coefficients that also favour this sector). We anticipate a similar strategic shift in the insurance sector as a result of the Solvency II weightings. It would appear that some insurance market leaders in Europe have already adjusted their strategy to reflect their internal economic model.

Since the late 1990s, some insurers have implemented economic capital models and perfected them over the years. This decision-making tool enables them on the one hand to refine their internal strategic choices and monitoring, and on the other to communicate externally about their performance. In France, AGF wrote in their annual report as early as 2000 about their economic capital model: "this approach is not replacing the information already contained in our financial statements, but it adds a useful economic perspective on the quality and sustainability of our results and facilitates the search for and implementation of practical initiatives targeting value creation for shareholders."

Economic capital can be used to reinforce the analysis of the firm's profitability by accounting for risks both at the overall firm level and in each business segment in accordance with the principles and objectives of value creation. The appeal of the economic capital model lies as much in its operational dimension, and therefore its capacity to structure the firm's management approach, as in its measurement of risks per se.

Economic capital also satisfies an internal objective relating to the management of allocated capital and risks in response to the sometimes contradictory demands of

shareholders (optimisation of capital allocation and of the profitability of capital invested) and rating agencies and bondholders (demand for high capital and appropriate management – risk diversification, growth prospects, etc.).

Lastly, the economic capital model provides an opportunity to bring top managers, financiers and operational staff together to share a common language and a single measurement approach that is in proportion to the risks incurred. Its purpose is to orient overall strategic choices as well as specific choices relating to each business operation, in particular regarding the allocation of capital to each activity, risk management (determining accepted limits, concentration, diversification, etc.), propagating a culture of risk awareness among all operational staff members and/or decision-makers, and even determining the firm's remuneration policy for top managers. For some insurance firms, economic capital also forms the basis for their external financial communication, and in this respect is a dynamic tool enabling outside parties to assess the effectiveness of the strategic decisions made.

CONCLUSION

The raison d'être of this e-book is to provide solutions to the challenge of “**business performance management and business valuation in the digital era and at a time of social, societal and environmental changes**”.

Is it time to question the traditional financial measures still in use today, whose origins can be traced back to the 1950s and 1960s, and adopt new alternatives being proposed by increasingly creative players? What other solutions could include the threefold margins–capital–risk perspective, intangible asset valuation and a financial index that would account for social, societal and environmental factors?

To launch the debate surrounding these questions and take steps towards finding solutions, part 1 of this e-book offers new analytical keys by producing a **classification of performance measures based on the number of dimensions they take into account**.

We have revealed the strengths and weaknesses of one-dimensional measures based primarily on the income statement and calculating a firm's different margins (gross, EBITDA, EBIT, net). This continues to be the approach favoured by most non-listed firms, as these measures are simple to implement, highly operations-focused and closely reflect on-the-ground realities (listed firms have abandoned this approach for more than 40 years, usually under pressure from investors!).

However, one-dimensional measures carry a major disadvantage: two different segments – each represented for example by a product, customer, activity, business unit or country – with the same margins will be considered to have the same performance. Measuring performance, even for an individual with no knowledge of finance, is very often based on the following intuitive and pertinent question: “how much have I earned compared to what I invested?” All firms should consider this question by looking at one-dimensional performance measures (margins), but also by comparing them with the capital contributed by financial backers (shareholders equity, bank credit and bonded debt).

This intuitive reasoning led us to an analysis of two-dimensional performance measures, which not only include earnings (margins), but also capital as presented in the balance sheet. Generally speaking, management have resources at their disposal (equity capital and debt) provided by finance providers (shareholders, banks, bondholders) and which are invested in medium-term and long-term assets (intangible, tangible and financial assets) and used to finance the firm’s working capital requirement (WCR) that stems from delayed payments as part of business operations (trade receivables, inventories and trade payables).

Looking at profit margins in absolute terms makes little sense, for it is essential to analyse them in light of the firm’s fixed assets as well as its working capital requirement. With the addition of this dimension, the paradigm of one-dimensional performance is profoundly shaken: the firm must now optimise its use of fixed assets, tangible assets in particular (equipment, machinery, land, real estate, etc.), and its WCR (recover trade receivables as quickly as possible, optimise stock management and negotiate the longest possible timeframes for payment of trade payables). This often feeds into changes to or optimisation of the business model. It is interesting to note in this respect that the digital economy has often chosen more effective economic models in terms of the consumption of capital employed (limited tangible assets and sometimes lower working capital requirements) than the “traditional” economy.

Any reduction in consumption in respect of fixed assets and WCR means a reduced need for fundraising from shareholders or banks and/or more available capital to finance the firm’s growth or development projects. This notion makes it clear that the balance sheet deserves just as much attention as the income statement, although in practice this is far from the case in many firms.

However, because these two-dimensional measures are based on notions of profitability (ROE, ROI, ROA, ROCE), they carry the disadvantage of not including the third dimension, which corresponds to the highly intuitive and pertinent question asked by any investor: “how much have I earned compared to what I invested and the risks incurred?” All firms should also therefore consider this question, yes by looking

at margins and capital (profitability), but also by comparing them against the risks incurred and therefore the volatility of their earnings.

Throughout this first part of the e-book, we have endeavoured to demonstrate the **advantages of the threefold margins–capital–risk perspective**. In particular, it strengthens a firm’s analysis of its profitability by accounting for risk not only at the overall level of the firm but also for each business activity or segment. The appeal of this threefold approach lies as much in its operational dimension (its capacity to structure management and performance management) as in its measurement of risk per se. It therefore provides an objective view of overall strategic choices and those made in each individual business unit, particularly when it comes to internal capital allocation and risk management. We concluded our analysis with a real-life case study, applying the measures with one, two and three dimensions to demonstrate the superiority of the threefold margins–capital–risk approach.

It should be pointed out that this approach has been adopted for several decades by the financial markets and therefore listed firms across all sectors and in all four corners of the globe, whereas the strategic, commercial and financial decisions made in most firms continue to be **based only on the concept of margins**.

Part 1 of this e-book was developed following discussions with top managers from firms keen to see research that investigates and analyses the fundamentals of financial performance measurement in today’s perplexing environment. It is important to remember that all strategic, operational and financial decisions, whether in market finance or corporate finance, are based on the Modern Portfolio Theory of the 1950s and 1960s, whose proponents went on to win several Nobel prizes. But these paradigms are increasingly being challenged by new business models against the backdrop of the digital transformation and millennial values (usage economy, impact on the environment, preponderance of intangibles). The following sections therefore look at the impact of the **digital era and today’s sweeping social, societal and environmental changes** on business models, performance measurement and business valuation.

By offering a holistic view of performance measurement based on three dimensions, part 1 not only offers our readers the keys to improved analysis and smart decision-making in the complex new world of performance management, but also, we hope, can serve as a source of inspiration to adapt their balanced scorecards and performance management tools in a way that could benefit from the wealth of the threefold margins–capital–risk perspective. The slow take-up of this approach has not in most cases been due to technical implementation difficulties but simply the inertia of corporate cultures. In light of this, the digital transformation and the values of millennials, which challenge the existing corporate culture, constitute in our opinion

a real opportunity for more sophisticated measurement of performance and value creation by adopting this threefold perspective.

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