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A Review of the Empirical Literature on Earnings and Economic Value Added (EVA®) in Explaining Stock Market Returns. Which Performance Measure is More Value Relevant in the Athens Stock Exchange (ASE)?

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Abstract

The aim of this study is (a) to present the empirical research to date on earnings and EVA® and (b) to provide a comprehensive analysis and interpretation of the value relevance of them in explaining stock returns in the ASE. To achieve it, the relevant literature was studied and publicly available financial data of the listed companies in the ASE during 1992-2001 was collected and analysed. Earnings per Share (EPS) is a financial performance measure traditionally used by companies and analysts, while EVA® is a representative measure of modern value-based performance measurement. It is defined as net operating profit after taxes less the capital employed for this operation (a capital charge).

EVA® has been introduced in the corporate world as the only integrated financial management system that 'drives stock prices' (Stewart 1991; 1999; Stern, Stewart and Chew, 1995). However, results from the empirical research to date are not consistent to this assertion. This study is stimulated by both the value-based performance measures proponents' assertions and by the mixed empirical results for its value relevance reported until now. Pooled time-series, cross sectional data of listed companies in the ASE over the period 1992 – 2001 have been employed to examine whether EVA® or earnings 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® while incremental information content tests suggest that EVA® adds considerable explanatory power to earnings per share.

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

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1. Introduction

Traditional accounting performance measures, such as Earnings per Share (EPS), Earnings on Invested Capital (EOIC), Return on Investment (ROI), Return on Assets (ROA) and Return on Equity (ROE), appeared in the late 1910s (Epstein, 1925; 1930; Sloan 1929). Since then, they have been used in various forms to measure the financial performance of corporations.

Fisher (1930) and Hirschleifer (1958) introduced the discounted cash flow techniques, such as Net Present Value (NPV) and the Internal Rate of Return (IRR). Miller and Modigliani (1958; 1961) suggested a more consistent determination of valuation. Gordon (1962) incorporated growth and the cost of capital in valuation models. In order to determine the cost of capital, Sharpe (1964), Lintner (1965), Mossin (1966), and Black (1972) developed the Capital Asset Pricing Model (CAPM).

Solomons (1965) introduced the divisional performance and the adaptation of Residual Income (RI), while Tobin (1969) suggested the Tobin's Q as the proper valuation method. Stern (1974), motivated by Miller and Modigliani conclusions, worked on Free Cash Flows (FCF), and lastly Rappaport (1986) and Stewart (1991; 1999) developed a new concept known as the Shareholder Value (SHV) approach. Modern value-based performance measures gained their popularity since the late 1980s, 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).

Several studies have been conducted in the last two decades in the international market community to answer questions such as: *(a) whether it is really better to use modern value-based measures than traditional accounting performance measures to measure the corporate financial performance, or (b) which performance measure best explains corporations' change in market value.* Results are quite mixed and controversial. This study is inspired by the controversial results of the previous research 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 and ROI, and from the modern value-based performance measures, we selected the EVA®.

The objective of this study is to provide an explanation on the utilisation of earnings and EVA® in the ASE. The study interprets results obtained from an analysis carried out on the basis of secondary financial data relating to the period 1992-2001. The rest of the paper is as follows: Section two presents a summary of the literature review, section three describes the methodology followed, section four presents the analysis and the results, and section five concludes the paper.

2. Literature Review

Performance measurement systems were developed as a means of monitoring and maintaining organisational control, which is the process of ensuring that an organisation aims at strategies that lead to the achievement of its overall goals and objectives. Performance measures, the key tools for performance measurement systems, play a vital role in every organisation as they are often viewed as forward-looking indicators that assist management to predict a company's economic performance and many times reveal the need for possible changes in operations (Nanni, Dixon and Vollmann 1990; Otley, 1999; Simons, 1999).

However, the choice of performance measures is one of the most critical challenges facing organisations (Ittner and Larcker, 1998; 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). Performance measures may be characterised as financial and non-financial.

This study has tended to restrict itself to looking only at financial performance measures, such as earnings and EVA®.

The perceived inadequacies in traditional accounting performance measures have motivated a variety of measurement innovations such as the *economic value* measures (Ittner and Larcker, 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 (see: 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.

VBM 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[1], EP[2], CVA, and Economic Value Management (EVM)[3] have spread all over Europe gaining acceptance by many companies.

2.1. Empirical Evidence on Earnings

Kothari (2001) underlined that research into the relationship between capital markets and financial statements has its origin in the publication of Ball and Brown (1968) where they first examined the relationship between earnings and stock prices. Since then many other publications have contributed to the field demonstrating a positive relationship between earnings and stock returns (Beaver, 1968; Easton and Zmijewski, 1989; Easton and Harris, 1991; Easton, Harris and Ohlson, 1992; Ohlson 1991; Ball, Kothari and Watts, 1993) for the US market. In the light of the previous studies a large amount of relevant research reported evidence for this relationship for the international markets.

Using different methodologies, a considerable number of studies have been conducted investigating the relationship between accounting earnings and stock returns. To refer to some: Ball, Kothari and Watts (1993) using annual earnings and return data from 1950 to 1988 for the US market, documented that changes in earnings have systematic economic determinants that are likely to be associated with variation in securities' expected returns, particularly since earnings is the accounting ROE. Cheng, Cheung and Copalakrishnan (1993) evaluated the usefulness of operating income (OI), net income (NI) and comprehensive income (CI). They measured the usefulness in terms of relative information content and incremental information content. Based on a sample that averaged 922 firms a year for 18 years, they found that OI weakly dominated NI, and that both OI and NI dominated CI in information content.

Booth, Broussard and Loistl (1997) focused on the German market investigated the relationship between stock returns, earnings, and a variant of earnings called DVFA[4]. They concluded that both types of earnings were associated with stock returns with

[1] CFROI and CVA has been developed by Boston Consulting Group (BCG) / HOLT Planning Associates
[2] EP has been introduced by Marakon Associates
[3] EVM has been developed by KPMG Peat Marwick
[4] DVFA earnings are a metric jointly constructed by the Deutscher Vereinigung für Finanzanalyse und Anlageberatung [German Association for Financial Analysis and Investment Advisor]

the latter being more significant. Vafeas, Trigeorgis and Georgiou (1998) provided evidence for the Cyprus stock market and suggested that earnings levels as well as changes in earnings are important in explaining stock returns in an emerging stock market. King and Langli (1998) examined accounting figures across Germany, Norway and the UK. They found, among others, that accounting book value and EPS were significantly related to current stock prices across all three countries with Germany scoring the lowest relation and UK reaching the highest one.

Cheung, Kim and Lee (1999) examined the impact of ownership characteristics on return-earnings association in Japan. They found that this association is positively affected by the extent to which a company's shares are owned by foreign investors. They also provided evidence that reported earnings were less value relevant in Japan than in the US. Graham and King (2000) examined the relationship between stock prices and accounting earnings and book values in six Asian countries: Indonesia, South Korea, Malaysia, the Philippines, Taiwan, and Thailand. They found differences across the six countries in the explanatory power of book values per share and residual earnings per share for firm values. Explanatory power for Korea and the Philippines was relatively high while that for Taiwan and Malaysia was relatively low. They also provided evidence suggesting that in all six countries residual earnings per share has less explanatory power than book value per share in most years.

Chen, Chen and Su (2001) provided an empirical examination of whether domestic investors in the Chinese stock market perceive accounting information based on Chinese GAAP to be value relevant. Using data from the Shanghai and Shenzhen Stock Exchanges from 1991 to 1998, and based on return and a price model, they provided evidence that accounting information is of value relevance according to both the pooled cross-section and time series regressions or year-by-year regressions.

Jindrichovska (2001) reported a statistically significant relationship between returns and accounting data for the developed Czech stock market, supporting the evidence from previous studies such as Kothari and Zimmerman (1995) that stock prices lead earnings. Jarmalaite (2002) examined the relationship between accounting numbers and returns in the Baltic stock markets. The stock markets of three countries were investigated: Lithuania, Latvia, and Estonia. Evidence from this study suggested that the association between returns and earnings differs substantially among the three countries. Estonia shows the highest value relevance while Lithuania shows the lowest. The association in Latvia seems to be very similar to Estonia but it has high standard errors making the results less acceptable. Jermakowicz and Gornik-Tomaszewski (1998) studied the association between accounting earnings and stock market returns in the emerging stock market of Poland. They also found a significant association between accounting earnings and stock market returns.

Chen and Zhang (2003) relied on prior studies that were focused on earnings (earnings levels and earnings change) to explain returns and developed a theoretical model to explain how balance sheet information can be introduced into a return model to supplement earnings information. They modelled earnings as a product of two underlying factors, capital base and profitability and showed that returns are more appropriately viewed as a function of profitability change and capital base change (capital investment), rather than a function of earnings change. Using a sample for the period 1966 to 2001, they found results consistent with their proposed theoretical model. Their main finding was that capital investment is an additionally important variable in explaining returns beyond earnings levels and profitability change (or earning change) and leads to a significant improvement of the model's explanatory power.

As far as Greece is concerned, Niarchos and Georgakopoulos (1986) provided evidence that the prices in the ASE respond very slowly to new information and concluded that the Greek stock market is not efficient. Kayha, Meggina and Theodossiou (1993) found that earnings growth rates were highly associated to future profitability and documented that earnings possessed an information content that explained unexpected changes in Greek stock prices. Ballas (1999) investigated the information content of the components of a clean surplus definition of income with respect to stock prices and found a significant association between OI and market values. Diacogiannis, Glezakos and Segredakis (1998) examined the effect of the P/E ratio and the Dividend Yield (DY) on expected returns of the common stocks in ASE during 1990-1995. They provided evidence suggesting that P/E ratio is a statistically significant variable in explaining the cross-section variation of expected returns. The explanatory power of DY reported rather weak. Karanikas (2000), provided evidence on the role of size, book-to-market ratio and dividend yields on average stock returns in the ASE for the period 1991-1997. He reported a statistically significant positive relationship between the book-to-market ratio (B/M), DY and average stock returns.

Kousenidis, Negakis and Floropoulos (2000), examined the size and B/M factors in the relationship between average stock returns and the average book returns for the ASE. They provided evidence suggesting that ROI is associated to stock returns especially when portfolios are formed based on B/M ratio. Kousenidis (2005) examined the association between stock returns and accounting earnings for a sample of Greek firms listed on the ASE over the period from 01/1992 to 12/1999. In particular, he expanded on the Easton and Harris (1991) model and tested whether deflated earnings and deflated changes in earnings contain information for contemporaneous stock returns. Moreover, he tested the hypothesis that the addition of further explanatory variables in the model, which account for size and for life-cycle stages, improves the information content of earnings for stock returns. He proved that (a) the explanatory power of earnings for contemporaneous stock returns is very poor, and (b) improved information content is reported when the regressions are adjusted to account for size, supporting the hypothesis that firm-size is a strong factor in explaining the returns/earnings relation. However, the results are unable to sustain the hypothesis that the information content of earnings for stock returns differentiates according to the stage of the firm's life-cycle. Finally, Theriou *et al.* (2005) provided evidence on the role of size and B/M ratio on average stock returns in the ASE for the period 1993-2001. They reported a statistically significant positive relationship between size and average stock returns.

2.2. Empirical Evidence on Value-Based Performance Measures

The overall results of the value relevance literature suggest that accounting-based information can potentially influence stock prices. The empirical literature also claims that earnings generally dominate most other measures in explaining stock returns. However, the more recent literature (Stewart, 1991; 1999; Stern, Stewart and Chew, 1995; Rappaport, 1981; 1986; 1998; Grant, 2003; Abate, Grant and Stewart, 2004) suggested that earnings should not be relied upon, since they have little direct relationship to wealth creation. Thus, research into information content of other variables such as cash flows, has increased largely for two reasons: the apparent limitations in earnings numbers, and the increased need and demand for analysts and investors to correctly identify the value of the companies.

However, while traditional accounting performance measures are popular measures for financial performance measurement, they are often under severe critique since they do not take into consideration the cost of capital and moreover, they are influenced by accrual based accounting conventions. On the other hand, modern value- based measures are promoted as the measures of a company's real profitability. Since value became of primary concern to investors, proponents of value based measures claim that those measures are the only performance measures tied directly to stock's intrinsic value (Stewart, 1991; 1999; Grant, 2003). Especially, EVA® proponents have argued that EVA® and stock prices appear to have a trend to move together. Moreover, they have asserted the superiority of information contained in EVA® when it is compared to traditional accounting figures. Those claims have been empirically tested by many scholars but with contradictory and mixed results. The most important of those studies are reported here.

Stewart (1991) found strong 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 provided evidence of 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) using a sample consisted of 241 US companies over the years 1987, 1988, 1992, and 1993, examined EVA® and MVA as measures of performance and as signals for strategic change. They found that (a) both EVA® and MVA correlated positively with stock returns and that this correlation was slightly better than with traditional performance measures and (b) 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) 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 studied the association between market value and two performance measures: EVA® and NOPAT. He showed 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. However, since O'Byrne (1996) did not make similar adjustments to the NOPAT model, it was impossible to compare results using the different measures.

Uyemura, Kantor and Petit (1996) studied the relationship between EVA® and MVA over the period 1986-1995. 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. Bao and Bao (1998) examined the usefulness of value added and abnormal economic earnings of 166 US companies. They found that value added is a significant explanatory factor in stock returns, and more, its explanatory power is higher than that of earnings. Riahi-Belkaoui (1993), Riahi-Belkaoui and Fekrat (1994), Riahi-Belkaoui and Picur (1994), Karpik and Riahi-Belkaoui (1994) and Worthington and West (2001) clearly suggested the superiority of EVA® compared to earnings and other accounting performance measures in explaining stock returns.

Several 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[5] 1,000 and the Compustat database, provided important evidence concerning the implementation of EVA®. Negakis (2006a) examining the relationship between Market Values (MV), Book Values (BV), Net Income (NI), Residual Income (RI), and Research and Development (RD) expenses in the US context found that RI has a stronger association with Market Values, while examining newly listed US firms for the period 2000-2004 he did not support the previous findings (Negakis, 2006b).

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 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, they 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

[5] Stern Stewart Performance[5] 1,000 is a database containing EVA® figures produced by Stern Stewart & Company.

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, they examined the power of accounting measures (earnings and operating profits) in explaining stock market returns, in direct comparison with EVA® and five components of EVA® (CFO, operating accruals, ATIntEx, capital charge, and accounting adjustments). In contrast to studies supporting the superiority of EVA®, they found that traditional accounting measures, generally, outperformed EVA® in explaining stock returns. They also found that capital charges and adjustments for accounting 'distortions' had some incremental explanatory power over traditional accounting measures, but the contribution from these variables was not economically significant.

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 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.

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, using Shiller (1981) methodology 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.

Kramer and Pushner (1997) evaluated EVA® and NOPAT as explanatory determinants of MVA and found that market value was better explained by NOPAT than EVA® under several scenarios. De Villiers (1997) studied the inability of EVA® to explain at least as much variation in stock returns as traditional accounting earnings and proposed a variant called AEVA[6]. De Villiers and Auret (1998) found that EPS had more explanatory power than EVA® in explaining stock prices in South Africa over the period 1977-1995.

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

[6] AEVA is in fact an adjusted EVA variant to inflation. AEVA is calculated by firstly restating the capital base in current values, then determining the asset structure of the company and finally calculating the required accounting return. As a final step, the product of required accounting return and current value of capital is subtracted from NOPAT.

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 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. Thus including both the cost of debt and equity in a profitability measure seems to be a promising practise in terms of increasing value relevance.

While their results support the incremental information value of EVA® in addition to RI and OI, the reported increase of the explanatory power is marginal from a practical point of view. Thus, Chen and Dodd (2001) concluded that since RI and EVA provide almost the same results and since they differ only in the Stern Stewart adjustments, companies should implement the less costly RI measure. Finally, the fact that only 10 per cent could be explained by accounting-based information, led Chen and Dodd (2001) to conclude that the remaining 90 per cent of the variation in stock returns is attributable to the other non earnings based information. Therefore, if a company intends to align organisational measures with stock returns, an alternative measure other than EVA® should be employed.

Clinton and Chen (1998) obtained similar results. Finally, Copeland (2002) provided evidence that earnings, EPS growth, EVA®, and EVA® growth are all uncorrelated with total shareholder returns (TSR). This prompted Copeland (2002) to investigate the correlation between TSR and the difference between expected and actual performance, called 'Expectation-based Management' (EBM). Since he found a significant correlation, he suggested the EBM as a better tool for performance measurement.

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

3.1. Sample and the data collection

Our sample period spans from 1992 to 2001. There are 167 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.

We 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, although Fama and McBeth (1973) used 60 monthly returns for this calculation. Thus, the stocks, that comprise the sample of 1992, have a trading presence in the ASE at least from the first month of 1990.

We also included in the sample 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 (Benninga, 2001):

$$R_{i,t} = \log\left(P_{i,t} / P_{i,t-1} \right) \quad (2)$$

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 earnings and EVA® was based on the annual financial statements of each listed company included in the sample. This information was mainly taken from the ASE data base. In some cases, where balance sheet or income statement information was unavailable, we collected them either from the ICAP, a private Greek data branch, or through direct contact with the concerned firms. Thus, the sample of the 984 year observations was developed.

3.2. Variables' Definitions and Calculations

To calculate the variables of our sample we used two sources of data. Firstly, we used the processed data from the developed database. This database contains: the stock returns, the market returns, the annual risk factor (beta) for each company, and the risk free rate. We have also used the stock prices, nine months prior to fiscal year end, in order to use them as the deflator factor to decrease heteroscedasticity in the data (Biddle, Bowen and Wallace, 1997; Kousenidis, 2005). Secondly, in order to calculate our independent variables, we developed a calculation framework, where, after inserting the appropriate financial data, all relevant variables were automatically calculated.

The independent variables of our models are: EPS, ΔEPS, ROI, ΔROI, EVA®, and ΔEVA. As far as the estimation of each variable is concerned we have come up with the following information: EPS is the most widely used ratio. It tells how much profit was generated on per share basis. It is calculated by dividing net income (less preferred dividends) to the average number of common shares outstanding (White, Sondhi and Fried, 2003; Williams *et al.* 2003). Balance sheet and income statement information are needed for this calculation. Using our calculation framework we produced the yearly EPS for each company included in our sample (we divide net operating profit before taxes by the average of the number of shares outstanding). By itself, EPS does not really convey much information. However, if it is compared to the EPS from the previous quarters or year it indicates the pace of a company's earnings growing, on a per share basis. For the purpose of our study we calculate the

ΔEPS by dividing EPS_t of the current year with EPS_{t-1} of the previous year (EPS_t/EPS_{t-1}). Using the calculation framework we produce the yearly ΔEPS for each company included in our sample. In the literature and in the empirical studies, change in EPS can be also calculated as the quotient of the difference between the two observations divided by that of the previous year ($(EPS_t-EPS_{t-1})/EPS_{t-1}$), but since they produce the same result we adopt the first approach.

ROI or ROA indicate what return a company is generating on its investments/assets. ROI is mostly used as a performance measure for autonomous strategic business units (SBU's), not for the whole company. It is calculated by dividing the net income plus interest expenses with average total assets. In our calculation framework we calculated ROI by dividing the NOPAT with the average total assets. For this calculation, balance sheet and income statement information is needed. ΔROI is also an important ratio for companies. It shows the ROI growth quarterly or from year to year. To calculate ΔROI we adopt the similar approach we used to calculate ΔEPS. We divide the current ROI_t by the ROI_{t-1} of the previous year (ROI_t/ROI_{t-1}).

EVA® attempts to capture the true economic profit of a company. All previous studies examining the value relevance of EVA® in international markets obtained the EVA® figures directly from the Stern Stewart & Co database. That means EVA® was calculated according to the adjustments proposed by Stewart (1991; 1999). However, since there are no available EVA® figures for the Greek listed companies in the ASE, we were required to calculate EVA® adopting the Stern Stewart's EVA® formula

$$\text{EVA}^{®} = \text{NOPAT} - (c^{*} \times \text{capital}) \qquad (3)$$

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

The adjustments we made were in terms of NOPAT and invested capital (for adjustments see: Stern, Stewart and Chew, 1995; Young, 1997; 1999; Young and O'Byrne, 2001; and Keys, Azamhuzjaev and Mackey, 2001). To calculate EVA® we need balance sheet and income statement information. After revealing the relevant information, we first calculated the adjusted NOPAT where we mainly added back amortisation and subtracted tax benefit on interest expenses as follows:

Operating Profit = EBIT + Amortisation

Cash Operating Taxes = Tax Paid + Tax Benefit on interest expenses

NOPAT = Operating Profit - Cash Operating Taxes

Then, we calculated the total capital invested and the weighted average cost of capital (WACC). To calculate the total capital invested, we needed the total equity capital and the total outstanding debt. Total equity capital can be found on the liability side of the balance sheet (we add minority interest and accumulated Goodwill amortisation), while the total outstanding debt is the sum of short-term and long-term debt, which can also be found on the liability side of the balance sheet. Thus the adjusted invested capital was calculated as follows:

Capital Invested = Capital + Minority interest + Accumulated Goodwill amortisation + S/T and L/T Debt

After the calculation of the total capital invested, we calculated the WACC relying on the formula:

$$c^* = \left(\text{cost of equity} \times \frac{\text{Equity}}{\text{Equity} + \text{Debt}}\right) + \left(\text{cost of debt} \times \frac{\text{Debt}}{\text{Equity} + \text{Debt}}\right) \times (1 - \text{Tax rate}) \quad (4)$$

Except for the total equity capital, and the short and long term debt we needed to know the cost of equity and the cost of short-term and long-term debt. The cost of short-term and long-term debt (interest rates) was obtained from the annual report of the Board of Directors of the Central Bank, while the cost of equity was calculated using the CAPM model. To calculate the cost of equity, we needed the risk free rate, the beta coefficient and the market return. The values of all those variables were provided in our database thus we just imported them into the calculation framework. Change in EVA® was also calculated since according to Stewart (1991; 1999), Stern, Stewart and Chew (1995) and Rappaport (1998) it is the change in EVA® that companies should maximise instead of the absolute EVA®. Change in EVA® was calculated using the similar procedure as change in EPS, and change in ROI. Namely, we divided the current EVA® to that of the previous year (EVA_t/EVA_{t-1}).

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; Worthington and West, 2001; Kousenidis, 2005; and Negakis, 2005; 2006a; 2006b) 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:

The levels model: $R_{jt} = \alpha_{t0} + \alpha_{t1} A_{jt}/P_{jt-1} + \varepsilon^{1}_{jt}$ (5-1)

The changes model: $R_{jt} = \varphi_{t0} + \varphi_{t1} \Delta A_{jt}/P_{jt-1} + \varepsilon^{2}_{jt}$ (5-2)

The model that combines both levels and changes perspectives:

$$R_{jt} = \gamma_{t0} + \gamma_{t1} A_{jt} / P_{jt-1} + \gamma_{t2} \Delta A_{jt}/P_{jt-1} + \varepsilon^{3}_{jt} \quad (5\text{-}3)$$

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 $t\text{-}1$. All models are demonstrated here as they have been developed and presented by Easton and Harris (1991, p. 25 and p. 29).

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 (each performance measure separately), while the incremental information content approach is employed to answer the second one (combination of two performance measures).

To explore the first research question three 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): $Ret = a_0 + a_1\, EPS/P_{t-1} + a_2\, \Delta EPS/P_{t-1} + u_1$

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

Equation (3): $Ret = c_0 + c_1\, EVA/P_{t-1} + c_2\, \Delta EVA/P_{t-1} + u_3$

Where, for all equations:

Ret 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*

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; Kousenidis, 2005). 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 (Cheng, Cheung and Gopalakrishnan, 1993; Biddle, Bowen and Wallace, 1995; Chen and Dodd, 2001; Worthington and West, 2001; Francis, Schipper and Vincent, 2003; Kousenidis, 2005; Negakis, 2005). 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 pair-wise combination of these measures are two (equations 4 and 5):

Equation (4): $Ret_t = m_0 + a_1\, EPS/P_{t-1} + a_2\, \Delta EPS/P_{t-1} + d_1\, EVA/P_{t-1} + d_2\, \Delta EVA/P_{t-1} + u_{4t}$

Equation (5): $Ret_t = n_0 + b_1\, ROI + b_2\, \Delta ROI + d_1\, EVA/P_{t-1} + d_2\, \Delta EVA/P_{t-1} + u_{5t}$

4. Results

4.1. Relative information content approach

Relative information content is assessed by comparing R^2s from three separate regressions (1 to 3), one for each performance measure: EPS, ROI, and EVA. 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.

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.

Table 1: *Summary (all years) results from the three (1-3) regressions*

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

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

Firstly, there is a significant difference between the three regressions in the relative information content tests. Regressions (1) and (3) are significant at 0.01 level, regression (2) is significant at 0.1 level. Secondly, comparing the reported R^2s of the three 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).

Examining the results from each measure under examination (for each year) we have the following tables:

Table 2: *A. Relative Information Content Approach*

Regressions of Annual Stock Returns to Earnings Levels and Earnings Changes

Model (1): $Ret_t = a_0 + a_1 EPS/P_{t-1} + a_2 \Delta EPS/P_{t-1} + u_{1t}$

All Years	a_0	a_1	a_2	R^2	F	No of Obs.
Coef.	0.0441	0.0950	0.0058	**0.019**		977
t	(2.003)**	(3.748)***	(2.478)**		(9.577)***	
Sign.	[0.045]	[0.000]	[0.013]		[0.000]	
2001						
Coef.	-0.5220	2.6550	0.0003	**0.149**		163
t	(-18.662)***	(5.242)***	(0.140)		(13.993)***	
Sign.	[0.000]	[0.000]	[0.889]		[0.000]	
2000						
Coef.	-0.7120	3.3080	-0.2630	**0.067**		144
t	(-20.269)***	(3.187)***	(-1.243)		(5.090)***	
Sign.	[0.000]	[0.002]	[0.216]		[0.007]	
1999						
Coef.	0.7480	0.0288	0.2430	**0.178**		130
t	(16.860)***	(0.473)	(4.763)***		(13.724)***	
Sign.	[0.000]	[0.637]	[0.000]		[0.000]	
1998						
Coef.	0.8150	0.2370	-0.0030	**0.071**		118
t	(16.825)***	(2.899)***	(-0.358)		(4.394)**	
Sign.	[0.000]	[0.004]	[0.721]		[0.014]	
1997						
Coef.	0.0697	0.1820	0.0009	**0.046**		106
t	(1.256)	(2.231)**	(0.119)		(2.505)*	
Sign.	[0.212]	[0.028]	[0.906]		[0.087]	
1996						
Coef.	-0.2040	0.0030	0.0418	**0.094**		80
t	(-5.186)***	(0.162)	(2.750)***		(3.977)**	
Sign.	[0.000]	[0.872]	[0.007]		[0.023]	
1995						
Coef.	0.1120	0.0480	0.0068	**0.165**		73
t	(3.339)***	(1.756)*	(3.249)***		(6.902)***	
Sign.	[0.001]	[0.083]	[0.002]		[0.002]	
1994						
Coef.	-0.2610	0.0350	0.0611	**0.200**		71
t	(-7.630)***	(1.097)	(4.114)***		(8.476)***	
Sign.	[0.000]	[0.277]	[0.000]		[0.001]	
1993						
Coef.	0.4740	-0.0326	0.0216	**0.053**		55
t	(7.210)***	(-0.445)	(1.666)*		(1.463)	
Sign.	[0.000]	[0.658]	[0.100]		[0.241]	
1992						
Coef.	-0.2860	0.2410	0.0082	**0.286**		37
t	(-5.006)***	(2.847)***	(3.681)***		(6.814)***	
Sign.	[0.000]	[0.007]	[0.001]		[0.003]	

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

Table 3: *A. Relative Information Content Approach*
Regressions of Annual Stock Returns to ROI Levels and ROI Changes

Model (2): $Ret_t = b_0 + b_1 ROI + b_2 \Delta ROI + u_{2t}$

All Years	b_0	b_1	b_2	R^2	F	No of Obs.
Coef.	0.0535	0.0145	0.0032	**0.004**		977
t	(2.429)***	(0.562)	(2.175)**		(2.781)*	
Sign.	[0.015]	[0.574]	[0.030]		[0.062]	
2001						
Coef.	-0.4640	-0.0213	0.0158	**0.025**		163
t	(-17.143)***	(-1.584)	1.605		(2.028)	
Sign.	[0.000]	[0.115]	[0.110]		[0.135]	
2000						
Coef.	-0.6570	0.0316	0.0073	**0.007**		144
t	(-21.803)***	(0.324)	(0.927)		(0.501)	
Sign.	[0.000]	[0.746]	[0.355]		[0.607]	
1999						
Coef.	0.8540	0.0267	-0.0001	**0.001**		130
t	(19.206)***	(0.308)	(-0.080)		(0.054)	
Sign.	[0.000]	[0.758]	[0.938]		[0.947]	
1998						
Coef.	0.8060	-0.6800	0.1270	**0.071**		118
t	(11.802)***	(-1.601)	(2.691)***		(4.399)***	
Sign.	[0.000]	[0.112]	[0.008]		[0.014]	
1997						
Coef.	0.0398	0.8250	0.0020	**0.089**		106
t	(0.722)	(3.169)***	(0.565)		(5.048)***	
Sign.	[0.472]	[0.002]	[0.573]		[0.008]	
1996						
Coef.	-0.1710	0.2900	-0.0137	**0.018**		80
t	(-3.503)***	(1.072)	(-0.497)		(0.708)	
Sign.	[0.001]	[0.287]	[0.621]		[0.496]	
1995						
Coef.	0.0912	0.3930	-0.0080	**0.038**		73
t	(2.033)**	(1.537)	(-0.611)		(1.395)	
Sign.	[0.046]	[0.129]	[0.543]		[0.255]	
1994						
Coef.	-0.2790	0.3100	0.0287	**0.035**		71
t	(-5.936)***	(1.163)	(0.902)		(1.223)	
Sign.	[0.000]	[0.249]	[0.370]		[0.301]	
1993						
Coef.	0.5310	-0.7570	0.0067	**0.032**		55
t	(4.969)***	(-0.918)	(0.539)		(0.853)	
Sign.	[0.000]	[0.363]	[0.592]		[0.432]	
1992						
Coef.	-0.1590	0.0677	-0.0298	**0.007**		37
t	(-1.943)*	(0.092)	(-0.457)		(0.122)	
Sign.	[0.060]	[0.927]	[0.651]		[0.885]	

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

Table 4: *A. Relative Information Content Approach*

Regressions of Annual Stock Returns to EVA® Levels and EVA® Changes

Model (4) $Returns_t = d_0 + d_1 EVA/P_{t-1} + d_2 \Delta EVA/P_{t-1} + u_{4t}$

All Years	d_0	d_1	d_2	R^2	F	No of Obs
Coef.	0.0455	-0.0467	0.0003	**0.009**		977
t	(2.039)**	(-2.856)***	(0.997)		(4.546)***	
Sign.	[0.042]	[0.004]	[0.319]		[0.011]	
2001						
Coef.	-0.4540	-0.0258	-0.0078	**0.019**		163
t	(-17.472)***	(-1.348)	(-1.086)		(1.578)	
Sign.	[0.000]	[0.179]	[0.279]		[0.210]	
2000						
Coef.	-0.6560	0.0883	-0.0575	**0.014**		144
t	(-22.675)***	(1.279)	(-0.598)		(0.997)	
Sign.	[0.000]	[0.203]	[0.551]		[0.372]	
1999						
Coef.	0.8670	0.0748	0.0083	**0.033**		130
t	(20.277)***	(1.700)*	(1.402)		(2.173)	
Sign.	[0.000]	[0.092]	[0.163]		[0.118]	
1998						
Coef.	0.8330	0.0187	0.0288	**0.040**		118
t	(14.570)***	(0.304)	(1.957)*		(2.397)*	
sign	[0.000]	[0.761]	[0.053]		[0.095]	
1997						
Coef.	0.1910	0.1590	0.0001	**0.074**		106
t	(3.455)***	(2.700)***	0.678		(4.128)**	
Sign.	[0.001]	[0.008]	[0.499]		[0.019]	
1996						
Coef.	-0.1600	-0.0154	0.0020	**0.016**		80
t	(-4.327)***	(-0.932)	(0.565)		(0.614)	
Sign.	[0.000]	[0.354]	[0.573]		[0.529]	
1995						
Coef.	0.1270	0.0397	-0.0018	**0.039**		73
t	(3.409)***	(1.640)*	(-0.301)		(1.409)	
Sign.	[0.001]	[0.100]	[0.764]		[0.251]	
1994						
Coef.	-0.2400	0.0006	0.0248	**0.007**		71
t	(-6.206)***	(0.024)	(0.634)		(0.232)	
Sign.	[0.000]	[0.981]	[0.529]		[0.793]	
1993						
Coef.	0.4470	-0.0345	-0.0048	**0.032**		55
t	(6.293)***	(-1.096)	(-0.810)		(0.853)	
Sign.	[0.000]	[0.278]	[0.422]		[0.432]	
1992						
Coef.	-0.1830	-0.0820	0.0115	**0.050**		37
t	(-3.224)***	(-0.572)	(1.265)		(0.888)	
Sign.	[0.003]	[0.571]	[0.241]		[0.421]	

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

Table 2 shows the results (all years and annually) of the regression model (1), which represents earnings per share levels and earnings per share changes. What we mainly examine are: the F statistics of the model, the coefficients' t-statistics of the independent variables and the reported R^2s. Firstly, for the pooled cross-sectional and intertemporal (all years) sample, the model is significant at 0.01 level (F=9.577 and sign.=0.000), suggesting that the Easton and Harris (1991) model provides a satisfactory description of the relation between stock returns and the EPS. Secondly, the coefficients a_1 and a_2 are statistically significant at the 0.01 and 0.05 level respectively suggesting that both EPS levels and EPS changes are associated with stock returns. The reported R^2 is 0.019, relatively low to be considered as the main explanatory factor for stock returns.

Results from the individual year cross-sectional sample revealed the following: nine out of the ten regressions (except the year 1993) are significant according to F statistics, and six of them (years 1992, 1994, 1995, 1999, 2000, 2001) are significant at the 0.01 level, two are significant at the 0.05 level (years 1996 and 1998), while one is significant at the 0.1 level (year 1997). This suggests that Easton and Harris (1991) model provides a satisfactory description of the relationship between stock returns and the EPS. Moreover, most of the co-efficients in annual regressions are statistically significant according to t-statistics, suggesting that EPS is associated with stock returns. What is important to notice in these annual regressions is the relatively high R^2s, ranging from 0.286 in year 1992 to 0.149 in year 2001.

Table 3 shows the results (all years and annually) of the regression model (2), which represents ROI levels and ROI changes. Firstly, for the pooled cross-sectional and intertemporal (all years) sample, the model is significant at the 0.1 level (F=2.781 and sign.=0.062), suggesting that the Easton and Harris (1991) model provides a relatively good description of the relationship between stock returns and the ROI. Secondly, only the coefficient b_2 is statistically significant at the 0.05 level suggesting that change in ROI is associated with stock returns.

Results from the individual year cross-sectional sample are not encouraging. Only two out of the ten regressions (years 1997 and 1998) are significant at the 0.01 level according to F statistics. This suggests that the Easton and Harris (1991) model does not provide a good description of the relationship between stock returns and the ROI for the specific years. Most of the coefficients in annual regression are not statistically significant according to t-statistics, suggesting that ROI is not associated with stock returns. What is important to notice in these annual regressions is the relatively low R^2s. Only in years 1997 and 1998 are the reported R^2s 0.089 and 0.071 respectively.

EVA® results are reported in table 4. Regression model (3) represents EVA® levels and EVA® changes. For the pooled cross-sectional and intertemporal (all years) sample, according to F statistics the model is significant at the 0.01 level, suggesting that the Easton and Harris (1991) model provides a satisfactory description of the relation between stock returns and the EVA®. However, only the coefficient d_1 is statistically significant at the 0.01 level while the same does not happen for the coefficient d_2 suggesting that EVA® is associated with stock returns while change in EVA® is not.

As for the individual year cross-sectional sample, reported results are not encouraging. Only two out of the ten regressions (years 1997 and 1998) are significant at the 0.05 and 0.1 level according to F statistics. Most of the co-efficients in annual regression are not statistically significant according to t-statistics, suggesting that EVA® is not associated with stock returns at least at the individual year's level. Significant R^2s are those of the years 1997 and 1998, which are 0.074, and 0.040 respectively.

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 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. On the other hand, the low explanatory power of the three regressions is consistent to the results of Copeland (2002) who also found low R^2s for EPS and EVA® (although EPS outperformed EVA®), i.e., scaled EPS 4.5 per cent, change in EPS 5.1 per cent, scaled EVA® 0.3 per cent, and change in EVA® 3 per cent.

4.2. Incremental information content approach

To test the incremental information power, each traditional performance measure (EPS, ROI) is combined pair wise with EVA® forming three different equations (4 to 6). 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 5 shows the detailed results from the pair wise combinations of one traditional performance measure and one value-based performance measure (EVA®). The highest R^2 (7.2 per cent) is reported in regression (4), 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 3, table 1). This suggests that the combination of EPS and EVA® represents a quite 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. As shown the combination of ROI and EVA®conveys particularly lower explanation power (2.1 per cent) than that of the combination of EPS and EVA®.

Table 5: *Incremental information content approach – Pair wise combinations*
Incremental / One Traditional Measure (EPS or ROI) + One Value-Based Measure (EVA)

Regr.	ALL YEARS	CONST	EPS	Δ EPS	ROI	Δ ROI	EVA	Δ EVA	R^2	F
4	Coef.	-0.0249	0.2580	0.0056			-0.1570	0.0001	**0.072**	
	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		
5	Coef.	0.0281			0.0630	0.0032	-0.0680	0.0003	**0.021**	
	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		

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

5. Summary / Conclusions

Relative information content approach revealed that the Easton and Harris (1991) model provides a satisfactory description of the relation between stock returns and EPS in the Greek stock market. Moreover, it is proved that earnings levels and earnings changes outperform all other performance measures under examination (ROI 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. However, this does not hold when EVA® is incorporated in the ROI model. The increase is only up to 2.1 per cent. 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 pair wise combinations but also from combinations incorporating more than one traditional or value-based performance measure. Wallace (1997) suggestion that you 'get what you pay for' lead us to propose further research both on adopter and non adopters of EVA® Financial Management System. 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 or stock markets which are going to follow the Greek paradigm (e.g. new or potential members of the European Union) should add value to this kind of research.

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