International Journal of Finance, Insurance and Risk Management
Volume XI, Issue 2, 2021

pp. 3-27

Financial Performance Assessment of Strategy for Building Resilience and Readiness in the Hotel Sector of Greece

Submitted 10/03/21, 1st revision 11/04/21, 2nd revision 29/04/21, accepted 20/05/21

Panayiotis Curtis[1], Michael Hanias[2], Eleftherios Kourtis[3], Michael Kourtis[4]

Abstract:

Purpose: *The aim of the study is to demonstrate the value of the financial performance , in assessing the degree of resilience and agility of a fruitful hotel strategy in a turbulent and disruptive era.*

Design/Methodology/Approach: *Data Envelopment Analysis (DEA) was performed for 2017-2019 period, in conjunction with the asset turnover and operating profit to assets ratios, were used as the main tool to measure resilience and preparedness, that are manifested in enduring efficiency and effectiveness performance of operations. The latter two features of performance together represent credible resilience engines, since are inextricably intertwined to enhance capability with flexibility, growth and prudence in confronting uncertainty decisively. Audited financial data were exploited to assess performance endurance among those dimensions. An input oriented model was employed based on total assets as the crucial input, while revenues and operating profits were utilized as outputs.*

Findings: *The DEA window analysis results, portrayed both, the low scale efficiency (SE) and the deficient pure technical efficiency (PTE) as contributors to low global efficiency (TE). Adequate revenues turnover and operating profits with respect to total assets, are the essential ingredients to secure resilience and the crucial aspects of effectiveness and efficiency performance of a victorious strategy.*

Originality/Value: *Performance differences among hotels, can be exploited to guide strategic management interventions to enhance the value creation process and resilience through versatility and sustainability, which are reflected in the effectiveness and efficiency measures. Performance measurement and evaluation unveils management options for informed choices to benefit the key stakeholders.*

Keywords: *Strategy, resilience, agility, financial analysis, DEA, effectiveness, efficiency.*

JEL codes: *M10.*

Paper type: *Research article.*

[1]*Associate Professor, The National and Kapodistrian University of Athens, Department of Business Administration and Organizations, pkourtis@ba.uoa.gr*
[2]*Associate Professor, International Hellenic University, mhanias@physics.ihu.gr*
[3]*M. Eng., LSE, M.Sc., Real Estate Economics and Finance, eleftherioskourtis@gmail.com*
[4]*NTUA School of Electrical and Computer Engineering, mixaliscurtis@hotmail.com*

1. Introduction

Tourism is called " the heavy industry" of the Greek economy. The hotel sector is the main pillar of it and is characterized by capital intensity and considerable seasonality in its operations. The principal product is the mass tourism for summer vacations with no discernible differentiation from the similar competitive destinations and thus very sensitive to price changes. Tourist arrivals to Greece in 2019 reached 31,3 million and the nights spent approached 232,5 mil. The total revenues from tourism reached the amount of 18,18 billion euro (Ernst & Young, 2020**).** The total direct employment in the sector were approximately 320.000 jobs (and 125.000 indirectly) and the hospitality industry directly or indirectly represents 20,8% of the GDP of the country in the same year. The revenues of hotels reached 8,4 billion in 2019 according to INSETE (2020) . The hotel business entities of any kind were 9.970 units in total, operating 433.689 rooms with 856.347 beds in 2019, the most recent normal year for the hospitality industry of the country (ITEP, 2019). In the January-September in 2019 period tourism revenues were €16.1b , while the corresponding period of 2020 reached €3.5b due to Covid 19 restrictions. Tourist receipts recorded a 78.2% reduction, compared to the same period in 2019 and the average occupancy rate dropped to 23%, from 71% in 2019.

The hospitality industry is unstable due to the fact that is very sensitive to external events and not only to the economic ones due to the fact that "tourism involves discretionary income, it has been traditionally considered vulnerable to economic uncertainty and volatility" (Papatheodorou *et al.,* 2010). The long term financial soundness (and viability) of tourism in general and the hotel sector in particular, is a very demanding task due to its utter dependency on many different external disturbances (economic, social, political, environmental, virus, law etc). The impact of those changes in the hotel sector is further augmented due to its capital intensity in operation and the ensuing substantial fixed expenses it carries, which must be paid in any case, regardless of the degree of hotel operation. That is why the sector requires a high occupancy rate to achieve at least the break even point and exceed it, in order make profits and achieve a satisfying return to capital.

In periods where the external environment is hugely unstable as in the current period due to covid-19, it is particularly crucial for the hotel sector to give precedence in crafting and implementing fruitful strategies that secure resilience and creative agility. The effectiveness of a strategy depends on the appropriate alignment of external and internal environment (Teece *et al.*,1997; Kourtis *et al.,* 2021). A PESTELE and five forces analysis of the general and immediate (industry) external environments of hotels (Curtis *et al.,* 2008), reveal the great shifts that have occurred which increased the competition (and uncertainty) especially in the mass tourism for summer vacations, and thus have reduced considerably the attractiveness of sector (Porter, 1996). The present Covid-19 period, causes tectonic changes with tremendous impact on the sector.

The constant, abrupt and unforeseeable changes that are beyond the control of hotel authorities, require innovative strategiesemanating from the quality of the internal environment, based predominately on intangible factors that are difficult to be replicated by the main competitors and are embedded in the dynamic capability theory. The latter is viewed as a refinement of the resource-based view (RBV) of an economic entity. It assigns superior performance not merely on assets an economic entity posses, but on its capability to "orchestrate a portfolio of assets that complements each other and create competencies, aligning external and external environments in a dynamic fashion to identify and exploit opportunities stemming from the environment that secure long term viability and value creation (Teece, 1997; Barney, 1991). The urgency for creating, maintaining and upgrading capabilities for value creation requires a combination of resources, skills, processes and organizational culture for creative, innovative and speedy adjustment with an extensive use of information technology. This is the right answer to an open and constantly changing external environment, that allows hotels to create, store, share and upgrade knowledge (formal , as well as a tacit one) (Helfat *et al.*, 2009). The level and the refinement of the alignment each hotel attains with its external environments, is ultimately affected by the degree of VRIN attributes of its resources, skills, processes and activities it encompasses. All these factors are orchestrated and applied accordingly to create dynamic capabilities appropriate to its market positioning in the sector, that exploits uniquely the five forces operating in it. The organization's goal is to establish, preserve and upgrade a versatile and dynamic competitive advantage that provides performance excellence, agility and resilience. Finally all these will be translated in to greater market share and value creation ultimately, if operational effectiveness is also achieved (Hax *et al.*, 1983; Porter, 1996).

2. Literature Review

2.1 Performance Measurement to Assess Resilience and Readiness

A performance measurement system related to hotels is based on " an amalgamation of relevant finance, marketing, strategy and hospitality literature" (Phillips, 1999). In an attempt to capture performance by aligning external and internal environments in an integrated way, the balanced Scorecard tool has been used to identify financial and non financial measures for the functional areas of finance, marketing (customer perspective), production and organization processes through the appropriate strategy (Sainaghi *et al.*, 2013). Performance measurement thus, is a complex task that integrates many business activities, which allow an organization to adjust accordingly to its environment in order not only survive but thrive in the long run. Resilience of an organization is a multifaceted and immensely challenging quality, that is more fully appreciated in nowadays when changes are more frequent and abrupt at an accelerating pace. The attainment of resilience is embedded in strategy which determines "the capability to foresee disruptions and unexpected events due to awareness and link operational management of internal and external shocks

(Annarelli *et al.,* 2016), "the ability and capacity of an organization to withstand unexpected changes, discontinuities and environmental risks" (Carvalho *et al.,* 2016) and finally the "ability to survive, adapt and grow in the face of turbulent change" (Fiskel *et al.,* 2014).

Organization resilience is the result of effectiveness and efficiency (PECB, 2018). The long term financially sound organizations, are characterized by operational efficiency and appropriate strategic positioning. The combined result of both factors is a sustained competitive advantage (Porter, 1996). The industry structure an economic entity chooses to operate and the right positioning in it, which is a manifestation of the strategy success, leads to sustained competitive advantage and above the average profitability. Profits are attributed to the industry structure, its attractiveness, the operational efficiency of an economic entity and its positioning (McGahan *et al.,* 1999). This approach is based on the structure-conduct-performance (SCP) strategy paradigm, that was developed by the Bain Co (Pawlowska, 2007). It focuses mainly on the industrial structure and ability of the firm to gain and exploit market power through the right positioning, in order to obtain superior performance (Hawanini, 2003). The "cluster-based agglomeration" and interconnectivity of hotels, has also been identified as a major force boosting business performance (Buhalis *et al.,* 2018; Delgado *et al.,* 2014). It was found especially true in regions where tourism dominates as the main economic activity (Lagos *et al.,* 2008; Curtis *et al.,* 2007).

The operational effectiveness (economic efficiency) through continuous improvements, is contemplated as a necessary but not sufficient condition of success, since it can be potentially imitated in sensible time horizon without prohibitive costs. A unique and valuable position by choosing specific activities to perform based on firm's internal strengths, requires trade offs due to the limitation of available resources. The activities must contribute also to the creation of synergies across all company's operations, in order to maintain and invigorate competitive advantage for a long period of time.The structure-conduct-performance (SCP) model, emphasizes primarily the importance of the external environment of the organization and the right positioning of the hotels in it.

The so called resource-based theory on the other hand, attempts to explain the observed differences in performance among companies and organizations, as emanating from specific factors (assets) they are endowed (Barney, 1991). They allege that the different levels of performance an economic entity exhibits, is affected primarily by the quality of its internal environment shaped by the management (Aguta *et al.,* 2003). The mix of resources, skills and capabilities the management has accumulated in its command and how it adeptly deploys them in business activities, determine the amount of rents it creates along the value chain, (Buhalis *et al.,* 2018). It is attained by achieving operational efficiency and effectiveness, through a sensible strategy.

The dynamic capabilities is achieved by orchestrating valuable, rare, inimitable, and non-substitutable resources, that lead in recent years primarily to knowledge creation (especially of a tacit one), storage, transfer, innovation that boost agility and secure resilience. It creates outcomes through the coordination of "physical assets, employees, suppliers-materials, customers, organization assets and improve also any every day aspect of the organizational performance (Almansoori *et al.,* 2020). The orchestration of these types of assets, must be unique and decided in a continuous consultations with the main stakeholders which understand and support the entire process. This is a holistic and systemic process that is difficult to be replicated by competitors, create a strong entity that is capable not only adapt to business ecosystem, but even harness and shape it (to a certain degree of course), in order accomplish sustainable development and above the average financial performance.

Towards that aim hotels must map out the variety of stakeholders and build a coalition that will produce support in their goals, that will allow management to navigate through turbulent and complex environment, especially crucial in this period of Covid-19 pandemic. Hotels must build operating models changes wcich will enhance their agility and resilience. Towards that aim an indispensable tool is to measure their performance intelligently and improve it in a balanced manner and finally identify the impact of the strategy applied in order not only survive but prosper.

The performance of an organization is a conclusive and decisive arbiter of its strategy conduciveness to resilience. Performance measurement is valuable tool of effective management and control. Despite some inherent but overstated obstacles to its smooth and indisputable acceptance by all parties involved, performance appraisal is an indispensable device that promotes transparency, holds management accountable and supplies it with the data needed to improve organization effectiveness and efficiency, for the sake of all stakeholders (Behn, 2003).

It is prudent to assess effectiveness and efficiency performance, since those two features in conjunction define competitiveness, profitability, viability and resilience. It also acknowledged that "what gets measured, gets managed" according to the respected patriarch of management P. Drucker. Whatever is measured properly, is gets managed better and improved, since "If you can't measure something, you can't improve it" (Prusak, 2010). So, the mantra "measure, assess and improve" is in nowadays widely espoused. According to P. Drucker (2006) "performance has become decisive well beyond the economic or even the social sphere". He argues that an organization thrives only through the coexistence of effectiveness that refers to goals to be attained and efficiency in the process of the implementation.

Efficiency alone without effectiveness (by "doing the wrong things, right"), leads to a "heroic failure and effectiveness without efficiency brings about just mere survival" (Solitaire, 2014). It is obvious that P. Ducker assigns pivotal role in the effectiveness with which the goals of the strategy are achieved. He does not omit

the task at the same time to stress the need for operational efficiency in the process of pursuing the dominant goals. He does not want though that an overwhelming concern for efficiency to derail the process of strategy and end up in a goal displacement. That is why he warns that "there is surely nothing quite so useless, as doing with great efficiency what should not be done at all" (Drucker, 1963). This is the cornerstone of our attempt to measure performance based on both effectiveness and efficiency. It guides our effort to choose the appropriate input and output variables, as well as the corresponding tool of analysis to carry out the task.

A dependable performance measurement tools must at least measure effectiveness and efficiency as the ultimate dimensions of the optimality of the resource allocation of an entity, since "effectiveness is doing the right things, while efficiency is doing things right, according to the renown guru of management P. Drucker. It is obvious that he assigns predominate role in effectiveness, which means achieving the goals the strategy assigned. He doesn't obviate the task at the same time to stress the need for operational efficiency in the process of pursuing the dominant goals. He does not want though the concern for efficiency to derail the process of strategy and end up in a goal displacement in the name of the quest for efficiency as the main concern. That is why he warns that "there is surely nothing quite so useless, as doing with great efficiency what should not be done at all" (Drucker, 1963). This is the cornerstone of our attempt to measure performance and resilience based on effectiveness and efficiency. Resilience without out achieving some sort of sustained competitive advantage and superior economic performance, that is based on good governance and pays attention to social and environmental sustainability, is not any more acceptable and advisable not even by the business leaders.

Any performance measurement apparatus must quantify the effectiveness with which an organization (hotel) meets the needs of its customers. It reflects that the hotel is doing the "right thing". In order to survive and prosper in the long run, it must serve its customers with profit, that secures the appropriate level return to capital invested (for the level of the risk involved). It comes about only by exploiting resources efficiently and operating economically i.e., "it does things right". Thus a suitable performance measurement scheme must encompass effectiveness and efficiency, since are both necessary for long term survival on one hand and a prerequisite for keeping investors and the rest key stakeholders happy and capital inflows for further investments (for development) secured on the other.

External and internal operation proficiencies, contribute to customer and the rest outside stakeholders (suppliers, banks, state, etc.) satisfaction on one hand, as well of the equity holders, management, employees (which are the main internal ones) on the other. At the same time the external and internal harmonious alignment bestows on the organization an adequate market share, that will allow it to cover all expenses incurred and yield enough profit. Lasting profitability and return on capital invested is the result of a successful matching of firms internal and external (industry)

environments especially in a sector that is affected my economic, political, social, ecological, health related issues etc.

The performance measurement that is stakeholder based, facilitates the additional funding of the sector, by addressing the concerns of various actors of the tourism ecosystem (Taylor *et al.,* 2014). The involvement of the main l stakeholders create check and balances, which will contribute positively towards achieving the most optimal solution possible, without squandering scarce resources. The "new competitive advantage" in nowadays requires value for all stakeholders by expanding impact on societal, environmental and governance issues and by reshaping the stakeholder ecosystem (Young *et al.,* 2020).

Although performance is considered as the repercussion of agility and endurance in a changing environment, a notable achievement can sustain further agility, sustainability, adaptability, innovation and resilience by providing the necessary capital for new investments, through internally generated funds by an enhanced profitability . It will build fences on the five forces operating in a sector (Porter 1996), while making the organization more competitive.

The degree of the strategy success is evaluated by its financial outcome. Favorable outcomes in long turn are fueled through new investments and the upgrading of the competitive advantage that secures further the longevity. It has been found that organizational resilience has positive and significant relationship with corporate performance (Oparanma *et al.,* 2019). The genuine resilience is assessed from the financial performance analysis using measures of profitability and return to capital (total or equity). Such ratios are EBITDA margin, ROE and ROA indicators (Carvalho *et al.,* 2016).

2.2 Financial Data, Performance Measurement Tools, Stakeholders and Sustainability

The amount of revenues is the first and foremost footprint of a successful strategy and a valid sign that there is an alignment of internal and external environments, that is crucial in culminating to competitive advantage and sustainability in the market. It measures quantities of services predominately offered by the hotels and the prices charged. Low price strategies are successful when the price elasticity of demand is greater than one. Then the lower prices are translated into greater increases in quantities sold and in total revenues obtained. It is known that high price strategy is pursued through service differentiation and quality offered, and is appropriate when the price elasticity of demand is characterized as inelastic (e <1).

Only then higher prices are triggering relative lower decrease in the quantities consumed, which results in greater revenues. Thus regardless which strategy is applied, to be reckoned as successful it must be reflected in the total revenue it yields as a result. That is why revenues are considered as an indisputable measure to

gauge financial performance of a hotel. Revenues per room are widely recognized as a pivotal measure of performance of hotels (Avkiran,, 2002; Baros, 2005; Manasakis *et al.,* 2013; Phillips *et al.,* 2005; Poldrugovac *et al.,* 2016; Sigala *et al.,* 2005; Verot. 2020).

Revenues are a necessary, but not a sufficient condition to create long term financial sustainability of the economic entity. The "bottom-line is profitability" (Anagnostopoulou *et al.,* 2020). Sustained profitability occurs when revenues of the hotel increase above the average one of the sector and value is created for the shareholders, when return on capital is higher than its costs, according to Marakon profitability matrix (Hax *et al.,* 1983). The operating profits or EBIT (Earnings before interest expenses and taxes) pay more attention to the return to wider stakeholders. Revenues growth is a precondition for the improvement of EBIT, net profits, return on capital , financial viability (resilience) over long periods of time (Nollet *et al.,* 2016).

So far we found that revenues and EBIT are appropriate outcomes of a successful strategy. The necessary input for capital intensive industries like the hotels, is the total amount of assets used to generate the necessary amounts revenues and EBIT that guarantee viability. It has been found that profitability has been affected by the "hotel location and room quality", which are "closely related to the level of investment made in the business (Anagnostopoulou *et al.,* 2020). Total asset value is naturally the most important input factor to be utilized in order to measure performance in the sector.

Total assets (or capital invested), revenues and EBIT are the building blocks of the comprehensive financial ratio return to total assets (ROTA). All these factors are the most important aspects of a sustained financial performance and proxies for resilience and readiness of hotels in order to navigate through uncertainty unscathed. Total assets is the main factor in the operations of hotels, since they represent capital intensive economic entities (Kourtis *et al.,* 2021). Revenues and EBIT are among the main final outcomes of its operation, that determine effectiveness and efficiency respectively. Any lasting performance with respect those two crucial factors reflects resilience, that is based on agility, sustainability and economic viability. Financial health and competitive advantage in the internal environment of hotels, as well as attractiveness industry (sector) and environmental stability in the external one, are the necessary elements for an aggressive strategy according to the strategic Position and Action Evaluation (or SPACE) matrix. In case these favorable conditions do not exist a defensive strategy is appropriate (Courtis *et al.,* 2008). When the internal environment is resilient (competitive advantage and financial stamina exist) hotels can follow a conservative strategy until the situation in the external environment improves to apply a competitive and ultimately an aggressive strategy.

Competitiveness, financial vigor and resilience, represent a self-feeding process that promotes profitability, value creation and financial stamina in the long run. Those characteristics secure resilience, give more leeway to strategy maneuvering and boost reinvestment, that in turn upgrades competitive advantage and inclusive growth for the sake of a more broad range of stakeholders and not just to shareholders.

Financial wellbeing is measured by ROTA is quite integrated type ratio that is determined by the EBIT margin (EBIT/ Revenues), combined with the total assets turnover ratio (Revenues/Total assets). The formula defining it, is:

ROTA = EBIT/Revenues X Revenues /Total assets = EBIT ÷ Total Assets

Thus EBIT, revenues and total assets are closely intertwined to define ROTA
The two ratios that compose ROTA, measure growth (effectiveness), efficiency, value creation, economic sustainability and resilience. Growth and profitability-efficiency although are both attractive factors indicating resilience, are not always move "hand in hand", according to Marakon Matrix (Hax, 1983). To satisfy them both, it is a very arduous task to achieve for a long period. Most of the time entities have to sacrifice partially one of these factors, to advance the other one a bit more.

ROTA ratio, estimates the benefits to total capital (assets) used, regardless if it is equity or debt proportions. The return on total assets (ROTA), is similar measure to the return on assets (ROA) (Courtis, 2003). The former though takes into consideration the return to all sources of capital and is why ROTA is more comprehensive and of a wider scope than the ROA. The latter also uses total assets in the denominator, but nominator only net profits, as ROE does (Curtis *et al.*, 2005; Kourtis *et al.*, 2020). Net profits though, is strictly the return to shareholders only. That is why EBIT is preferred since it is broader in scope and its directed towards more stakeholders.

Fixed assets are one of the most important attributes of the capital intensive entities. It entails grave consequences regarding their operating risk and the level of revenues required to attain and surpass the break -even point. The capital employed (fixed and current), is considered the means which determines the capacity of the entity to produce, attract and satisfy customers. The market share a corporation finally attains, depends on how readily and widely customers respond favorably to the value proposition put forward by the organization at a given price. The scale of revenues produced it is known depends on the alignment of the product's (or service) characteristics, with respect to the tastes of the consumers and the prices offered. The strategic (resilient) growth, allows hotels to thrive not only survive. The EBIT margin reflects the overall efficiency of operations on annual basis, without paying attention to the sources of financing for growth, reflected in revenues augmentation. It also true new investments and capital structure changes (to meet the financing needs) is a strategic choice since it also affects resilience

and thus agility (Simmons *et al.,* 2011). The sources of financing influence also the Earnings before taxes (EBT) and net income as well. The financing decisions though follow the growth(investments) considerations to which are attached as facilitators in the execution phase, as it is argued by the profitability Marakon Matrix (Hax *et al.,* 1983).

The scale of total assets used, depends on the management's adeptness and the characteristics of the sector in which the entity operates. Some sectors require heavy fixed assets as a percentage of total capital (as in the case of hotels, hospitals, shipping, wind farming electricity, etc.) (Courtis 2008; Curtis *et al.,* 2020; Kourtis *et al.,* 2021). The total sales (revenues) to-total assets and EBIT/Total Assets (and thus ROTA) are among the most important financial ratios which "play an important role in revealing corporate financial soundness, to maintain the competitive position of an enterprise" (Kliestik *et al.,* 2020).

Efficiency measurement has been recognized as a precious factor of performance evaluation, since it considered as an indispensable ingredient of the value creation process. That is why hotels must embrace efficiency for its investments in structure, process, and human resources in order to create value (Jacobs, 2006). Efficiency achievement through best practices although is essential, it can potentially be imitated more easily though and is not considered as a lasting source of competitive advantage, especially when the external external environment changes constantly and erratically.

So, technical efficiency alone is necessary, but not sufficient condition for financial sustainability (profitability). Efficiency alone doesn't lead automatically to financial sustainability and must be supplemented by effectiveness, which is realized through the alignment of internal and external organizational environments by the appropriate strategy. It is also true that (other things being equal), an improvement in efficiency will bolster profitability and return on assets (capital). Efficiency is a means that affects other important economic measures, since it is argued that "inefficiencies due to wasted resources, affects earnings, cash flow and growth through the negative repercussions" (Greene *et al.,* 2004). It is crucial though from the performance measurement and value creation perspective "to measure and manage the overall efficiency and effectiveness of the tourism product and services from a value chain management perspective" (Yilmaz *et al.,* 2006). The concurrence of both efficiency and profitability it is alleged "can ensure a reasonable return to stakeholders that minimizes the risk of bankruptcy, which otherwise leads to misallocation of resources" (Kumar, 2008).

A stakeholders approach is more appropriate for "a cohesive and sustainable world" (McKinsey-Davos, 2020). According to the Business Roundtable report "the purpose of a corporation is not just to create financial return to its shareholders, but to create benefits to all of its stakeholders (customers, employees, suppliers, communities, and shareholders) (Brookings Institute, 2020). This

statement heralds a broader view of performance measurement, that "beacons an emerging shift away from the paradigm of shareholder capitalism", according to Brookings Institution (2020). This development was verified and sealed also at Davos Manifesto 2020, which states that "the universal purpose of a company in the fourth industrial revolution is to serve clients, shareholders, workers and employees, as well as societies, and to harmonize the different interests of the stakeholders". Davos declaration invigorates the attempt for the establishment of a new dominant model, that fosters the stakeholder capitalism in order to promote sustainability and inclusiveness in the existing market system.
On the other hand the return on equity:

ROE = Net Income ÷ Shareholders' Equity

although it is a very useful profitability ratio, it concerns primarily the shareholders and has been criticized on the ground it favors shortsighted outcomes in many cases (Curtis *et al.*, 2005).

A strategy of resilience and agility is especially crucial during periods of rapid change, disruptions and growing uncertainty at an accelerating pace. The present unexpected Covid-19 pandemic, is a vivid current event of the vast changes occurring in the external environment of an economic entit. It affects more profoundly the hospitality sector of Greece (and not only) due to its utter dependence on the visitors from overseas, that are extremely sensitive to economic, political, health related, ecological etc events .

The data from the financial statements that are necessary to estimate ROTA, will be exploited as input and outputs in the Data Envelopment Analysis DEA in order to assess effectiveness, efficiency and finally resilience. It is well known that the validity of DEA outcomes, depends heavily on the degree of comparability of input and output data (Avkiran, 2002). Data extracted from the financial statements are considered in general as more homogeneous, since are expressed in value terms and they are also audited by an external third party. We choose to employ value data, although most of the studies using DEA using physical inputs and outputs to evaluate efficiency, since by incorporating prices in connection with quantities, renders input and output data in more comparable form. Values are taking care of the differences in quality, which is an insurmountable task to carry out in the case of services and affects the measurement outcomes.

The estimates of the revenues per room or bed which is a customary ratio used, although it is a useful metric is not a complete one since the investment associated with it may differ if the category of the hotel is not the same or the age of the premises diverge. This thorny issue is eschewed by considering the value of the capital invested on those assets. The revenues / investment ratio we apply, is more straight forward and less misleading, compared to physical assets involved.

3. Data Envelopment Analysis and Variables (DEA)

The Data Envelopment Analysis (DEA) is a non-parametric comparative performance assessment tool, that can be applied to any group of entities that transform a variety of inputs to outputs, and doesn't have to specify in advance the type of relationship among them (Coelli, 1996). DEA represents a linear programming based technique for measuring the relative performance of organizational units, that allows comparisons in case of multiple inputs and outputs. It is utilized as a method for performance evaluation and best-practice benchmarking (Cook, Tone, and Zhu, 2014), as well as for auditing competitiveness (Guan *et al.,* 2006). A main advantage of the DEA over a parametric approach is that it does not require any rigorous assumption concerning the production technology, while it can also easily accommodate multiple outputs.

The technique was introduced initially by Charnes *et al.* (1978) to measure the efficiency of input conversion into outputs. A measure of firm efficiency proposed by Farrell (1957) who defined the technical efficiency as the ability to obtain maximum output from a given set of inputs. The administration of efficiency contributes to the management's role to gain competitiveness, profitability and long term viability in a wider possible sense.

A Decision Making Unit (DMU) is any entity that exploits inputs to produce any form of output. Relative Technical Efficiency is the "ability of the DMU to obtain output, from a given set of inputs as:

$$\textbf{efficiency} = \frac{\textbf{output}}{\textbf{input}}$$

It is an index of total outputs produced, divided by the total input used for that purpose. The efficiency score of each unit is expressed compared to the optimal performance of DMUs that excel in the group of reference, that is under scrutiny. It is a relative measure compared to the one of the peer units and not an absolute one, that cannot be improved further (even for the so called efficient units). It is merely the champion in performance among the members of the group measured. The resulting efficiency scores lie between zero and one. DEA scores divide DMUs into two categories, the efficient and inefficient ones. Score one (1) gets the case (s) located on the frontier that is considered efficient and constitutes the base for comparison (benchmark). Their position is characterized as Pareto optimal. The output can't change, without a corresponding change in inputs. The inefficient DMUs are rated greater than zero, but lower than one (1). A DMU can improve efficiency through DEA benchmarking based on the adoption of best practices and appropriate strategy to obtain a more suitable production scale.

As a matter of fact in our case of hotels, we apply DEA window analysis to measure the Revenue/Assets (effectiveness) and EBIT/Assets (operational efficiency) ratios,

as the crucial building blocks of resilience (and agility). The first is known as the assets (capital) turnover ratio, reflects the level of activity, the growth and the effectiveness with which a hotel is linked to the market conditions, with the services and prices it offers on one hand and the effectiveness with the management transform assets to revenues. On the other hand, the second ratio (the EBIT asset margin), mirrors the efficiency and prudence with which the management exploits the assets at its disposal, in order to thrive and grow by creating value for a greater array of members of its stakeholders ecosystem (and not just to shareholders, as the net profit margin does). It is necessary for a hotel in order to be sustainable and secure resilience, to embrace the stakeholder capitalism and abide by its principles that are gaining considerable ground in nowadays, as it is conspicuously manifested in the growing ESG based investing, financing and reporting activities.

Charnes *et al.* (1978) in their work (following Farrel's seminal contribution), assume that Constant Returns to Scale (CRS) prevail and a change in inputs leads to an exactly proportional change, and proposed a frontier that measures the overall (total, global) efficiency. The isoquant describes the "technological set" to produce the certain amount of output. It is a model under the assumption that the DMUs are operating at an optimal scale. It can happen when perfect competition prevails and no constraints exist in the market.

The BCC model developed by Banker *et al.* (1984) refines further the previous model and discerns that the overall technical efficiency is consisting of two factors, a) the pure technical (PTE) and b) the scale inefficiencies (SE). So the BCC model identifies whether at the given scale of operation, increasing or decreasing returns to scale possibilities exist. If imperfections in the market do occur, it may not be possible for DMUs to reach an optimal size of operations. In that situation, which is not scarce, the BCC model is appropriate to tackle the issue of the DMUs' return to scale. The latter applies when a percentage change in inputs, doesn't lead to an equal (but greater or lower) change in output, leading to increasing or decreasing returns to scale (Junius, 1997). In that case the scale of operation is crucial and discerns it from the pure technical efficiency which is the other constituent of the tolal (global, overall) efficiency. So, DMUs must decide on how to improve of efficiency and choose the appropriate scale of operation to achieve that. So, the DEA CCR and BCC models are used to derive the technical, pure technical and scale efficiency. Total technical or global efficiency (TE) is a comprehensive measure that combines the degree input allocation capability of management (PTE) and the scale of operation. Having calculated CRS and VRS efficiency ratios, the Scale efficiency (SE) can be derived as a ratio:

SE = CRS (TE) / VRS (PTE)

CRS/VRS measures scale efficiency attributed to the DMU scale (size) of operations. The value of scale efficiency denotes whether a DMU is operating under increasing – decreasing or not (Avrikan, 2011). Its values range between 0 and 1.

When it is equal to 1, the VRS and CRS are equal and the DMU is operating at the optimal scale size. In every other case we have scale inefficiency. A hotel is said to be scale efficient if its size of operations maximizes productivity. Besides the concept of technically efficient when a set of outputs are attained using the smallest possible amount of inputs, there is also the concept of allocative efficiency that measures the ability of a firm to apply the inputs at optimal proportions in accordance with their existing prices. When a DMU is at the same time technically and allocatively efficient, it is characterized as cost efficient (Coelli, 1996). It is the most integrated concept of efficiency from all the above, that contributes to value creation, if prices of the output are high enough to cover costs and reflect the genuine utility to consumers who pay for. It is obvious that DEA is a tool that fosters benchmarking and best practices in the management process.

Benchmark management provides organizations with the tangible means to comprehend the ultimate result of adopting best practices in order to bridge the gap of companies with the best performing actors in their sector. It enhances efficiency and improves wealth for all parties involved. Efficiency contributes to the improvement of allocation of the factors of production, and thus to the overall wealth and prosperity in the economy. Efficiently operating units are rewarded by attracting additional investments. DEA is widely used in almost any sector of economic activity (hospitals, banks, Hotels, ports, education, agriculture, fisheries, etc.). A comprehensive and enlightened review of the literature regarding DEA applications in sustainability can be found in Zhou *et al.* (2018), who allege that "DEA is is a valuable tool of sustainability performance evaluation".

4. DEA Application, Research Results and Discussion

We apply DEA window analysis to measure economic performance in examining a sample of seventeen (17) hotels, using one input (total assets) and two outputs (revenues and EBIT). The input and outputs financial data exploited, are linked in a very robust and incontestable relationship to measure ROTA ratio. The DEA method as a tool of assessing performance is suitable, since it works particularly well with small samples. At the same time It is acknowledged, that it provides "poor discrimination on the performance" in the case of lack of sufficient observations or other factors limiting the effective discrimination among them (Podinovski *et al.*, 2007). It happens when the number of DMUs decreases beyond some critical boundaries and concurrently the sum of input and output variables increases. It is due to insufficient degrees of freedom. That is why it is suggested that the number of DMUs is equal or greater three times the sum of the variables (inputs plus outputs) used by the model (Cooper *et al.*, 2006; Avkiran, 2011), as it happens in our case.

As far the credibility of values of the three variables (assets, revenues and EBIT) used to assess performance is concerned, it is secured by using audited published data. Additional precautionary steps have been taken to avoid measurement mistakes (or even intentional reported financial shenanigans), that are more difficult to

identify when physical input and output data have been utilized. In our case we find that the EBIT figures are contemplated as genuine, given that the average cash flows from operations (CFFO) are at least twice as much as the net income reported by the hotels of the sample (Kourtis *et al.,* 2021). It is also true that non financial data very rarely have being verified officially by a certified third party (as the externals auditors), besides the fact that quality discrepancies are more prevalent, when data concerning only quantities are analyzed. Environmental sensitivity is present in the management of the hotels and its sustainability, since any damage in the surrounding environment is detrimental to its efforts to attract visitors, attain extended length of stay per visitor, achieve high room (or bed) occupancy rates and customer satisfaction as well. All these repercussions affect adversely revenues (per room) and finally EBIT, which represent some of the most popular key performance indicators in the sector (Verot, 2020).

The input orientation of the model was chosen, due to the reckoning that assets (mainly rooms, beds and rest equipments) are more probably controlled by the management, compare to revenues or EBIT (Avkiran, 2002). The performance in the hospitality sector was estimated using input and output data of seventeen (17) hotels (and groups of them) operating in different places of Greece, which published financial statements for the years 2017, 2018 and 2019). Data were extracted from audited financial statements, that have undergone further tests to verify as much as possible the validity of the information contained. The data regarding the total assets used, the revenues obtained and EBIT realized by the economic entities of the sample, are presented in the following Table 1.

Table 1. *Input and output data (in Euros) of hotels for 2017-2019 period*

	2019			**2018**			**2017**		
DMUs	Assets	Revenues	EBIT	Assets	Revenues	EBIT	Assets	Revenue	EBIT
1	207.619.000	65.075.000	13.085.000	190.146.000	54.667.000	10.735.000	161.587.000	50.506.001	10.740.000
2	95.364.048	40.145.324	3.702.844	84.386.009	38.582.972	6.158.417	76.248.440	35.486.015	6.348.760
3	476.456.343	104.250.951	26.154.561	466.298.621	97.382.105	27.566.651	457.894.029	81.712.162	25.432.534
4	99.827.660	26.067.672	8.379.619	89.343.666	24.131.394	7.442.865	63.134.894	22.201.363	7.114.756
5	50.470.205	18.235.749	3.434.057	41.275.105	17.192.031	2.637.389	34.610.944	14.128.863	2.960.191
6	163.283.276	47.295.545	15.920.048	141.302.337	40.200.674	15.169.696	138.185.746	37.633.650	10.989.525
7	54.305.342	14.459.473	1.099.402	52.961.129	13.878.252	2.568.742	51.093.604	14.232.504	3.316.661
8	63.923.893	12.277.176	4.653.998	63.444.133	11.069.684	4.360.932	67.372.335	10.076.717	3.605.962
9	12.179.818	4.352.877	414.959	12.171.915	4.209.180	475.015	12.223.853	4.067.928	440.755
10	109.673.671	21.586.053	4.880.252	111.455.704	20.194.681	4.705.114	113.551.972	19.951.295	4.655.634
11	197.404.843	35.066.313	5.651.668	195.312.000	34.977.000	5.573.000	183.986.001	32.158.000	3.855.000
12	53.309.449	16.213.957	3.800.017	52.737.120	16.344.356	3.882.016	51.633.708	15.911.937	4.793.384
13	20.720.492	7.665.348	1.674.036	20.109.591	7.461.566	2.569.335	16.081.451	6.680.395	2.479.259
14	18.805.355	6.743.234	991.805	19.362.051	7.413.473	134	19.387.506	6.838.922	371.076
15	8.857.450	2.870.887	210.247	9.413.188	3.003.377	412.213	9.693.057	2.984.948	525.063,23
16	30.812.962	14.218.177	3.000.486	30.139.561	14.386.824	3.849.645	29.113.609	13.264.299	3.787.794
17	19.075.590	14.927.569	626.114	18.580.786	13.987.747	230.608	18.500.413	13.864.799	235.939

Note: *Data extracted from audited financial statements of hotels.*
Source: *Own study.*

In the following Table 2, the main descriptive statistics of the data used in the model are shown. The descriptive statistics (mean, median, St. Dev.) of input and output variables of hotels, denote that the individual hotel entities (DMUs) of the sample, diverge significantly with respect to their size of operation and their performance as

well. Most particularly, the much higher value of the means of the variables compare to the respective medians, as well as the quite high standard deviations in the case of the input variable of total assets, indicate very clearly the wide variability in the scale (capital invested) of operations of hotels. A parallel behavior is exposed among the output variables of revenues and EBIT (or even more pronounced indeed).

Table 2. *The descriptive statistics of Input and output data (in Euros) of hotels for 2017-2019 period*

	2019			**2018**			**2017**		
	Assets	Revenues	EBIT	Assets	Revenues	EBIT	Assets	Revenues	EBIT
Total	1.682.089.398	451.451.306	97.679.113	1.598.438.916	419.082.317	98.336.773	1.504.298.561	381.699.798	91.652.292
Max	476.456.343	466.298.621	466.298.621	466.298.621	457.894.029	457.894.029	457.894.029	81.712.162	25.432.534
Min	8.857.450	2.870.887	210.247	9.413.188	3.003.377	134	9.693.057	2.984.948	235.939
Mean	98.946.435	26.555.959	5.745.830	94.025.819	24.651.901	5.784.516	88.488.151	22.452.929	5.391.311
STDEV	115.959.421	26.040.335	6.845.001	112.505.203	23.554.082	6.857.844	109.369.220	20.155.714	6.088.757
MEDIAN	54.305.342	16.213.957	3.702.844	52.961.129	16.344.356	3.882.016	51.633.708	14.232.504	3.787.794

Note: *Data extracted from audited financial statements of hotels.*
Source: *Own study.*

Table 3 shows that in 2017 only two (DMUs No 13 and 17) out of the seventeen (17) hotels examined are overall technically efficient (TE), achieving score equal to one (TE=PTE=SE=1) under the Constant Return to Scale (CRS) version. The average TE score for all hotels of the sample in 2017 is 0,637 (Table 4). It indicates that in order the average DMU to become efficient, the input must be reduced by 36,3 % and outputs remain the same (or produce the current output with 63,7 % of the present inputs used).

Table 3. *TE, PTE SE and RTS annual factors of hotels for the period 2017-2019*

	2019			**2018**			**2017**			**RTS**		
DMUs	**TE**	**PTE**	**SE**	**TE**	**PTE**	**SE**	**TE**	**PTE**	**SE**	**2019**	**2018**	**2017**
1	0,663	1,000	0,663	0,540	0,993	0,543	0,602	1,000	0,602	**Decreasing**	**Decreasing**	**Decreasing**
2	0,649	1,000	0,649	0,807	1,000	0,807	0,849	1,000	0,849	**Decreasing**	**Decreasing**	**Decreasing**
3	0,563	1,000	0,563	0,463	1,000	0,463	0,397	1,000	0,397	**Decreasing**	**Decreasing**	**Decreasing**
4	0,861	0,861	1,000	0,645	0,729	0,885	0,793	1,000	0,793	**Increasing**	**Decreasing**	**Decreasing**
5	0,740	0,806	0,918	0,727	0,776	0,938	0,783	0,806	0,971	**Decreasing**	**Decreasing**	**Decreasing**
6	1,000	1,000	1,000	0,840	0,931	0,881	0,590	1,000	0,590	**Constant**	**Decreasing**	**Decreasing**
7	0,388	0,390	0,994	0,483	0,486	0,994	0,554	0,573	0,968	**Increasing**	**Increasing**	**Decreasing**
8	0,747	0,747	0,999	0,524	0,528	0,991	0,354	0,405	0,874	**Increasing**	**Decreasing**	**Decreasing**
9	0,557	0,895	0,622	0,561	0,877	0,640	0,536	0,536	1,000	**Increasing**	**Increasing**	**Increasing**
10	0,457	0,500	0,914	0,360	0,401	0,900	0,350	0,387	0,904	**Decreasing**	**Decreasing**	**Decreasing**
11	0,338	0,458	0,738	0,316	0,387	0,817	0,288	0,366	0,786	**Decreasing**	**Decreasing**	**Decreasing**
12	0,732	0,732	1,000	0,621	0,646	0,961	0,677	0,763	0,887	**Increasing**	**Decreasing**	**Decreasing**
13	0,830	0,983	0,844	1,000	1,000	1,000	1,000	1,000	1,000	**Increasing**	**constant**	**Constant**
14	0,656	0,823	0,798	0,509	0,676	0,752	0,510	0,510	1,000	**Increasing**	**Increasing**	**Increasing**
15	0,468	1,000	0,468	0,541	1,000	0,541	0,559	0,559	1,000	**Increasing**	**Increasing**	**Increasing**
16	1,000	1,000	1,000	1,000	1,000	1,000	0,979	1,000	0,979	**Constant**	**Constant**	**Decreasing**
17	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	**Constant**	**Constant**	**Constant**

Note: *Data extracted from audited financial statements of hotels.*
Source: *Own study.*

The observations are based on the comparatively optimal performance of with respect the efficiency reference set of hotels consisting of the DMUs No 13 and

17. These two optimally efficient (comparatively) hotels, are followed closely in performance by the No 16, which exhibits total efficiency score (TE) equal to 0,979. The DMU No 11 that is exhibiting the minimum TE score (Table 4) which is equal to 0,288 in 2017, must curtail its input by 71,2 % (while keeping output constant), to become efficient and move to the efficiency reference frontier.

The decomposition of the global (total) efficiency (TE) score, permits us to attribute the entire amount of it to each one of its particular two causes, the pure technical efficiency dimension (PTE) on one hand and the scale efficiency (SE) on the other (Kumar, 2008). The PTE is associated with the management capability to transform inputs to desired outputs of through a skillful allocation of them, the right processes and other methods of administration applied. It usually takes less time to materialize the results pursued, compared to measures that require to adjust the scale in order to improve SE outcomes. Many times both PTE and SE must be improved in order to revamp the TE.

The BCC version of DEA which allows for variable return to scale (VRS), shows the PTE efficient number of hotels becomes eight (8) in 2017 due to the convexity condition and the average PTE becomes 0,759 (Table 4). All the rest nine (9) hotels, still remain purely technical inefficient, indicating that the total inefficiency (TE) is due predominately in the pure technical rather, than to the scale one. On the average in 2017 the low overall technical efficiency (TE) which is equal to 0,637 is affected more by the average PTE=0,759, compared to the scale efficiency which is greater, namely SE=0,859 (Table 4).

Table 4. *The descriptive of the efficiency dimensions (TE, PTE, SE) and RTS for the years 2019, 2018 and 2017*

	2019			**2018**			**2017**			**2019-2017**		
	TE	PTE	SE	TE	PTE	SE	TE	PTE	SE	TE	PTE	SE
AVERAGE	0,685	0,835	0,834	0,644	0,790	0,832	0,637	0,759	0,859	0,655	0,795	0,841
MIN	0,338	0,390	0,468	0,316	0,387	0,463	0,288	0,366	0,397	0,314	0,381	0,443
MAX	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000
STDEV	0,209	0,207	0,182	0,218	0,230	0,182	0,231	0,259	0,177	0,220	0,232	0,180
TE Efficient hotels	3			3			2					
TE Inefficient hotels	14			14			15					
Incrreasing RTS	8			4			3					
Decreasing RTS	6			10			12					

Note: *Data extracted from audited financial statements of hotels.*
Source: *Own study.*

The DMU No 11, exhibits still the lowest PTE efficiency score of 0,366 in the same year, revealing that its inefficiency is primarily due to its PTE factor. The fact that that average PTE is lower than the average SE, denotes that in the year 2017 the average hotel generally faced more difficulties operating at optimal technical and administrative levels, than operating at the optimal level of scale. As far as the scale efficiency (SE) aspect is concerned, in 2017 the lowest ratio equal

to 0,397, is achieved by the hotel No 3, which is the largest in size (total assets) of the group.

In 2018 the average global (overall, or total) efficiency TE increased to 0,644 due mainly to an improvement in average PTE that was found low in the previous years. The latter became equal to 0,790 (it was 0,759 in 2017), while at the same time the SE decreased and reached 0,832 (from 0,859 ratio in 2017). The latter still remained superior in value in comparison to PTE of the year, indicating that in 2018 the low average total efficiency (TE) is attributed also more to the low PTE (deficient management capability), than to the scale effect. The optimally total efficient hotels (the efficiency reference set) in 2018 are the No 17 and 13 (as in the previous year), plus the No 16 for the first time. All three DMUs expose a comparatively optimal global efficiency (TE=PTE=SE=1). The lowest TE and PTE scores are achieved this year again by the DMU No 11. The lowest SE ratio is shown by DMU No 3 again, which is the biggest in size (total assets) hotel in the group.

During 2019 the average total efficiency ratio (TE) increased further to 0,685. The PTE improved once again to reach 0,835 while the respective one SE ratio improved slightly to 0,834 (in comparison to the previous year but still remains below its size in the 2017). The latter (SE) becomes for the first time lower (even marginally) than the PTE factor in 2019. It reveals that in 2019 for the first time the low TE, is due primarily to SE, compared to the PTE. At the same time the level of the average PTE ratio of the year, although is improving gradually indicates without any question that there is enough space to pursue its further enhancement, since it is also well below the optimal level of one (1). The DMUs with the comparative optimal TE of the year 2019, are the hotels No. 17, 16 and 6. The lowest TE figure belongs again to DMU No 11.

As we move from 2017 to 2019 the average TE is increasing from 0,637 to 0,685 due to PTE factor surging from 0,759 to 0,835 respectively. The fact that the PTE ratio was moving constantly upwards from 2017 to 2019, this trend can be attributed to "learning by doing" effect, indicating that management becomes more efficient as the time proceeds. The PTE was dealt primarily with some success due to its quicker pay off (before tackling the scale), since the space for improvement was greater and the task rather easier, than the one that involves costly and time consuming scale (or fixed assets) adjustments. The mean SE was higher than the corresponding PTE for every year in the period 2017 and 2018, indicating that the weaker factor was the pure technical efficiency or the ability to bolster the operational efficiency by transforming inputs to outputs through higher productivity.

The scale efficiency (SE) although indicates whether some hotels are not efficient from the point of view of scale, It does not explain how the hotels could remedy their inefficiencies. To overcome this obstacle it is necessary to find out the return to scales (RTS) of the DMUS. Based on the last three columns of Table 3, we understand that the majority of hotels operate at decreasing returns of scale. More

specifically the seventeen hotels in the three year period represent 51 (17X3) cells. Each one (hotel and year) is reflecting the return to scale operation (RTS). It reveals, that twenty eight (28) (hotel/year) cases operate at a decreasing RTS.

It denotes that for these hotels in order to improve their efficiency ratios, should reduce their size of operations, that creates possibly complexity, congestion, red tape, overlapping, communication, lack of coordination, impersonal environment, inertia, poor decision making and control problems. As a result, any increase in inputs leads to an increase in output at a lower pace.

The hotels operating at a decreasing returns to scale constantly drops from 12 DMUs in 2017, to ten (10) in 2018 and six (6) in 2019. At the same time the DMUs showing increasing RTS are growing with the lapse of time from three (3) in 2017, to four (4) in 2018 and eight (8) in 2019. These changes happen as the average revenues per hotel increases. There are fifteen (15) cases operate at an increasing RTS which will have greater potential to approach the reference set of hospitals by increasing their size of operation to boost efficiency. The hotels that operate under scale inefficiency, which is a substantial number (but must reduce their present excess input slack by altering their non optimal scale due to either increasing or decreasing RTS. This treatment inherently needs more time to be implemented, compare to management and administrative aspect. At the same time though it is obvious there is also room to improve further and the PTE efficiency dimension in those hotels, since are services offering organizations that are affected by the quality of human factor. Eight (8) hotel/years are operating at a constant RTS, ones that correspond to the hotel No 17 all three years, the No 16 for the years 2019 and 2018, the No 13 for 2018 and 2017 respectively, as well as the No 6 for the 2019 only. The latter eight cases are the ones which are operating at a comparatively optimal overall efficiency ratio. It must be noted also that almost none of the larger in size (assets or capital) hotels and more specifically the No 1, 2, 3, 4, 6, 8, 10 and 11, exhibits optimal global efficiency score one (1), with the exception of No 6 in 2019.

As far as the PTE is concerned, in 2017 a total of eight (8) hotels achieved an optimal PTE (equal to 1), in 2018 seven (7) hotels and in 2019 seven (7) of them. So in total during the 2017-2019 period a total of 22 cases (hotel/year) attained a comparative optimal PTE ratio. The low average PTE (although it improved during the period) indicates that the management failed to allocate resources more efficiently and this situation that contributed to poor input utilization. Thus hotels with pure technical inefficiency still, must improve operating policies and managerial performance through more effective management and organization practices to translate input into outputs

IDEA although offers benchmarks for comparisons and policy prescriptions for improvements for the inefficient hotels, it is well known that there is no a solid

basis for comparison among the hotels that exhibit total efficiency score equal one (1).

5. Conclusion

The hospitality industry is particularly important for countries like Greece. The hotel sector which is the backbone of tourism, is capital intensive and at the same time particularly amenable to influence by any external environment disturbances. Resilience to the external changes is achieved through strategy. Economic performance is the result of the successful strategy that secures an amalgam of effectiveness and efficiency.

We applied the input oriented CCR and the BCC versions of DEA window analysis to measure TE, PTE, SE and RTS. Through the global efficiency decomposition we tried to identify the main causes of inefficiency. As the main input total assets were used, since hotels are capital intensive economic entities. Revenues and operating profits were chosen as the outputs reflecting effectiveness and efficiency. Adequate revenues and EBIT which secure adequate return on total assets are crucial aspects for hotels to thrive (and not merely survive) in a sustainable fashion. Resilience is the product of agility, sustainability, competitiveness and economic viability that benefit the key stakeholders, ameliorate the allocation of scarce resources in the sector through ESG investing and finance that promote more inclusive growth and prosperity.

We found that the rather low global efficiency (TE) is due to both deficient pure technical efficiency (PTE) and scale efficiency (SE). In 2017 and 2018 the SE was greater than PTE. The latter was proven to be a greater cause for the low TE for these two years, compared to the low also SE. The PTE all these years improved and in 2019 became marginally greater than the corresponding SE.

The pure technical efficiency (PTE) prevailed in the improvement process during that period, due to the fact that the hotels with great scale of operations (which exceeded in numbers the rest of the sample), improved the average PTE factor. It is achieved relatively easier through the learning by doing effect, and the knowledge accumulation and sharing process. It paid off earlier, compare to more painful actions related to scale reduction, which usually invoke greater resistance to change. In 2019 finally, the low SE constituted then the prime (even marginally) cause of low overall efficiency (TE).

It is suggested that in periods of turbulence in the external environment (as the current one) successful changes in the operating model are attained through agility, that secures resilience (the "ability to thrive in challenging circumstances"). An operating model in order to be creatively and conclusisevly responsive to mounting external changes, it must encompasses realignments in the product-service portfolio, internal structures, processeses and performance (McKinsey, 2021).

6. Limitations

Limitations of the study is probably pertaining to the small number of hotels of the study, that is partially related to the fact that a great number of hotels report negative data with respect to EBIT in one or more years in any given period, which is an element that can not be dealt by DEA. Another factor restricting a substantial number of hotels available for the study, is the fact that a substantial considerable number of them do not report audited data or don't report all consecutive years under consideration.

A suggestion for further research may be to include probably the labor expenses (if available) as an additional input factor, since employee expenses represent the main cost of the annual operation of a hotel, that affects its operating profit in the income statement. A suggestion for further research is to incorporate the specific effects of pandemic for the 2020. Until now we don't have yet a full year annual financial data published in order to assess more fully the repercussions of covid 19 on the particular hotels of the sample. The financial reports of 2020 would test the validity of the results that the degree of capital turnover and the operating profit margin to total assets, are the crucial financial ratios that measure effectiveness and efficiency which culminate in expressing hotel residence into any kind of hardships plague them abruptly, as the case of the Covid-19 presently.

Incorporating the results from the financial statements in 2020, would indicate even more visibly whether the DMU 17 (and the rest hotels of the reference set for the specific years each) which comparatively excelled all years (2017-2019), navigated through the pandemic in 2020 the least unscathed (as it is anticipated). It will show whether the auspices for their future are more favorable (or at least less ominous in case of severe disturbances) as it is contemplated, compared to the hotels found to underperform so far with respect the asset turnover and operating profits.,which are showing low resilience.

References:

Aguta, S., Graub, R., Peir, J.M. 2003. Competency needs among managers from Spanish hotels and restaurants and their training demands. International Journal of Hospitality Management, 22, 281-295.

Almansoori, A., AlShamsi M., Salloum, S.A., Shaalan, K. 2020. Critical Review of Knowledge Management in Healthcare. Recent advances in Intelligent Systems and Smart Applications, 99-119.

Anagnostopoulou, S., Buhalis, D., Kountouri, I., Manousakis, E., Tsekrekos, A. 2020. The impact of online reputation on hotel profitability. International Journal of Contemporary Hospitality Management, 32(1), 20-39.

Annarelli, A., Nonino, F. 2016. Strategic and operational management of organizational resilience: Current state of research and future directions. Omega, 62, 1-18.

Avkiran, N.K. 2002. Monitoring Hotel Performance. Journal of Asia Pacific Business, 4(1), 51-66.

Avkiran, N.K. 2011. Association of DEA super-efficiency estimates with Financial ratios: Investigating the case for Chinese banks. Ωmega, 39, 323-334.

Banker, R.D., Charnes, A., Cooper, W.W. 1984. Some models for estimating Technical scale inefficiencies in data envelopment analysis. Management Science, 30, 1078-1092.

Barney, J. 1991. Firm Resources and Sustained Competitive Advantage. Journal of Management, 17(1), 99-120.

Barros, C.P. 2005. Evaluating the Efficiency of a Small Hotel Chain with a Malmquist Productivity Index. International Journal of Tourism Research, 7(3), 173-184.

Barua, B., Moir, M. 2020. Comparing Performance of Universal Health Care Countries. Fraser Institute, 1-66.

Behn, R.D. 2003. Why measure performance? Different purposes require different measures. Public Administration Review, 63(5), 586-606.

Buhalis, D., Leung, R. 2018. Smart Hospitality–Interconnectivity and Interoperability towards an Ecosystem. International Journal of Hospitality Management, 71, 41-50.

Cantor, V.J.M., Poh, K.L. 2017. Integrated Analysis of Healthcare Efficiency: A Systematic Review. Journal Medical Systems, 42(1), 1-23.

Carslaw, C.A., Mills, J.R. 1991. Developing Ratios for Effective Cash Flow Statement Analysis. Journal of Accountancy, 172(5), 63-70.

Carvalho, A.O., Ribeiro, I., Cirani, C.B.S., Cintra, R.F. 2016. Organizational resilience: a comparative study between innovative and non-innovative companies based on the financial performance analysis. International Journal of Innovation, 4(1), 58-69.

Casu, B., Girardone, C. 2004. Financial Conglomeration: Efficiency, Productivity and Strategic Drive. Applied Financial Economics, 14(10), 687-696.

Chang, H. 1998. Determinants of hospital efficiency: the case of central government-owned hospitals in Taiwan. Omega International Journal of Management Science, 26(2), 307-317.

Charnes, A., Cooper, W.W., Rhodes, E. 1978. Measuring the efficiency of decision making units. European Journal of Operational Research, 2, 429-444.

Coelli, T.J. 1995. Recent Developments in Frontier Modelling and Efficiency Measurement. Australian Journal of Agricultural Economics, 39, 219-245.

Cooper, W.W., Seiford, L.M., Tone, K. 2006. Introduction to Data Envelopment Analysis and Its Uses. New York: Springer.

Cooper, W.W., Seiford, L.M., Zhu, J. 2011. Data Envelopment Analysis: History, Models, and Interpretations, Chapter 1. DOI: 10.1007/978-1-4419-6151-8_1.

Courtis, P. 2003. Du Pont ratio: A comprehensive measure of business performance. European Research Studies Journal, 6(1-2), 21-34.

Courtis, P., Mylonakis, J. 2008. A holistic approach of assessing and improving competitiveness in tourism: the case of Ionian Islands, Greece. Problems and Perspectives in Management, 6(3), 31-37.

Curtis, P., Lagos, D. 2017. Critical Evaluation of the Methodological Framework for strategic Tourism planning on a regional level. Studies in Regional & Urban Planning, 10, 5-14.

Curtis, P., Hanias, M., Kourtis, E., Kourtis, M. 2020. Data Envelopment Analysis (DEA) and Financial Ratios: A Pro-Stakeholders' View of Performance measurement for Sustainable Value Creation of the Wind Energy. International Journal of Economics and Business Administration, 8(2), 326-350.

Curtis, P., Thalassinos, J. 2005. Equity fund raising and "creative" accounting

practices: Indications from Athens Stock Exchange for the 1999-2000 period. European Research Studies Journal, 8(1-2), 2-10.

Damilano, M., Miglietta, N., Battisti, E., Creta, F. 2018. Value Creation and Competitive Advantage: Empirical Evidence from Dividend Champions of the S&P 500. International Journal of Business and Management, 13(12), 50-60.

Delgado, M., Porter, M.E., Stern, S. 2014. Clusters, convergence, and economic performance. Research Policy, 43, 1785-1799.

Drucker, P.F. 1963. Managing for business effectiveness. Harvard Business Review, 41, 53-60.

Young, E. 2020. COVID-19 Industry Pulse Report: Tourism https://assets.ey.com/content/dam/ey-sites/ey-com/en_gr/tourism_pulse_report.pdf

Farrell, M.J. 1957. The Measurement of Productive Efficiency. Journal of the Royal Statistical Society, 120, 253-290.

Fiksel, J., Goodman, I., Hecht, A. 2014. Resilience: Navigating toward a Sustainable Future. Solutions, 5(5), 38-47.

Greene, W., Segal, D. 2004. Profitability and efficiency in the US life insurance industry. Journal of Productivity Analysis, 21(3), 229-247.

Guan, J.C., Yam, R.C.M., Mok, C.K., Ma, N. 2006. A study of the relationship between competitiveness and technological innovation capability based on DEA models. European Journal of Operational Research, 170(3), 971-986.

Hax, A.C., Majluf, N.S. 1983. The Use of the Growth-Share Matrix in Strategic Planning. Interfaces,13(1), 46-60.

Hawawini, G., Subramanian V., Verdin P. 2003. Is Performance Driven by Industry- or Firm-Specific Factors? A New Look at the Evidence. Strategic Management Journal, 24, 1-16.

Hellenic Chamber of Hotels (ITEP). 2019. https://www.grhotels.gr/wp-content/uploads/2020/02/2019-Hotels_total.pdf.

Helfat, C.E., Peteraf, M.A. 2009. Understanding dynamic capabilities: Progress along a development path. Strategic Organization, 7(1), 91-102.

INSETE. 2020. Basic figures regarding Greek tourism (In Greek). https://sete.gr/el/stratigiki-gia-ton-tourismo/vasika-megethi-tou - ellinikoy-tourismoy/.

Junius, K. 1997. Economies of scale: A survey of the empirical literature. Kiel Working Paper, No. 813. Kiel Institute of World Economics.

Kliestik, T., Valaskova, K., Lazaroiu, G., Kovacova, M., Vrbka, J. 2020. Remaining Financially Healthy and Competitive: The Role of Financial Predictors. Journal of Competitiveness, 12(1), 74-92.

Kor, Y.Y., Mahoney, J.T. 2000. Penrose's resource-based approach: the process and product of research creativity. Journal of Management Studies, 37(1), 109-139.

Kor, Y.Y., Leblebici, H. 2005. How do interdependencies among human-capital deployment, development, and diversification strategies affect firms' financial performance? Strategic Management Journal, 26(10), 967-985.

Kourtis, M., Curtis, P., Hanias, M., Kourtis, E.M. 2021. A Strategic Financial Management Evaluation of Private Hospitals' Effectiveness and Efficiency for Sustainable Financing: A Research Study. European Research Studies Journal, 24(1), 1025-1054.

Kourtis, E., Kourtis, G., Curtis, P. 2019. An Integrated Financial Ratio Analysis as a Navigation Compass through the Fraudulent Reporting Conundrum: A Case Study. International Journal of Finance, Insurance and Risk Management,

9(1-2), 3-20.

Kourtis, G., Kourtis, E., Kourtis, M., Curtis, P. 2017. Fundamental Analysis, Stock Returns and High B/M Companies. International Journal of Economics and Business Administration, 9(4), 3-18.

Kumar, S. 2008. An Analysis of Efficiency–Profitability Relationship in Indian Public Sector Banks. Global Business, 9(1), 115-129.

Kumar, S., Gulati, R. 2010. Measuring efficiency, effectiveness and Performance of Indian public sector banks. International Journal Productivity and Performance Management, 59(1), 51-74.

Lagos, D., Courtis, P.G. 2008. Business Clusters Formation as a Means of Improving Competitiveness in the Tourism Sector. European Research Studies Journal, 11(1-2), 111-121.

McKinsey. 2021. Adapting your operating model to the next normal: The next big move in chemicals https://www.mckinsey.com/industries/chemicals/our-insights/adapting-your-operating-model-to-the-next-normal-the-next-big-move-in-chemicals.

Melián-Alzola, L., Fernández-Monroy, M., Hidalgo-Peñate, M. 2020. Hotels in contexts of uncertainty: Measuring organisational resilience Tourism. Management Perspectives, 36, 1-14.

Manasakis, C., Apostolakis, A., Datseris, G. 2013. Using data envelopment analysis to measure hotel efficiency in Crete. International Journal of Contemporary Hospitality Management, 25(4), 510-535.

McGahan, A.M., Porter, E. 1997. How Much Does Industry Matter, Really? Strategic Management Journal, 18(4), 15-30.

Nollet, J., Filis, G., Mitrokostas, E. 2016. Corporate social responsibility and financial performance:a non-linear and disaggregated approach. Economic Modelling, 52, 400-407.

Oparanma, A., Ulunma, E.P. 2019. Organizational Resilience and Corporate Performance of Deposit Money Bank in Port Harcourt, Nigeria. International Journal of Business and Management Future, 3(2), 1-12.

Papatheodorou, A., Rosselló, J., Xiao, H. 2010. Global economic crisis and tourism: consequences and perspectives. Journal of Travel Research, 49(1), 39-45.

Pawlowska, M. 2016**.** The Impact of Market Structure and the Business Cycle on Bank Profitability:The role of foreign Ownership, The case of Poland. National Bank of Poland. Working Paper No. 229. https://www.nbp.pl/publikacje/materialy_i_studia/229_en.pdf.

Pecb. 2018. The Importance of Organizational Resilience. https://pecb.com/article/the-importance-of-organizational-resilience.

Phillips, P., Louvieris, P. 2005. Performance Measurement Systems in Tourism, Hospitality, and Leisure Small medium-Sized Enterprises: A Balanced Scorecard Perspective. Journal of Travel Research, 44 (2), 201-211.

Pierre-Louis, A. 2020. Planning for Resilience in Hospitality. Lodging Magazine. https://lodgingmagazine.com/planning-for-resilience-in-hospitality/.

Podinovski, V., Thanassoulis, E. 2007. Improving discrimination in data envelopment analysis: Some practical suggestions. Journal of Productivity Analysis, 28(1), 117-126.

Porter, M. 1996. What is Strategy? Harvard Business Review, 74(6), 61-78.

Prusak, L. 2010. What Can't Be Measured. Harvard Business Review.

https://hbr.org/2010/10/what-cant-be-measured.

Poldrugovac, K., Tekavcic, M., Jankovic, S. 2016. Efficiency in the hotel industry: an empirical examination of the most influential factors. Economic Research, 29(1), 583-597.

Quenniche, J., Carrales, S. 2018. Assessing efficiency profiles of UK commercial banks: a DEA analysis with regression-based feedback. Annals of Operation Research, 266, 551-587.

Schmidgall, R.S., Geller, A.N. 1993. Financial Analysis Using the Statement of Cash Flows. The Cornell H.R.A. Quarterly, 47-53.

Seiford, L.M., Zhu, J. 1999. An investigation of returns to scale in data envelopment analysis. Omega, International Journal of Management Science, 27, 1-11.

Sainaghi, R., Phillips, P., Corti, V. 2013. Measuring hotel performance: Using a balanced scorecard perspective approach. International Journal of Hospitality Management, 34(1), 150-159.

Sigala, M., Jones, P., Lockwood, A., Airey, D. 2005. Productivity in hotels: a stepwise data envelopment analysis of hotels' rooms division processes. The Service Industries Journal, 25(1), 61-81.

Simmons, G., Tinsley, D. 2011. Financial Elements of Business Resilience. A Systematic Graziadio Business Review, 14(2).

Stamolampros, P., Korfiatis, N., Chalvatzis, K., Buhalis, D. 2020. Harnessing the "Wisdom of Employees" from Online Reviews. Annals of Tourism Research, 80, 1-4.

Taylor, M., Taylor, A. 2014. Performance measurement in the Third Sector: the development of a stakeholder- focussed research agenda. The Management of Operations, 25(1), 1370-1385.

Teece, D. 2007. Explicating dynamic capabilities: The nature and microfoundations of Sustainable enterprise performance. Strategic Management Journal, 28(13), 1319-1350.

Turner, J., Broom, K., Elliot, M., Lee, J. 2015. A comparison of capital structure: the use of debt in investor-owned and not-for-profit hospitals. Journal Health Care Finance, 41(4), 1-17.

Unido.org https://www.unido.org/2030-agenda-and-sustainable-development- goals.

Verot, B. 2020. Top Hospitality Key Performance Indicators. https://www.hotelminder.com/top-hospitality-key-performance-indicators.

Walters, B.A., Bhuian, S. 2004. Complexity absorption and performance: A structural analysis of acute-care hospitals. Journal of Management, 30, 97-121.

Wernerfelt, B. 1984. A Resource-based view of the firm. Strategic Management Journal, 5(2), 171-180.

Yilmaz, Y., Bititci, U.S. 2006. Performance mesaurement in tourism. A value chain model. International Journal of Contemporary Hospitality Management, 18(4), 341-349.

Young, D., Reeves, M., Gerard, M. 2020. Why the New Competitive Advantage Demands Sustainability. Boston Consulting Group. https://www.bcg.com/en-gr/publications/2020/why-the-new-competitive-advantage-demands-sustainability.

Zhu, J. 2007. http://www.deafrontier.net/index.html.