Economic Value Added (EVA®). Is it really the best performance measure? A Review of the Theoretical and Empirical Literature. The case of Athens Stock Exchange (ASE)

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Economic Value Added (EVA®). Is it really the best performance measure? A Review of the Theoretical and Empirical Literature. The case of Athens Stock Exchange (ASE)

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Abstract

The aim of this paper is to extensively discuss the underlying concept of Economic Value Added, henceforth EVA®, to present its strengthens and weaknesses, to discuss the revealed results from the empirical studies up to now concerning its usefulness as a financial performance measure, and finally, to show the results of the first empirical study on the issue conducted in the Greek capital market. Despite all positive and encouraging comments about EVA®, emphasised by Stewart (1991; 1994; 1999), Sheehan (1994), Walbert (1994), Stern, Stewart and Chew (1995) and other EVA® proponents such as Tully (1993), O'Byrne (1996), Ehrbar (1998), Stern (1974; 2001) and Grant (2003) among others, the empirical literature which came out provided mixed results for the usefulness of EVA® in explaining stock returns. Studies focused on whether EVA® is more highly associated with stock returns than other performance measures provided mixed and controversial results. This study employs pooled time-series, cross sectional data of 163 listed companies in the ASE over the period 1992 – 2001 to examine whether EVA® or the traditional accounting-based measures are associated more strongly with stock returns. Relative information content tests reveal that stock returns are more closely associated with earnings per share than with EVA®. However, incremental information content tests suggest that EVA® adds considerable explanatory power to earnings per share in explaining stock returns.

Key words: Traditional and value-based performance measures, EVA®

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1. Introduction

Modern value-based performance measures, such as Shareholder Value Added (SVA), Economic Value Added (EVA®), Market Value Added (MVA), Economic Profit (EP), Cash Flow Return on Investment (CFROI) and Cash Value Added (CVA), have attempted to divert management focus away from earnings and towards cash flows. These measures recognise that capital invested in a corporation is not free, and make a charge for the use of the capital employed by the corporation in its operations (O'Hanlon and Peasnell, 1998).

According to Rappaport (1986) within a business, there are seven drivers (e.g. sales growth rate, operating profit margin, income tax rate, working capital investment, fixed capital investment, cost of capital, and forecast duration) that can be managed to create value. The theory suggests that improvement in these value drivers leads to an increase in shareholder value. A common theme of the value-based performance measures is that they take these drivers and summarise them into a single measure, be it SVA, EVA®, or any of the other value-based measures that have been developed. Ehrbar (1998, p. 134) for instance states that 'the mandate under an EVA® management system is to increase EVA® as much as possible in order to maximise shareholder wealth'.

Modern value-based performance measures gained their popularity since the late 1980s (Rappaport, 1986; Stewart, 1991; Stern, Stewart and Chew, 1995; Copeland, Koller and Murrin, 1996; Black, Wright and Bachman, 1998; Madden, 1999), and thereby, the Value Based Management (VBM) approach became increasingly popular both as a decision making tool and as an incentive compensation system (Knight, 1998).

Many studies have been conducted in the last two decades, first in the US and later in the rest of the international market community to answer questions such as *whether it is really better to use modern value-based measures than traditional performance measures to measure the corporate financial performance, or which performance measure best explains corporations' change in market value.* Reported results are quite mixed and controversial. This study is inspired by the controversial results of the previous studies and aims to investigate whether traditional and/or modern value-based performance measures are value relevant in the context of ASE. Since there are many financial performance measures (traditional and modern value-based), which appear in different variations, this study is focused on the most popular

of them, those that have been extensively mentioned in the literature. From the traditional accounting performance measures we selected the EPS, ROI and ROE, while from the modern value-based performance measures we focused on EVA®.

2. Literature review

2.1. Introduction

The choice of performance measures is one of the most critical challenges facing organisations (Knight, 1998). Poorly chosen performance measures routinely create the wrong signals for managers, leading to poor decisions and undesirable results. There are enormous hidden costs in misused performance measures. Shareholders pay the bill each day in the form of overinvestment and acquisitions that do not pay off etc. It is not that management is poor. Simply, it is the wrongly chosen performance measures, which in turn push management to take improper decisions (Ferguson and Leistikow, 1998; Knight, 1998).

Over the last few years an increasing number of consultants, corporate executives, institutional investors and scholars have taken part in the debate on the most appropriate way to measure performance (Rappaport, 1998). Consultants are willing to demonstrate the mastery of their recommended performance models. Corporate executives show clearly that the performance models adopted by their corporations are the most appropriate and successful. Institutional investors debate the advantages of alternative performance models for screening underperforming companies in their portfolios. Finally, scholars develop performance measurement models and test the extent to which existing performance evaluation and incentive compensation systems inspire management decisions and performance itself (Rappaport, 1998).

Traditional performance measurement systems were developed at a time when decision-making was focused at the center of the organisation and responsibilities for decision-making were very clearly defined. According to Knight (1998, p. 173) 'these performance measurement systems were designed to measure accountability to confirm that people *met their budget* and followed orders'. However, during the last two decades it was widely argued (Rappaport, 1986; 1998; Stewart, 1991; 1999) that most of the performance measurement systems failed to capture and encourage a corporation's strategy, producing mostly poor information leading to wrong decisions. Knight (1998), in an attempt to explain why traditional performance measures were so misused, asserted that part of the answer lies in three myths surrounding performance

measurement, which are: growing quarterly EPS is all that matters, accounting measures tell the whole story, and that you can manage anything only with financial reporting methods. These myths are all based on the common belief that accounting is the only means of measuring performance. He then discussed the shortcomings of these three myths and suggested that value-based performance measures such as EVA® and SVA, among others, could be considered as alternative options to measure a corporation's financial performance.

Value-based management approach, based mainly on NPV techniques, FCF, and cost of capital, has as its main objective the maximisation of shareholder value. In recent years, SHV approach and VBM became particularly popular both as a decision making tool and as an incentive compensation system as well. Thus, value-based performance measures, such as EVA®, MVA, SVA, CFROI[2], EP[3], CVA, and Economic Value Management (EVM)[4] have spread all over Europe gaining acceptance by many companies.

Moreover, many shareholder value proponents such as Rappaport (1986; 1998), Stewart (1991; 1999), Stern, Stewart and Chew (1995), Ehrbar (1998), Knight (1998), and Stern (1974; 2001) have strongly criticised earnings since they fail to measure changes in the economic value of a company. Their critique was mainly based on three reasons: alternative accounting methods may be employed to calculate earnings, investment requirements are excluded from earnings calculation, and the time value for money is ignored in earnings calculation.

2.2. The EVA® Financial Management System

EVA® is considered as the centerpiece of a completely integrated financial framework for financial management and incentive compensation (Stewart, 1994; Stern, Stewart and Chew, 1995). It is a technique for value creation measurement and has been developed and trademarked by the New York consultant group Stern Stewart & Co. (Stern, 1985; Stewart 1991). Stern Stewart & Co. (established by Joel Stern and Bennett Stewart), promoted the EVA® technique not only as a simple performance measure but as an integrated Financial Management System as well, which associates

[2] CFROI and CVA has been developed by Boston Consulting Group (BCG) / HOLT Planning Associates
[3] EP has been introduced by Marakon Associates
[4] EVM has been developed by KPMG Peat Marwick

the value creation with incentive compensations (Stewart 1991; 1994; 1999; Stern, Stewart and Chew, 1995; Ehrbar 1998).

EVA® is calculated as the product of the economic book value of the capital committed to the business multiplied by the spread between the rate of return on capital, defined as *r*, and the cost of capital, defined as *c** (Stewart, 1991). Therefore, the formula for EVA® calculation becomes as follows:

$$EVA = (r - c^*) \times \text{capital} \qquad (2\text{-}1)$$

or

$$EVA = (\text{rate of return} - \text{cost of capital}) \times \text{capital} \qquad (2\text{-}2)$$

where *r* is the rate of return, and *c** is the cost of capital, or more correctly stated, the WACC.

The rate of return, *r*, is computed by dividing a company's NOPAT by the total capital employed in operations:

$$r = \frac{\text{NOPAT}}{\text{Capital}} \qquad (2\text{-}3)$$

According to Stewart (1991; 1999) the rate of return measures the productivity of capital employed without taking into consideration the method of financing, and it is free from accounting distortions that arise from accrual bookkeeping entries, from the conservative bias in accounting statements, and from the tendency to understate capital by writing off unsuccessful efforts. It may be compared directly to the company's overall cost of capital employed and therefore it is able to indicate whether value has been created or destroyed. Stern Stewart & Co. has proposed up to 164 adjustments in order to eliminate financing distortions in a company's NOPAT and Capital (Stewart, 1991; 1994; 1999).

Rearranging equation (2-1), EVA® becomes: $EVA = (r \times \text{capital}) - (c^* \times \text{capital})$ and rearranging equation (2-3), NOPAT becomes: $NOPAT = r \times \text{capital}$

Thus, replacing the $(r \times \text{capital})$ in equation (2-1) with NOPAT, EVA® becomes:

$$EVA = NOPAT - (c^* \times \text{capital}) \qquad (2\text{-}4)$$

where NOPAT is operating profits and $(c^* \times \text{capital})$ is the capital charge. Therefore, we can define EVA® as operating profits less a capital charge.

EVA® is based on accounting items such as net income, interest bearing debt and capital. Compared to the other traditional accounting measures, EVA® differs to the degree that it includes the cost of capital in its calculation. Additionally, Stewart (1991, p. 3) argued that 'algebraically EVA® produces the same results in valuation as

DCF or NPV', valuation methods that are widely accepted as the theoretically best valuation mechanisms from the shareholders' point of view (Miller and Modigliani, 1961; Stern, 1974; Gordon, 1962). DCF and NPV take into account the time value for money, use the opportunity cost of equity capital and moreover, they do not suffer from any sort of distortions caused from accounting. However, since they are alone in being based on forecasted cash flows, they do not match in performance evaluation, while EVA® seems to fit quite satisfactorily in measuring the performance (Stewart, 1999).

2.3. The Introduction of EVA® in Corporate World

In 1991, Stern Stewart & Co. revised the computation of Residual Income (RI) through a series of accounting adjustments and the result was the trademarked variant of RI, the EVA®. They recommended EVA® as a measure that could be used instead of earnings or cash from operations in order to capture both internal and external performance. Stewart (1991, p. 66) as a principal advocate of EVA® argued: 'Earnings, earnings per share and earnings growth are misleading measures of corporate performance. Earnings are diminished by bookkeeping entries that have nothing to do with recurring cash flow, and are charged with such value-building capital outlay as R&D, all in an attempt to placate lenders' desires to assess liquidation value. EPS at best measures only the quantity of earnings, but the quality of earnings reflected in the P/E matters too'.

Many other important studies contributed to the increasing interest in EVA®. For example, Peterson and Peterson (1996) and Copeland, Koller and Murrin (1996) provided details for EVA® calculation (or variations of EVA®, since Copeland refers to economic profit). O'Hanlon and Peasnell (1998) and Young (1997; 1999) discussed and explained the applicable *use* and *cost* of the potential accounting adjustments for EVA®calculation. McConville (1994), Jackson, Mauboussin and Wolf (1996), Dierks and Patel (1997), Stewart (1998), Prober (2000), Ray (2001), and Grant (2003) promoted the usefulness of EVA® as a financial reporting tool and described it as a vital measure of total factor productivity, one that reflects all the dimensions by which management can increase value. Managers of leading companies such as Coca Cola, Sprint Corporation, and Quaker Oats have also presented their encouraging aspects for the effectiveness of the EVA® financial management system. Besides, there has

been a widespread adoption of EVA® by security analysts such as Credit Suisse, First Boston's and Goldman Sachs'. They prefer this model instead of the dividend discount approach (Abate, Grant and Stewart, 2004).

What makes EVA® challenging and interesting to study, is its adoption as a performance measure and/or incentive compensation system of hundreds of companies in the US. Moreover, in recent years the EVA® concept/system crossed oceans and made sense in many other countries. EVA® figures have been largely promoted in countries such as the UK, Australia, Canada, Brazil, Germany, Mexico and France among others (Günther, Landrock and T. Muche, 2000; Worthington and West, 2001). Ehrbar (1998) refers to the adoption of EVA® by New Zealand state owned companies in order to be invigorated, while Worthington and West (2001) discuss the adoption of the EVA® financial management system by companies in Australia.

Despite all positive and encouraging comments about EVA® emphasised by its proponents, the empirical literature which came out provided mixed results for the usefulness of EVA® in explaining stock returns. Studies focused on whether EVA® is more highly associated with stock returns than other performance measures provided mixed and controversial results. For example, O'Byrne (1996), Uyemura, Kantor and Petit (1996), Milunovich and Tsuei (1996), Lehn and Makhija (1997), Herzberg (1998) and Forker and Powell (2004) provided positive results for the value relevance of EVA®. Their findings supported the Stewart's (1991; 1999) claim for the superiority of EVA® as a financial performance measure.

On the other hand, studies carried out by Peterson and Peterson (1996), Biddle, Bowen and Wallace (1997), Chen and Dodd (1997; 2001) and Turvey *et al.* (2000) did not provide encouraging results for the superiority of EVA® compared to traditional accounting performance measures such as EPS, ROI and ROE. Many other studies have been conducted examining other parameters of EVA®. Bacidore *et al.* (1997) examined an alternative option of invested capital (they used market values instead of book values to estimate the capital invested) and proposed the Refined EVA (REVA) as the proper representative of economic value added. Although their findings proved that REVA is preferable than EVA®, a study carried out by Ferguson and Leistikow (1998) proved that it does not hold. Finally, Wallace (1997) and Lovata

and Costigan (2002) examined the consequences of the adoption of the EVA® financial management system.

2.4. Adjustments in EVA® Calculation

According to Young (1997) EVA® is not bound by accounting conventions. If National accounting principles distort the measurement of operating income or capital, adjustments are made as necessary. Most of the adjustments are in the form of what Stern Stewart & Co. call 'equity equivalents'. The reasoning behind these adjustments is that when companies apply generally accepted accounting principles or National accounting principles, certain items are charged to operating income, such as R&D, goodwill, provisions, and deferred taxes, that misleadingly reduce stated capital. Unless these charges are restored to equity, capital charges will be understated. Additionally, operating income will also be mis-stated.

To define and refine its EVA® measure, Stern Stewart & Co. has identified a total of 164 performance measurement issues, including methods of addressing shortcomings in conventional accounting such as: inventory costing and valuation, seasonality, depreciation, revenue recognition, the write off of bad debts, the capitalisation and amortisation of R&D, intangibles, mandated investments in safety and environmental compliance, valuation of contingent liabilities and hedges, special issues for taxation, inflation, currency translation, etc. (Stewart, 1994). However, the number of accounting shortcomings or adjustments needed appears differently in the literature. For example Stern, Stewart and Chew (1995, p. 41) stated: 'Stern Stewart has identified over 120 shortcomings in conventional GAAP accounting'. Ehrbar (1998, p. 164) quoted 'Stern Stewart has identified more than 160 potential adjustments to GAAP and to internal accounting treatments, all of which can improve the measure of operating profits and capital', while other scholars (for instance, Young, 1999; Worthington and West, 2001) are referring to *120-150 possible adjustments*[5].

Nevertheless, because of the great number of possible adjustments, no company is intended to apply all of them (Stewart, 1994; Stern, Stewart and Chew, 1995; Ehrbar 1998). In general, they found it necessary to address only 20 to 25 key

[5] Most common adjustments are referred on: Recognising non-recurring gains and losses, R&D, deferred taxes, intangibles (goodwill), depreciation, provisions, restructuring changes and other macroeconomic conditions.

measurement issues in detail and as few as 5 to 10 key adjustments to be actually made in practice. Young (1999)[6] also observed that a figure of no more than fifteen adjustments to published accounts has progressively decreased in recent years.

Despite the large amount of possible EVA® adjustments Young (1997; 1999) suggested that companies adopting this method should limit the number of implemented adjustments to fewer than ten. Otherwise, they face the risk of making the system very complicated and costly as well. Young (1999) argued that many of the adjustments are of little importance to the company level, and some may be difficult, if not impossible, to replicate at the security level. Finally, Young (1997, p. 338) summarising the critique on the adjustment processing suggested as a rule that 'adjustments should be made only if the amounts are significant, the required information is readily available, and no finance professionals can understand them'. The last point is very important, since it is the basis for truthful communication between managers and the company's finance persons.

Although EVA® proponents are considering the adjustments as a crucial process to produce the equity equivalence and consequently the correct EVA®, a number of scholars discussed in detail their usefulness. Anderson, Bey and Waver (2004) asserted that there is no theoretical or empirical evidence that the EVA® adjustments convert *wrong* accounting numbers into *correct* estimates of value, and moreover, there is no economic theory to guide the selection of the most relevant accounting variables that will be adjusted. They also found that the impact of the primary adjustments is inconsistent from year to year and, in general, insignificant. This led them to believe that the use of EVA® as a basis for compensation or a measure of corporate wealth creation is limited. According to Chen and Dodd (1997, p. 331) this result can be supported since they argued that a company could 'implement performance measures, based on the computationally simpler RI, which will likely provide them with most of the practical benefits promised by the EVA® system'.

The EVA® calculation as proposed by Stern Stewart & Co. is not an easy process at all. However, there are only a few studies that discuss the particular difficulties in EVA® calculation. Keys, Azamhuzjaev and Mackey (2001) presented a

[6] In our days special software packages have been developed, e.g. FINANSIER from Stern Stewart and Company, that can very easily apply all proposed adjustments for the exact measurement or the refined EVA®.

critical analysis for the calculation of EVA®. They examined step-by-step EVA® calculations, and concluded that EVA® has several weaknesses, especially in calculation of NOPAT and Capital, EVA® has eight general limitations and EVA® is identical to RI, an older financial measure largely abandoned by US companies' years ago.

Concerning the weaknesses in calculation of NOPAT and capital, they were mainly focused on the proposed accounting adjustments by EVA® proponents, which they have criticised in detail. As for the general limitations they summarised them as follows: managers will have fewer choices in financing operations, risky projects will be accepted and moderate ones will be rejected, EVA® is too complex, EVA® is easy to manipulate, EVA® is a short term measure, EVA® is a single performance measure that includes no measures for quality or time, EVA® terminology is misleading, and EVA® should not be used for capital budgeting (Keys, Azamhuzjaev and Mackey, 2001).

2.5. Empirical Evidence on Value-Based Performance Measures

Stewart (1991) first provided evidence of the correlation between EVA® and MVA. Using a sample of 613 US companies over the period 1987-1988 and examining both levels and changes in EVA® and MVA, he found that there is a striking relationship between both levels of EVA® and MVA, and even more pronounced, between changes in these levels. Since the correlation between changes in EVA® and MVA was high, he suggested that adopting the goal of maximising EVA® and EVA® growth would in fact build a premium into the market value of the company.

Lehn and Makhija (1996) examined EVA® and MVA as measures of performance and as signals for strategic change. Their sample consisted of 241 US companies over the years 1987, 1988, 1992, and 1993. Firstly, they found that both EVA® and MVA correlated positively with stock returns and that this correlation was slightly better than with traditional performance measures such as ROA, ROE and ROS. Secondly, they suggested that both EVA® and MVA were effective performance measures containing information about the quality of strategic decisions and that they can serve as signals for strategic changes.

Milunovich and Tseui (1996) examined the computer service industry for the period 1990-1995. They found that MVA is more highly correlated with EVA® than

with EPS, EPS growth, ROE, FCF or FCF growth. O'Byrne (1996) challenged the suggestion of other scholars (e.g. Easton, Harris and Ohlson, 1992) that earnings, without regard to the amount of capital employed to generate those earnings are sufficient to explain differences in stock returns. He examined the association between market value and two performance measures: EVA® and NOPAT. He found that both measures had similar explanatory power when no control variables were included in the regression models, but that a modified EVA® model had greater explanatory power when indicator variables for 57 industries and the logarithm of capital for each firm were included as additional explanatory variables.

Uyemura, Kantor and Petit (1996) using ten years data (1986-1995) studied the relationship between EVA® and MVA. They also studied the relationship between MVA and four traditional performance measures: EPS, NI, ROE and ROA. They provided evidence suggesting that the correlation between MVA and those measures are: EVA® 40 per cent, ROA 13 per cent, ROE 10 per cent, NI 8 per cent and EPS 6 per cent. Lehn and Makhija (1997) also found that stock returns over a ten-year period were more highly correlated with average EVA® over the period than with the average of ROA, ROS or ROE. Moreover, Worthington and West (2001) clearly suggested the superiority of EVA® compared to earnings and other accounting performance measures in explaining stock returns.

Other scholars found that EVA® is predictive of stock returns, but it is not the only performance measure that ties directly to a stock's intrinsic value, which is one of the primary assertions of EVA® proponents (Stewart, 1991; 1999). Among others, they suggested that EVA® is not a superior measure of company's performance. Dodd and Chen (1996) and Chen and Dodd (1997) based on a ten years (1983-1992) sample of 566 US companies obtained from the 1992 Stern Stewart Performance[7] 1,000 and the Compustat database, provided important evidence concerning the implementation of EVA®.

Dodd and Chen (1996) found that stock returns and EVA® per share are correlated as advocated by EVA® adopters. However, the correlation was far from perfect. On the other hand they found that ROA explained stock returns slightly better than EVA®. Their findings also suggested that if a company wants to adopt the

[7] Stern Stewart Performance[7] 1,000 is a database containing EVA® figures produced by Stern Stewart & Company.

philosophy of EVA® as a corporate performance measure, it might want to consider using RI instead. Finally, since nearly 80 per cent of their sample's stock returns could not be explained by EVA®, they concluded that EVA® is neither the only performance measure to tie with stock returns nor a very complete one. This is consistent with other stock market research suggesting that to explain more completely the variability in stock returns, multiple determinants are required.

Chen and Dodd (1997) extended the previous research and examined the explanatory power of EPS, ROA, ROE, RI, and four EVA® related measures. Firstly, they found that improving EVA® performance is associated with higher returns. However this association is not as strong as suggested by EVA® proponents. No single EVA® measure was able to account for more than 26 per cent of the variation in stock returns. Secondly, the EVA® measures provided relatively more information than the traditional accounting measures in terms of the strength of their association to the stock returns. Moreover, the findings of this study suggested that the accounting earnings provided significant incremental explanatory power above EVA®. Thus, Chen and Dodd (1997) concluded that companies should not follow the suggestions of EVA® advocates where traditional accounting measures should be completely replaced with EVA® and suggested that along with EVA®, companies should continue monitoring the traditional measures of accounting profits such as EPS, ROA and ROE. Finally, consistent with their previous results, they found that RI provided almost identical results to EVA®, without the need of accounting adjustments advocated by Stern Stewart & Co.

Bacidore *et al.* (1997) suggested a refinement of EVA®, the REVA. REVA assesses a capital charge for a period equal to WACC times the market (rather than book) value of the company at the beginning of the period. Their sample was based on 600 companies randomly selected from the Stern Stewart Performance 1,000 database, and on accounting and financial data selected from Standard and Poor's Compustat and University of Chicago CRSP database respectively. They compared EVA® to REVA and found that although both measures were statistically related to abnormal stock returns, REVA outperformed EVA®.

Biddle, Bowen and Wallace (1997) provided the most comprehensive study of EVA's value relevance to date. They used a sample of 773 US companies from Stern Stewart & Co. database, resulting in a 6,174 year-observations over the period 1984-

1993. Using relative and incremental information content tests and constructing models based on Easton and Harris (1991) methodology found that traditional accounting measures, generally, outperformed EVA® in explaining stock returns.

Some scholars applied Biddle, Bowen and Wallace (1997) methodology into their own countries (e.g. Worthington and West, 2001) and found similar results. Worthington and West (2001), using pooled time-series, cross-sectional data on 110 Australian companies over the period 1992-1998, proved that relative information content tests reveal earnings to be more closely associated with returns than Net Cash flows (NCF), RI and EVA®. However, consistent with the construction of EVA-type measures, incremental information content tests suggested that EVA® adds more explanatory power to earnings than either NCF or RI. The pair wise combination of EVA® and earnings indicated that the explanatory power has increased by 10.26 percent, higher than any other pair wise combination.

However, other scholars (e.g. Forker and Powell, 2004; Worthington and West, 2004) using different methodologies provided totally different results than those reported by Biddle, Bowen and Wallace (1997). Worthington and West (2004) using the same sample but changing the methodology found that EVA® is more associated with stock returns than earnings. Forker and Powell (2004) also revisited Biddle, Bowen and Wallace (1997) study and provided reverse results. They showed that investors' factor of cost of capital into equity pricing and residual-based metrics, such as EVA®, are superior to traditional accounting metrics in providing a basis for investors to confirm or revise their expectations in the valuation process.

Turvey *et al.* (2000) studied the relationship between EVA® and stock market returns for a sample of 17 publicly traded food companies in Canada. The key finding was that no relationship could be found between the two. Keef and Rush (2003) examined both theoretically and empirically the link between EVA® and stock price reaction. They found the results of Turvey *et al.* (2000) as expected, but moreover, they considered the EVA® concept as an enigma. In light of the findings and the arguments of Turvey *et al.* (2000) and Keef and Rush (2003), Sparling and Turvey (2003) examined the relationship of EVA® and shareholder returns and found an extremely weak correlation.

Chen and Dodd (2001) based on the valuation models used in previous studies from Easton and Harris (1991) and Chen and Dodd (1997) examined the value

relevance of three profitability measures: OI, RI and EVA®. For a ten year period they used only those companies from 1992 Stern Stewart 1,000 database that were also available in Standard and Poor's Compustat PC Plus database with relevant data for the operating income and residual income variables. The final combined data set consisted of 6,683 observations. Relative and incremental information content tests were then conducted according to previous studies Relative information content test revealed that Operating Income (OI) outperformed RI and EVA®. This result suggested that the new information provided by EVA® is less value relevant, at least from stock returns perspective, a finding consistent with Biddle, Bowen and Wallace (1997). The incremental information content tests revealed that RI measures contain significant information that is not available in OI.

Many other studies reported the weak correlation of RI metrics with stock returns. Peterson and Peterson (1996) provided evidence that EVA® type measures do not provide much more information than stock prices. Stark and Thomas (1998) examined the UK market and concluded that the relationship between RI and market value is by no means perfect. Günther, Landrock and Muche (2000) in examining the Germany stock market, could not prove that value-based measures (EVA®, CVA, DCF and Tobin's Q) outperform traditional accounting-based measures (ROS, ROI, and ROE). Goetzmann and Garstka (1999) found that long-term survival of companies may be related to accounting earnings, and more, simple EPS does as well or better than EVA® at explaining differences across companies and at predicting future performance. Finally, Kramer and Peters (2001) also reported the weak correlation between EVA® and MVA.

As for the Greek capital market, there is almost no evidence concerning the relevance of value-based measures on performance measurement. Only Kousenidis, Negakis and Floropoulos (1998) studied the analysis of divisional profitability using the RI profile. They reported results indicating that in addition to the question of whether RI and ROI were useful in divisional performance evaluation, both measures had an important role to play as a means of approximating actual cash flow.

3. Methodology of the study

3.1. Sample and the data collection

Our sample period spans 10 years, from 1992 to 2001. There are 163 companies in the sample with different number of participating years for each of them. These

companies gave a total of 984 year-observations. After excluding the extreme observations (3 standard deviations), the final sample was reduced to that of 977 year-observations.

The research started the sample selection using daily closing prices of the common stocks, which were trading in the ASE during the period from January 1990 to April 2002, even though the investigation period spans from 1992 to 2001. They are raw prices in the sense that they do not include dividends but they are adjusted for capital splits and stock dividends. It starts from January 1990 since it needs at least two years prior trading period for each stock to incorporate it in the sample. The main reason for this was the need of 36 monthly returns for each stock in order to calculate its risk (beta) for each year. Thus, the stocks which consist the sample of 1992 have a trading presence in the ASE at least from the first month of 1990.

It also included the closing prices three months after the fiscal year end 2001 since the return period for each year spans nine months prior to three months after the fiscal year end (Easton and Harris, 1991; Biddle, Bowen and Wallace, 1997; Chen and Dodd, 2001). Except from the daily closing prices for each stock, it was also collected the daily General Index of the ASE and the three-month Government Treasury Bill rate, which is considered to be the short-term interest rate (risk free interest rate). All data was acquired directly from the ASE data bank.

From the daily closing prices of the common stocks the daily returns for each stock was calculated using the logarithmic approximation:

$$R_{i,t} = \log\left(P_{i,t} \Big/ P_{i,t-1}\right) \qquad (3\text{-}1)$$

where $R_{i,t}$ is the return of stock *i* at time *t*, while $P_{i,t}$ and $P_{i,t-1}$ are the prices of stock *i* at time *t* and *t-1* respectively.

Daily returns were aggregated to compose the monthly returns, which are the primary inputs for our investigation. Using the same procedure, the monthly returns for the General Index (GI) were also calculated. Employing the first selection criterion, all financial companies and the Banks were excluded from the sample, while employing the second selection criterion the companies with penalties or with long periods without transactions (more than two months) or with missing values were also excluded. Using the monthly returns of each stock and the monthly returns of GI, the annual betas for each stock were estimated. Finally, annually returns were calculated as the aggregation of the monthly returns, extending nine months prior to three

months after each fiscal year end. The estimation of the adopted accounting and value-based performance measures was based on the annual balance sheet and income statement of each listed company included in the sample. This information was taken from the ASE data-base.

3.2. The Model

This research is based on Easton and Harris (1991) formal valuation model, which has been used by the majority of researchers who contacted similar studies (Biddle, Bowen and Wallace, 1997; Chen and Dodd, 1997 and 2001; and Worthington and West, 2001) and which is actually the only model supported theoretically by their proponents and, up to now, according to our knowledge, remains without any sound criticism by academia. The model links stock returns to earnings levels and earnings changes as below:

$$R_{jt} = \gamma_{t0} + \gamma_{t1} A_{jt} / P_{jt-1} + \gamma_{t2} \Delta A_{jt} / P_{jt-1} + \varepsilon^3_{jt} \qquad (3\text{-}2)$$

Where R_{jt} is the return on a share of firm j over the 12 months, extending from 9 months prior to fiscal year-end to 3 months after the fiscal year-end, A_{jt} is the accounting earnings per share of firm j for period t, ΔA_{jt} is the earnings change, and P_{jt-1} is the price per share of firm j at time $t-1$.

Both relative and incremental information content approaches were employed to answer the two research questions under examination. The relative information content approach is used to explore the first research question, while the incremental information content approach is employed to answer the second one.

To explore the first research question four equations (variations) were developed based on Easton and Harris (1991) adopted model. Analytically, the earnings and earnings' change variables were replaced with each of the performance measures under examination. Thus, the following equations were finally developed:

Equation (1): $Returns = a_0 + a_1 EPS/P_{t-1} + a_2 \Delta EPS/P_{t-1} + u_1$

Equation (2): $Returns = b_0 + b_1 ROI + b_2 \Delta ROI + u_2$

Equation (3): $Returns = c_0 + c_1 ROE + c_2 \Delta ROE + u_3$

Equation (4): $Returns = d_0 + d_1 EVA/P_{t-1} + d_2 \Delta EVA/P_{t-1} + u_4$

Where, for all equations:

Returns are the annual compounded returns extending nine months prior to current fiscal year end to three months after the current fiscal year end

EPS is the earnings per share of firm at time *t*, ΔEPS is the change in earnings per share over period *t-1* to *t*, P_{t-1} is the market value per share at the first trading day of the ninth month prior to fiscal year end, ROI is the return on investment of firm at time *t*, ΔROI is the change in ROI over period *t-1* to *t*, ROE is the return on equity of firm at time *t*, ΔROE is the change in ROE over period *t-1* to *t*, EVA is the economic value added of firm at time *t*, ΔEVA is the change in EVA over period *t-1* to *t* and

Through this approach (the relative information content approach), the study will investigate which one of the performance measures under examination is superior in terms of association with stock returns in the Greek capital market. The equations will be estimated cross-sectionally by years as well as using pooled cross-sectional and intertemporal data (Easton and Harris, 1991; Chen and Dodd, 2001; Worthington and West, 2001). This design facilitates the use of testing procedures that are common in the information content literature and, therefore, will ease the comparison of the present study with those in the literature. In order to reveal the explanatory power of the variables under examination, the coefficients' significance, F-statistics, and R^2s will be examined.

To explore the second research question the incremental information content tests will be employed (Chen and Dodd, 2001; Worthington and West, 2001). The purpose of these tests is to examine whether one measure adds information to that provided by another measure. The coefficient of determination, $R^2_{p/q}$, denotes the increase in R^2 due to variable *p*, conditional on variable *q*, and $R^2_{p.q}$ denotes the R^2 due to both variables *p* and *q* (Cheng, Cheung and Gopalakrishnan, 1993). Pooled time-series cross sectional data (all years) will be employed to reveal the information usefulness of each regression model. For this purpose the Easton and Harris (1991) model was extended incorporating the combination of one traditional and one value-based performance measure. The new equations (variations) that have been developed to explore the incremental information content of the pairwise combination of these measures are three (equations 5-7):

Equation (5) : $Returns_t = l_0 + a_1 EPS/P_{t-1} + a_2 \Delta EPS/P_{t-1} + d_1 EVA/P_{t-1} + d_2 \Delta EVA/P_{t-1} + u_{5t}$

Equation (6) : $Returns_t = n_0 + b_1 ROI + b_2 \Delta ROI + d_1 EVA/P_{t-1} + d_2 \Delta EVA/P_{t-1} + u_{6t}$

Equation (7) : $Returns_t = p_0 + c_1 ROE + c_2 \Delta ROE + d_1 EVA/P_{t-1} + d_2 \Delta EVA/P_{t-1} + u_{7t}$

4. Results

4.1. Relative information content approach

Relative information content is assessed by comparing R^2s from four separate regressions (1 to 4), one for each performance measure, EPS, ROI, ROE and EVA. R^2s from these regressions are provided in Table 1. The higher R^2 is shown on the left and the lowest is shown on the right.

Following the Easton and Harris (1991) and Chen and Dodd (2001) methodology, the model was estimated using both the pooled cross-sectional and intertemporal (all years) sample and the individual year cross-sectional sample.

Table 1: Summary (all years) results from the five (1-4) regressions

	Regression (1)	**Regression (4)**	**Regression (2)**	**Regression (3)**
All Years	**EPS**	**EVA**	**ROI**	**ROE**
R^2	**0.019**	**0.009**	**0.004**	**0.000**
F	(9.577)***	(4.546)***	(2.781)*	(0.005)
Significance	0.000	0.01	0.062	0.995

* significance at 10% level, ** significance at 5% level, *** significance at 1% level

Firstly, there is a significant difference between the four regressions in the relative information content tests. Regressions (1) and (4) are significant at 0.01 level, regression (2) is significant at 0.1 level, while regression (3) is not statistically significant. Secondly, comparing the reported R^2s of the four pooled regressions, it is noticed that all are largely consistent to those of Biddle, Bowen and Wallace (1997), Worthington and West (2001), and Chen and Dodd (2001).

The results of the present study show that EPS (R^2 = 1.9 per cent) provide more information in explaining stock returns than EVA® (R^2 = 0.9 per cent). Biddle, Bowen and Wallace (1997) found that Earnings Before Extraordinary Items-EBEI with an R^2 = 9.0 per cent provides more information than Residual Income-RI (R^2 = 6.2 per cent), and EVA® (R^2 = 5.0 per cent). Worthington and West (2001) also found similar results: EBEI (R^2 = 23.6 per cent), RI (R^2 = 19.2 per cent) and EVA® (R^2 = 14.3 per cent), while Chen and Dodd (2001) reported that Operating Income-OI with an R^2 = 6.2 per cent explains the stock returns better than RI (R^2 = 5.0 per cent) and EVA® (R^2 = 2.3 per cent). The results of this research suggest that for the Greek capital market, the new information provided by the EVA®measure is less value relevant than EPS, at least from a stock return perspective. Examining separately each of the four regressions (1 to 4) and using the individual year cross-sectional sample,

results are largely consistent with those reported for the pooled cross-sectional and intertemporal (all years) sample.

4.2. Incremental information content approach

To test the incremental information power, each traditional performance measure (EPS, ROI and ROE) is combined pairwise with EVA® forming three different equations (5 to 7). An assumption of a linear relationship between these variables was made. All regression models were tested for multicollinearity using the variance inflation factor (VIF). According to Neter, Wasserman and Kunter (1985) a VIF in excess of 10 is often taken as an indicator of severe multicollinearity, while mild multicollinearity exists when the VIF is between 5 and 10. A VIF lower than 5 indicates that multicollinearity does not exist. The reported VIF from our regressions are mostly less than 5. Examination of residual plot and normality plot reveal no serious violations of the regressions' assumptions. There was an attempt to correct these minor violations, but the outcome was either produced regressions with insignificant coefficients or regressions with similar explanatory power to the initial ones.

Table 2 shows the detailed results from the pairwise combinations of one traditional performance measure and the EVA®. It is noticed that regressions (5), (6) and (7) are significant at 0.05 level or better. The highest R^2 (7.2 per cent) is reported in regression (5), which combines EPS, ΔEPS and EVA®, ΔEVA. The contribution of the EPS in the explanatory power of this regression is higher than that of EVA®, since the R^2 of EPS alone is 1.9 per cent (regression 1, table 1) while that of EVA® alone is 0.9 per cent (regression 4, table 1).

This suggests that the combination of EPS and EVA® represents the most satisfactory explanation for stock returns in the Greek stock market. Chen and Dodd (1997; 2001) and Worthington and West (2001) revealed almost similar results for the US and Australian capital markets respectively. They found that EVA® is a useful measure for measuring the financial corporate performance, especially when it is combined with EPS. All other examined models have reported low R^2s (lower than 2.1 per cent). SVA has been also examined providing relatively weak results in explaining stock returns.

Table 2: Incremental information content approach – Pairwise combinations

Incremental / One Traditional Measure + One Value-Based Measure (EVA®)

Regression	ALL YEARS	CONST	EPS	Δ EPS	ROI	Δ ROI	ROE	Δ ROE	EVA	Δ EVA	R^2	F	No of Obs
5	coef.	-0.0249	0.2580	0.0056					-0.1570	0.0001	**0.072**		976
	t	(-1.073)	(7.772)***	(2.464)**					(-7.355)***	(0.405)		(18.761)***	
	sign	0.283	0.000	0.014					0.000	0.686		0.000	
	VIF		1.834	1.004					1.824	1.006			
6	coef.	0.0281			0.0630	0.0032			-0.0680	0.0003	**0.021**		976
	t	(1.243)			(2.195)**	(2.173)**			(-3.730)***	(1.000)		(5.141)***	
	sign	0.214			0.028	0.030			0.000	0.317		0.000	
	VIF				1.293	1.025			1.267	1.000			
7	coef.	0.0420					0.0001	0.0009	-0.0528	0.0003	**0.011**		976
	t	(1.869)*					(0.027)	(1.027)	(-3.072)***	(0.977)		(2.599)**	
	sign	0.062					0.979	0.305	0.002	0.319		0.035	
	VIF						1.002	1.113	1.115	1.001			

Significance at 10% level, ** significance at 5% level, *** significance at 1% level.

5. Summary / Conclusions

Relative information content approach revealed that in the Greek stock market earnings levels and earnings changes are associated with stock returns and outperform all other performance measures under examination (ROI, ROE and EVA®) in explaining stock returns. These results are consistent to those reported for various international markets. Easton and Harris (1991), for example, found that earnings levels and earnings changes are associated with stock returns for the US market. Also, Biddle, Bowen and Wallace (1997) and Chen and Dodd (2001) found that earnings outperform EVA® and residual income in the US stock market. Günther, Landrock and Muche (2000) and Worthington and West (2001) revealed similar results for the Germany and Australian stock markets respectively. On the other hand, the results of the present study do not support the claims of Stewart (1991) and the advocates of EVA® financial system that EVA® alone is the best performance measure.

On the other hand, incremental information content approach provided further interesting results. When EVA® is incorporated in an EPS model its explanatory power increases from 1.9 to 7.2 per cent. This suggests that the new information provided by the EVA® is of some value relevance in explaining stock returns. The relative low explanatory power of performance measures under examination is, in large, consistent with the reported results of several relevant studies conducted for the US market. Chen and Dodd (1997) found that EVA® variables and accounting profit variables could not explain more than 47 per cent of the variation of stock returns. Moreover, a recent study of Chen and Dodd (2001) provided evidences that EPS and EVA® could not explain more than 23.49 per cent of stock returns. These results support the claims of many scholars that more determinants should be employed to assess the value of the firm. This evidence suggests that the participants in the Greek Stock market should pay additional attention to that relatively new value-based performance measure.

This study can be further extended in examining the incremental information content not only of the pairwise combinations but also from combinations incorporating more than one traditional or value-based performance measure. The examination of EVA® adopters should also provide interesting results. Another important suggestion for further research is to explore the value relevance of other factors beyond the above examined performance measures in explaining stock returns.

Behavioural finance provides a good ground for this. Moreover, comparative studies within stock markets with similar market characteristics as these of Greece should add value to this kind of research.

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